

cal poly | CALIFORNIA POLYTECHNIC
STATE UNIVERSITY

2011 - 2013

CATALOG



Mission Statement

Cal Poly fosters teaching, scholarship, and service in a learn-by-doing environment where students, staff, and faculty are partners in discovery. As a polytechnic university, Cal Poly promotes the application of theory to practice. As a comprehensive institution, Cal Poly provides a balanced education in the arts, sciences, and technology, while encouraging cross-disciplinary and co-curricular experiences. As an academic community, Cal Poly values free inquiry, cultural and intellectual diversity, mutual respect, civic engagement, and social and environmental responsibility.

Cal Poly On-Line

For the most current information, please visit Cal Poly's web pages:

www.calpoly.edu

www.catalog.calpoly.edu



California Polytechnic State University

2011-2013 Catalog

The 2011-2013 Cal Poly Catalog

The *Catalog* is available online at www.catalog.calpoly.edu in downloadable, printable format. Contact El Corral Bookstore for availability for purchase: 805-756-0144 or 800-367-0771, www.elcorralbookstore.com.

The *Catalog* is prepared in the Office of the Registrar, Cem Sunata. The Interim Associate Registrar for Curriculum and Scheduling is Susan Olivas, and Catalog Editor, Kay Jensen. Special thanks to Ashley Kircher, Public Affairs, for cover design.

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Nothing in this catalog shall be construed as, operate as, or have the effect of an abridgment or a limitation of any rights, powers, or privileges of the Board of Trustees of the California State University, the Chancellor of the CSU, 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 CSU. The relationship of the student to the institution is one governed by statute, rules, and policy adopted by the Legislature, the Trustees, the Chancellor, the President and their duly authorized designees.

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Welcome to Cal Poly

A Message from President Armstrong

As the 21st Century unfolds, Cal Poly remains firmly committed to the values and traditions that have distinguished Cal Poly since it opened its doors more than a century ago. We seek to transform young adults into resourceful professionals and innovative leaders. At the core of our educational experience is our Learn by Doing philosophy, which provides students the opportunities to apply classroom learning theory to real-world problems. We strive to graduate whole-system thinkers who be able to help solve the increasingly complex challenges that confront California and the global community.

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

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

Polytechnic Mission: From its inception, Cal Poly has given particular emphasis to instruction in polytechnic disciplines – science, technology, engineering, agriculture, and mathematics. At the same time, we recognize that liberal arts provide a critical and indispensable foundation for all academic disciplines. We are proud of the comprehensive education Cal Poly provides to its students, who graduate as professionals ready to be leaders in industry and society.

Information Technology to Support Teaching and Learning: Cal Poly has been, and continues to be, a leader in the use of information technology to enhance teaching and learning. Students and faculty have access to Internet resources, to course information, to library resources, and to advanced software tools 24 hours a day.

Educational Philosophy: Cal Poly is committed to excellence in teaching and learning. In all disciplines, we seek to provide a student-centered, learner-focused education, facilitated by a low student-teacher ratio in classes conducted primarily by full-time, regular faculty. The cornerstone of our educational philosophy is our commitment to Learn by Doing whereby classroom instruction is complemented by practical, hands-on learning in the laboratory, the studio, and the field.

Diversity: As a campus, we welcome and nurture a rich array of different perspectives, ideas and cultures. We encourage international and multi-cultural education in order to prepare students for successful participation and competition in a diverse world and a global workforce. We believe that diversity of our students, faculty, and staff enlivens and enriches Cal Poly's educational environment.

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



Jeffrey D. Armstrong
President

A Guide to Using the Catalog

General Information: www.calpoly.edu

Catalog: www.catalog.calpoly.edu/

General Education: www.ge.calpoly.edu

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

For the most current information, students are encouraged to visit the Cal Poly web pages shown above and to consult with their academic advisors.

College and Departments

The faculty who supply instruction at Cal Poly hold positions in academic departments, which in turn are grouped into Colleges. All of the academic programs offered by the University are described in the catalog. A complete listing of academic programs at Cal Poly may be found on page 11.

Sections for each College follow in alphabetical order. Departments are arranged alphabetically within the appropriate College.

Degrees

A *degree* is an academic rank which the University confers on a student who satisfactorily completes a designated curriculum, or program of study. Cal Poly grants undergraduate degrees – also called baccalaureate degrees – as well as master's degrees, and, jointly with the University of California at Santa Barbara, the doctorate of education.

At the undergraduate level, Cal Poly grants the

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

At the graduate level, Cal Poly grants the

- * Master of Arts (MA),
- * Master of Science (MS),
- * Master of Business Administration (MBA),
- * Master of City and Regional Planning (MCRP),
- * Master of Public Policy (MPP), and
- * Doctorate of Education (EdD) jointly with UCSB

Majors

A *major* is a program of study that provides students with the knowledge, skills and experience necessary to pursue a specific career or advanced study and leads to an undergraduate degree in that subject. Each major is offered in an academic department.

Undergraduate applicants to Cal Poly select a major at the time they apply for admission.

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

The curriculum display for each bachelor's degree program shows courses arranged by *Major*, *Support*, *General Education* and *Electives*. These curriculum displays are useful guides, but students should consult with their academic advisors.

Academic Advising. Information regarding academic advising is available on page 28.

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 or offering department). The courses in a bachelor's degree curriculum are identified as *major courses*, *support courses*, *general education*, and *electives*.

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

Approved Electives are courses that students can choose from within the parameters set by their departments.

Support courses provide background needed for major courses and are 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. Some degree programs do not include support courses.

General Education (GE) courses provide a common foundation of knowledge for all undergraduate programs. GE requirements are described in detail on page 39.

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

Prerequisites are one or more courses that must be completed, or other knowledge, skills, or standards that must be demonstrated, before a student is permitted to take certain courses. Prerequisites (if any) for a course are listed in the course description of the catalog.

Some prerequisites have their own prerequisites, forming a string of courses that must all be taken. The catalog course description shows the last course in the prerequisite string of courses. For example, *ME 212 Engineering Dynamics* has prerequisites of MATH 241 and ME 211. *MATH 241* requires MATH 143, which requires MATH 142, which requires MATH 141. *ME 211* requires ME 241 and PHYS 131. To enroll in ME 212, students must have successfully completed MATH 241, 143, 142, 141 and ME 211 and PHYS 131.

Statements in the catalog course descriptions may also contain the words “**concurrent**” which means that two or more courses must be taken in the same term or “**corequisite**” which means that the course or courses may be taken prior to the course being described (prerequisite) or in the same term (concurrent).

Crosslisted courses are shared by two or more academic units and have identical titles, descriptions, units, modes of instruction and prerequisites. They are interchangeable for degree requirements. They cannot be repeated for degree credit under separate prefixes. Example: HNRS 141/MATH 141 Calculus I

Selected Advanced Topics (470s) are generic courses that offer special topics on an "as needed basis." The specific title appears in the Class Schedule and on the students' transcripts.

Topic courses are shown in the catalog with generic titles and are repeatable with different topics. Specific topic titles appear in the Schedule of Classes and on students' transcripts. Example: ENGL 439 Significant British Authors, repeatable to 12 units with different subtitles (e.g., Jane Austen, Victorian Poets, Hardy).

Other statements in the course descriptions include, “**major credit limit**” (total number of units allowed toward the major) and “**total credit limit**” (total number of units students can take a course for credit).

COURSE NUMBERING SYSTEM

Courses are generally numbered according to the plan shown below.

- 010–099 Nondegree credit or short courses.
- 100–299 Courses primarily for freshman and sophomore students.
- 300–399 Courses primarily for advanced undergraduate students with prerequisite coursework.
- 400–499 Courses for advanced undergraduates. Certain 400-level courses can be used in graduate programs. See page 61.
- 500–599 Graduate courses.

MODES OF INSTRUCTION

The mode of instruction is included in each course description; for supervision courses, no mode is indicated. Some courses have more than one mode of instruction.

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

Concentrations

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

Specializations

A **specialization** is a similarly specialized group of courses in a master's degree program. Completion of a specialization is noted on the student's transcript and shown on the diploma.

Minors

A **minor** is an integrated, coherent group of courses designed to give a student knowledge in an academic area outside of the major field of study. The minor is completed along with the requirements for the bachelor's degree. For more information and a list including available minors at Cal Poly, see page 11.

Quarters and Quarter Units

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

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

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

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

To convert semester units to quarter units, multiply by 1.5. For example,

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

Academic Calendar

2011–2013

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

SUMMER TERM 2011

June 20	Beginning of university year Beginning of summer term – classes begin
July 1	End of second week of instruction
July 4	Academic holiday – Independence Day observed
July 11	End of third week of instruction – Census date
August 8	End of seventh week of instruction
August 12	End of eight-week session; finals August 15, 16, 17
August 26	Last day of classes
August 29– Sept 2	Final examination period
September 2	End of summer term
September 3–11	Academic holiday

FALL TERM 2011

September 12	Beginning of fall term (faculty only)
September 19	Fall term classes begin
September 30	End of second week of instruction
October 7	End of third week of instruction – Census date
November 4	End of seventh week of instruction
November 11	Academic holiday – Veterans' Day observed
November 23–27	Academic holiday – Thanksgiving
December 2	Last day of classes
December 5–9	Final examination period
December 10	Mid-Year Commencement, End of fall term
December 11– January 2	Academic holiday

WINTER TERM 2012

January 3, Tuesday	Beginning of winter term – classes begin
January 16	Academic holiday – Martin Luther King, Jr.'s Birthday observed
January 17	End of second week of instruction
January 24	End of third week of instruction – Census date
February 17, Friday	Classes follow a Monday schedule
February 20	Academic holiday – Washington's Birthday observed
February 22	End of seventh week of instruction
March 9	Last day of classes
March 12–16	Final examination period
March 19	*Evaluation Day
March 20	*Grades Due Day, end of winter term
March 21–25	Academic holiday

SPRING TERM 2012

March 26	Beginning of spring term – classes begin
March 30	Academic holiday – César Chávez's Birthday observed
April 9	End of second week of instruction
April 16	End of third week of instruction – Census date
May 14	End of seventh week of instruction
May 28	Academic holiday – Memorial Day observed
June 1	Last day of classes
June 4–8	Final examination period
June 9–10**	Commencement; end of spring term End of university year (faculty only)
June 11–17	Academic holiday

* Faculty work day; not a class day.

** Commencement in June may be scheduled on Saturday only. This will be determined at a later date. For most current information, see the 2011-12 calendar via the Academic Calendar website at www.ess.calpoly.edu/_records/acad_cal/.

SUMMER TERM 2012

June 18	Beginning of university year Beginning of summer term – classes begin
June 29	End of second week of instruction
July 4	Academic holiday – Independence Day observed
July 9	End of third week of instruction – Census date
August 6	End of seventh week of instruction
August 10	End of eight-week session, finals August 13, 14, 15
August 24	Last day of classes
August 27–31	Final examination period
August 31	End of summer term
September 1–9	Academic holiday

FALL TERM 2012

September 10	Beginning of fall term (faculty only)
September 17, Monday	Instructional Planning Day
September 18, Tuesday	Fall term classes begin
October 1	End of second week of instruction
October 8	End of third week of instruction – Census date
November 5	End of seventh week of instruction
November 12	Academic holiday – Veterans' Day observed
November 21–25	Academic holiday – Thanksgiving
November 30	Last day of classes
December 3–7	Final examination period
December 8	Mid-Year Commencement End of fall term
December 9– January 6	Academic holiday

WINTER TERM 2013

January 7	Beginning of winter term – classes begin
January 18	End of second week of instruction
January 21	Academic holiday – Martin Luther King, Jr.'s Birthday observed
January 22, Tuesday	Classes follow a Monday Schedule
January 28	End of third week of instruction – Census date
February 18	Academic holiday – Washington's Birthday observed
February 26	End of seventh week of instruction
March 15	Last day of classes
March 18–22	Final examination period
March 25	*Evaluation Day, End of winter term
March 26–31	Academic holiday

SPRING TERM 2013

April 1	Academic holiday – Cesar Chavez's Birthday observed
April 2, Tuesday	Beginning of spring term – classes begin
April 15	End of second week of instruction
April 22	End of third week of instruction – Census date
May 20	End of seventh week of instruction
May 27	Academic holiday – Memorial Day observed
May 28, Tuesday	Classes follow a Monday Schedule
June 7	Last day of classes
June 10–14	Final examination period
June 15–16**	Commencement
	End of spring term
	End of university year (faculty only)

* Faculty work day; not a class day.

** Commencement in June may be scheduled on Saturday only. This will be determined at a later date. For most current information, see the 2012-13 calendar via the Academic Calendar website at www.ess.calpoly.edu/_records/acad_cal/.

Accreditation

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

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

The School of Education offers instruction and services credentials which are fully accredited by California Commission on Teacher Credentialing (CCTC). The credentials are described in catalog sections on "Teacher Education" and "Graduate Studies in Education."

Program	Accrediting Agency
Art and Design, BFA	National Association of Schools of Art and Design (NASAD)
Architecture, BArch	National Architectural Accrediting Board (NAAB)
Business Administration, BS, MBA	Association to Advance Collegiate Schools of Business (AACSB)
City and Regional Planning, BS, MCRP	Planning Accreditation Board (PAB)
Computer Science, BS	Computing Accreditation Commission (CAC) of the Accreditation Board for Engineering and Technology (ABET)
Construction Management, BS	American Council for Construction Education (ACCE)
Economics, BS	Association to Advance Collegiate Schools of Business (AACSB)
Engineering Programs: Aerospace Engineering, BS Architectural Engineering, BS BioResource and Agricultural Engineering, BS Civil Engineering, BS Computer Engineering, BS Electrical Engineering, BS Environmental Engineering, BS Industrial Engineering, BS Manufacturing Engineering, BS Materials Engineering, BS Mechanical Engineering, BS Software Engineering, BS	Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET)
Forestry and Natural Resources, BS	Society of American Foresters (SAF)
Graphic Communication, BS	Accrediting Counsel for Collegiate Graphic Communications (ACCGC)
Industrial Technology, BS	Association of Technology, Management, and Applied Engineering (ATMAE)
Landscape Architecture, BLA	American Society of Landscape Architects (ASLA) Landscape Architectural Accreditation Board (LAAB)
Music, BA	National Association of Schools of Music (NASM)
Nutrition, BS (Applied Nutrition Concentration)	Commission on Accreditation for Dietetics Education (CADE) of the American Dietetics Association (ADA)
Recreation, Parks, and Tourism Administration, BS	National Recreation and Parks Association (NRPA) and the American Association for Physical Activity and Recreation (AAPAR)

Academic Programs

BA	Bachelor of Arts
BFA	Bachelor of Fine Arts
BS	Bachelor of Science
BArch	Bachelor of Architecture
BLA	Bachelor of Landscape Architecture
EdD	Doctor of Education
MA	Master of Arts
MS	Master of Science
MBA	Master of Business Admin
MCRP	Master of City & Regional Planning
MPP	Master of Public Policy
Concentration	within bachelor's program
Specialization	within master's program
Minor	

Program name	Program type
Accounting	MS, concentration
Actuarial Preparation	minor
Aeronautics	concentration
Aerospace Engineering	BS, MS
Agribusiness	MS, specialization, minor
Agricultural and Environmental Plant Sciences	BS
Agricultural Business	BS
Agricultural Communication	minor
Agricultural Education	MAGEd
Agricultural Engineering Technology	specialization, concentration
Agricultural Science	BS
Agricultural Supplies & Services	concentration
Agricultural Systems Management	BS
Agriculture	MS
American Politics	concentration
Anatomy and Physiology	concentration
Animal Science	BS, concentration, specialization
Anthropology and Geography	BS, minor
Applied Food Technology	concentration
Applied Mathematics	concentration
Applied Nutrition	concentration
Applied Social Psychology	concentration
Architectural Engineering	BS, specialization, minor
Architecture	BArch, MS
Art & Design	BFA
Art History	minor
Asian Studies	minor
Astronautics	concentration
Astronomy	minor

Biochemical Engineering	specialization
Biochemistry	BS
Bioengineering	concentration, specialization
Biological Sciences	BS, MS, MA
Biology	minor
Biology Teaching	concentration
Biomedical Engineering	BS, MS, specialization
BioResource & Agricultural Engineering	BS
Biotechnology	minor
Business	minor
Business Administration	BS, MBA
Business & Technology	MS
Chemistry	BS
Child Development	BS, minor
City & Regional Planning	BS, MCRP, minor
Civil Engineering	BS
Civil & Environmental Engineering	MS
Climate Change Studies	concentration
Communication Studies	BA, minor
Comparative Ethnic Studies	BA
Computer Engineering	BS
Computer Graphics	concentration
Computer Science	BS, MS, minor
Construction Management	BS, minor
Counseling & Family Psychology	concentration
Counseling & Guidance	specialization
Criminal Justice	concentration
Crop & Soil Science	concentration
Crop Science	concentration, specialization, minor
Cross-Cultural Studies & International Devel	concentration
Culinary	concentration
Culture, Society and Technology	concentration
Dairy Products Technology	specialization
Dairy Science	BS, minor
Dance	minor
Design Reproduction Technology	concentration
Developmental Psychology	concentration
Disaster Management & Homeland Security	minor
Document Systems Management	specialization
Earth Sciences	BS
Ecology	concentration
Economics	BS, MS, minor
Education	MA
Educational Leadership & Administration	specialization
Electrical Engineering	BS, MS
Electrical Engineering (Power)	concentration
Electronics	concentration
Electro-Optics	concentration

Engineering	<i>MS</i>
Engineering Management	<i>MBA/MS</i>
English	<i>BA, MA, minor</i>
Enology	<i>concentration</i>
Entrepreneurship	<i>concentration</i>
Environmental Design	<i>specialization</i>
Environmental Engineering	<i>BS</i>
Environmental Horticultural Science	<i>specialization</i>
Environmental Impact Mitigation Strategies	<i>concentration</i>
Environmental Interpretation and Assessment	<i>concentration</i>
Environmental Management	<i>concentration</i>
Environmental Management and Protection	<i>BS</i>
Environmental Planning and Assessment	<i>concentration</i>
Environmental Policy and Management	<i>concentration</i>
Environmental Science and Technology	<i>concentration</i>
Environmental Studies	<i>minor</i>
Environmental Studies and Sustainability	<i>concentration</i>
Equine Science	<i>minor</i>
Ethnic Studies	<i>minor</i>
Event Planning and Management	<i>concentration</i>
Field and Wildlife Biology	<i>concentration</i>
Financial Accounting	<i>specialization</i>
Financial Management	<i>concentration</i>
Fire Protection Engineering	<i>MS</i>
Food Science	<i>BS, concentration, minor</i>
Food Science and Nutrition	<i>specialization</i>
Forest and Environmental Practices	<i>concentration</i>
Forestry and Natural Resources	<i>BS, concentration</i>
Forestry Sciences	<i>MS</i>
French	<i>minor</i>
Fruit Science	<i>concentration, minor</i>
General Engineering	<i>BS</i>
Geographic Information Systems (GIS)	<i>minor</i>
Geology	<i>concentration, minor</i>
Geosciences Teaching	<i>concentration</i>
German	<i>minor</i>
Gerontology	<i>minor</i>
Global Politics	<i>concentration, minor</i>
Graphic Communication	<i>BS, minor</i>
Graphic Communication Document Sys Mgt	<i>specialization</i>
Graphic Communication Management	<i>concentration</i>
Graphic Design	<i>concentration</i>
Graphics for Packaging	<i>concentration</i>
Greenhouse and Nursery Plant Production	<i>concentration</i>
Heating, Ventilating, Air-Conditioning and Refrigerating	<i>concentration</i>
History	<i>BA, MA, minor</i>

Human Ecology	<i>concentration</i>
Industrial Engineering	<i>BS, MS</i>
Industrial Technology	<i>BS, minor</i>
Information Systems	<i>concentration</i>
Interactive Communication-Cinema	<i>concentration</i>
Interactive Communication-Theatre	<i>concentration</i>
Integrated Project Delivery	<i>minor</i>
Integrated Technology Management	<i>specialization</i>
Interdisciplinary Studies	<i>BA</i>
International Business	<i>concentration</i>
Irrigation	<i>specialization</i>
Journalism	<i>BS</i>
Kinesiology	<i>BS, MS</i>
Land Rehabilitation	<i>minor</i>
Land Resources	<i>concentration</i>
Land and Water Resources	<i>concentration</i>
Landscape Architecture	<i>BLA</i>
Landscape Horticulture	<i>minor</i>
Latin America Studies	<i>minor</i>
Law and Society	<i>minor</i>
Liberal Arts and Engineering Studies	<i>BA</i>
Liberal Studies	<i>BS</i>
Linguistics	<i>minor</i>
Management and Human Resources	<i>concentration</i>
Manufacturing Engineering	<i>BS</i>
Marine Biology and Fisheries	<i>concentration</i>
Marketing Management	<i>concentration</i>
Materials Engineering	<i>BS, specialization</i>
Mathematics	<i>BS, MS, minor</i>
Meat Science and Processing	<i>minor</i>
Mechanical Engineering	<i>BS, MS</i>
Mechatronics	<i>concentration</i>
Media Arts and Technologies	<i>minor</i>
Microbiology	<i>BS, minor</i>
Military Science	<i>minor</i>
Modern Languages and Literatures	<i>BA</i>
Molecular and Cellular Biology	<i>concentration</i>
Multidisciplinary Design	<i>minor</i>
Music	<i>BA, minor</i>
Nutrition	<i>BS, minor</i>
Nutrition and Food Industries	<i>concentration</i>
Nutrition Science	<i>concentration</i>
Organizations	<i>concentration</i>
Ornamental Horticulture	<i>concentration</i>
Ornamental Plant Production	<i>minor</i>
Outdoor, Adventure, & Resource Recreation	<i>concentration</i>
Packaging	<i>minor</i>
Packaging and Logistics	<i>concentration</i>
Philosophy	<i>BA, minor</i>

Photography	<i>concentration, minor</i>
Physics	<i>BA, BS, minor</i>
Plant Protection Science	<i>concentration, specialization, minor</i>
Political Science	<i>BA</i>
Poultry Management	<i>minor</i>
Polymers & Coatings Science	<i>concentration, MS</i>
Pre-Law	<i>concentration</i>
Professional Practice	<i>specialization</i>
Psychology	<i>BS, MS, minor</i>
Public Horticulture	<i>concentration</i>
Public Policy	<i>MPP</i>
Publishing Technology	<i>concentration</i>
Pure Mathematics	<i>concentration</i>
Quantitative	<i>concentration</i>
Rangeland Resources	<i>minor</i>
Real Estate	<i>concentration</i>
Real Property Development	<i>minor</i>
Recreation, Parks, & Tourism Administration	<i>BS, specialization</i>
Religious Studies	<i>minor</i>
Research	<i>specialization</i>
Social Services	<i>concentration</i>
Sociology	<i>BA, minor</i>
Software Engineering	<i>BS</i>
Soil Science	<i>BS, specialization, minor</i>
Space Systems Engineering	<i>specialization</i>
Spanish	<i>minor</i>
Special Education	<i>specialization</i>
Sport Management	<i>concentration</i>
Stem Cell Research	<i>specialization</i>
Statistics	<i>BS, minor</i>
Studio Art	<i>concentration, minor</i>
Sustainable Agriculture	<i>minor</i>
Sustainable Environments	<i>minor</i>
Sustainable Landscape Mgmt & Design	<i>concentration</i>
System Design	<i>concentration</i>
Tax	<i>specialization</i>
Teaching	<i>concentration</i>
Technical Communication	<i>concentration</i>
Theatre	<i>BA, minor</i>
Tourism Planning & Management	<i>concentration</i>
Transportation Planning	<i>MCRP/MS</i>
Turfgrass and Sports Field Management	<i>concentration</i>
Urban Forestry	<i>concentration</i>
Values, Technology and Society	<i>minor</i>
Viticulture	<i>concentration</i>
Water Engineering	<i>specialization</i>
Water Science	<i>minor</i>

Watershed Management & Hydrology	<i>concentration</i>
Web and Digital Media	<i>concentration</i>
Western Intellectual Tradition	<i>minor</i>
Wildland Fire and Fuels Management	<i>concentration</i>
Wine & Viticulture	<i>BS, minor</i>
Wine Business	<i>concentration</i>
Women's & Gender Studies	<i>minor</i>

CREDENTIAL PROGRAMS

Administrative Services
Agriculture Specialist
Education Specialist (Mild/Moderate Disabilities)
Multiple Subject Instruction
Multiple Subject; Bilingual Cross-cultural Language and Academic Development (BCLAD) Emphasis
Single Subject; Agriculture Instruction
Single Subject; Biological Science Instruction
Single Subject; Chemistry Instruction
Single Subject; English Instruction
Single Subject; Mathematics Instruction
Single Subject; Social Science Instruction
Single Subject; Physical Education Instruction
Single Subject; Physics Instruction

OTHER PROGRAMS

ROTC
Gerontology Certificate
Teaching English as a Second Language (TESL) Certificate
Technical Communication Certificate

University Policies

STATEMENT ON COMMITMENT TO COMMUNITY

The Cal Poly community values a broad and inclusive campus learning experience where its members embrace core values of mutual respect, academic excellence, open inquiry, free expression and respect for diversity. Membership in the Cal Poly community is consistent with the highest principles of shared governance, social and environmental responsibility, engagement and integrity.

As students, faculty and staff of Cal Poly, we choose to:

- Act with integrity and show respect for ourselves and one another
- Accept responsibility for our individual actions
- Support and promote collaboration in University life
- Practice academic honesty in the spirit of inquiry and discovery
- Contribute to the university community through service and volunteerism
- Demonstrate concern for the well-being of others
- Promote the benefits of diversity by practicing and advocating openness, respect and fairness

Individual commitment to these actions is essential to Cal Poly's dedication to an enriched learning experience for all its members.

STATEMENT ON DIVERSITY

The following excerpts are taken from *The Cal Poly Statement on Diversity*¹, which has been endorsed by the Cal Poly Academic Senate Resolution AS-506-98/DTF:

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

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

POLICIES ON THE RIGHTS OF INDIVIDUALS

Cal Poly is a community enriched by individual differences. The University is committed to respecting and protecting the rights of individuals. This section presents a summary of University non-discrimination policies and procedures for pursuing complaints under these policies. The office of Employment Equity, working with the Inclusive Excellence Council, has been designated to oversee and coordinate implementation of campus non-discrimination policies.

Except where otherwise indicated, procedures for reporting incidents of discrimination can be found in “Reporting Guidelines.”

Non-discrimination Policy

Cal Poly does not discriminate in admission or access to, or treatment or employment in, its programs and activities, including intercollegiate athletics. Cal Poly and its auxiliary organizations are committed to maintaining and implementing policies and procedures in compliance with applicable CSU, State, and federal nondiscrimination and affirmative action laws, regulations, and policies. Cal Poly supports an environment free of unlawful discrimination on the basis of:

- Race
- Color
- Ethnicity
- National Origin
- Age (40 and above)
- Religion
- Sex
- Request for employee leave
- Sexual Orientation
- Gender Identity
- Marital Status
- Physical Disability
- Mental Disability
- Medical Condition
- Veteran Status (as defined by the Vietnam-Era Veterans' Readjustment Assistance Act of 1974, as amended)

Federal, State and CSU Mandates

Cal Poly complies with the requirements of Title VI and Title VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Sections 504 and 508 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990 and other CSU, State, and federal laws, regulations, and policies prohibiting unlawful discrimination.

Protection from Retaliation

It is critical that individuals not be deterred from reporting possible prohibited harassment. CSU policy [Executive Order 927] prohibits retaliation against individuals who have or are believed to have filed a discrimination complaint, opposed a discriminatory act, or participated in a discrimination investigation or proceeding.

Reporting Guidelines

Individuals with inquiries regarding the application of these laws, regulations and policies to programs and activities of California Polytechnic State University, or those wishing to file a complaint alleging a violation of these policies, may contact the office of Employment Equity, Fisher Science (Bldg. 33), Room 290, 805 756-6770, <http://employeequity.calpoly.edu>, or other designated campus offices as indicated in the following administrative guidelines.

- * Students may obtain confidential, informal, impartial, and independent advice about any university-related concerns from Student Ombuds Services, Robert E. Kennedy Library (Bldg. 35), Room 113, 805 756-1380,

¹ The definition of diversity is specifically inclusive of, but not limited to, an individual's race/ethnicity, sex/gender, socioeconomic status, cultural heritage, disability, and sexual orientation.

<http://ombuds.calpoly.edu>. Working with Student Ombuds Services does not constitute official notice to the University of alleged policy violations.

- * Complaints from or about students alleging violations of these policies by other students may be directed to the office of the Vice President for Student Affairs, Administration Building (Bldg. 01), Room 209, 805 756-1521; the office of the Dean of Students, Student Health Center (Bldg. 17), Room 113, 805 756-0327; or the office of Student Rights and Responsibilities, Student Services Building (Bldg. 124), 805 756-0327
- * Student disability-related complaints may be directed to the Disability Resource Center, Student Services (Bldg. 124), Room 119, 805 756-1395.
- * Students wishing to seek additional information or file a complaint not previously addressed should contact the office of Employment Equity, Fisher Science (Bldg. 33), Room 290, 805 756-6770, for assistance.
- * Complaints by or against employees who are covered by either collective bargaining agreements or CSU system-wide procedures shall be processed in accordance with the applicable collective bargaining agreement or system-wide procedures. Questions should be directed to the office of the Associate Vice Provost for Academic Personnel, Administration (Bldg. 01), Room 314, 805 756-2844 for faculty matters; and the office of the Director of Human Resources, Administration (Bldg. 01), Rm 110, 805 756-6564, for staff or management issues.
- * Complaints from non-represented employees or Independent Contractors may be directed to the office of Employment Equity, Fisher Science (Bldg. 33), Room 290, 805 756-6770.
- * Complaints by or against employees of the Cal Poly Corporation must follow the Corporation's "Procedures for Resolving Harassment Complaints." Any such complaints should be directed to either her or his supervisor or the Advisor on Harassment Concerns, Corporation Building (15), 805 756-1151.
www.calpolycorporation.org/administration/policies/pm207.pdf
- * Employees and students of Associated Students, Inc., comply with University policies. Employees of Associated Students, Inc., or others who believe that they have been discriminated against can file a complaint using the ASI "Policy Prohibiting Harassment."
www.asi.calpoly.edu/about/policies/personnel_policy_manual.pdf
- * If an act of discrimination is alleged to have occurred over the campus's information resources infrastructure—telephones, computers, network, etc.—redress may be through Information Technology Service's "Responsible Use Policy." Initial inquiries regarding violations should be directed to the office of the Vice Provost and Chief Information Officer, (Bldg. 14), Room 113, 805 756-5541.

Inquiries concerning the application of these laws to programs and activities of California Polytechnic State

University may also be referred to the Regional Director of the Office for Civil Rights, United States Department of Education, 50 Beale Street, Suite 7200, San Francisco, California 94105.

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

ACADEMIC FREEDOM

Cal Poly recognizes and supports the principle of academic freedom, by which each instructional faculty member, researcher, librarian and counselor 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.

Cal Poly endorses the nationally recognized definition of academic freedom from the American Association of University Professors (AAUP): The 1940 *Statement of Principles on Academic Freedom and Tenure with 1970 Interpretative Notes*, as follows:

(a) Teachers¹ are entitled to full freedom in research and in the publication of results, subject to the adequate performance of their other academic duties; but research, for pecuniary return, should be based upon an understanding with the authorities of the institution.

(b) Teachers are entitled to freedom in the classroom in discussing their subject, but they should be careful not to introduce into their teaching controversial subject matter

¹ The footnote from the 1940 Statement states: "The word 'teacher' as used in this document is understood to include the investigator who is attached to an academic institution without teaching duties." Reference: AAUP: The 1940 *Statement of Principles on Academic Freedom and Tenure with 1970 Interpretative Notes*, adopted by the Council of the American Association of University Professors in April 1970 and endorsed by the Fifty-sixth Annual Meeting as Association policy, www.aaup.org/AAUP/pubsres/policydocs/contents/1940statement.htm

which has no relation to the subject.² Limitations of academic freedom because of religious or other aims of the institution should be clearly stated in writing at the time of appointment.

(c) College and university teachers are citizens, members of a learned profession, and officers of an educational institution. When they speak or write as citizens, they should be free from institutional censorship or discipline, but their special position in the community imposes special obligations. As scholars and educational officers, they should remember that the public may judge their profession and institution by their utterances. Hence, they should at all times be accurate, should exercise appropriate restraints, should show respect for the opinions of others, and should make every effort to indicate they are not speaking for the institution.

STUDENT ACADEMIC RIGHTS & RESPONSIBILITIES

Academic Rights

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

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

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

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

A **Fairness Board** has been established to hear grievances of students who believe their academic rights have been denied or violated. The legitimacy of the process and procedure of evaluation in the course shall be the sole criterion of the Fairness Board. Students may contact the Academic Senate (805-756-1258; www.calpoly.edu/~acadsen) for clarification of the description and procedures for the Fairness Board and the appeal process for grade disputes.

Students may also contact the Dean of Students (805-756-0327) for informal assistance with grade disputes.

Academic Responsibilities

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

Cheating and Plagiarism

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

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

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

University policy can be summarized simply:

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

USE AND RELEASE OF STUDENT INFORMATION

www.ess.calpoly.edu/_records/stu_info/ferpa.htm

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

² The footnote from the 1970 Interpretative Notes on the AAUP Statement reads: "The intent of this statement is not to discourage what is 'controversial.' Controversy is at the heart of free academic inquiry which the entire statement is designed to focus. The passage serves to underscore the need for teachers to avoid persistently intruding material which has no relation to the subject."

RESPONSIBLE USE OF INFORMATION TECHNOLOGY RESOURCES

<http://security.calpoly.edu/policies/>

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

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

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

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

E-MAIL -- AN OFFICIAL MEANS OF COMMUNICATION TO STUDENTS

www.email.calpoly.edu/policy/email-student-final.html

Campus policy permits colleges, departments and faculty to use electronic mail (e-mail) to send official communications to students, i.e., messages pertaining to the conduct of university business for academic or administrative purposes. Using e-mail for such purposes is at the discretion of the sender and in no way precludes the use of other communication methods. Official communications are sent to a student's university-assigned e-mail address (*username@calpoly.edu*).

Students are responsible for receiving and reading official e-mail communications in a timely manner and for taking action where appropriate. Redirecting university e-mail to a non-university e-mail address does not absolve students from their responsibilities associated with official communications.

For more information about the policy and related standards and practices, including frequently asked questions, see *www.email.calpoly.edu/policy/index.html*.

ACCESSIBILITY OF CAL POLY ELECTRONIC AND INFORMATION TECHNOLOGY RESOURCES

<http://accessibility.calpoly.edu>

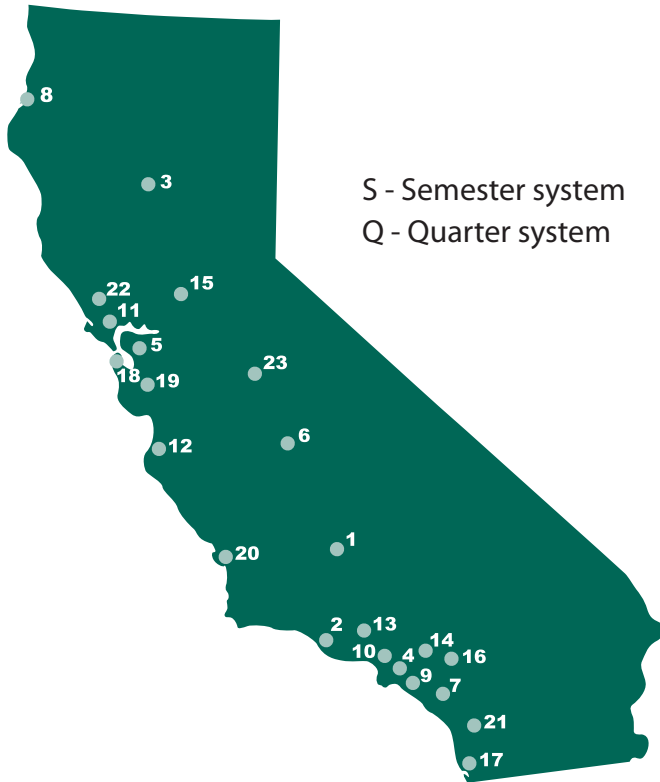
The Americans with Disabilities Act (ADA) provides that no qualified individual with a disability be denied access to or participation in services, programs, and activities at Cal Poly. This act applies to virtually all aspects of campus

activities, including employment, teaching and learning, and services provided to the campus community.

It is the policy of the California State University to make information technology resources and services accessible to all CSU students, faculty, staff, and the general public regardless of disability status. Cal Poly is committed to ensuring that university information and services delivered electronically are made accessible and the needs of individual students and employees with disabilities are accommodated. For more information regarding Cal Poly plans and policies and related standards and practices related to accessibility, visit *<http://accessibility.calpoly.edu>*.

A world of information is just a click away.

Check out the website for the entire **California State University**: www.csumentor.edu. You will find helpful hints, frequently-asked questions, campus tours, and general information about all 23 campuses. The phone number listed for each campus is for the Office of Admissions. -



S - Semester system
Q - Quarter system

- 1 **California State University, Bakersfield • Q**
9001 Stockdale Highway, Bakersfield, CA 93311-1099
(661) 654-3036 • www.csusb.edu
- 2 **California State University Channel Islands • S**
One University Drive, Camarillo, CA 93012
(805) 437-8500 • www.csuci.edu
- 3 **California State University, Chico • S**
400 W. First Street, Chico, CA 95929-0722
(530) 898-6321 • www.csuchico.edu
- 4 **California State University, Dominguez Hills • S**
1000 East Victoria Street, Carson, CA 90747
(310) 243-3645 • www.csudh.edu
- 5 **California State University, East Bay • Q**
25800 Carlos Bee Blvd., Hayward, CA 94542-3035
(510) 885-2556 • www.csueastbay.edu
- 6 **California State University, Fresno • S**
5150 North Maple Avenue, Fresno, CA 93740-0057
(559) 278-2261 • www.csufresno.edu
- 7 **California State University, Fullerton • S**
800 N. State College Blvd., Fullerton, CA 92834-9480
(657) 278-7601 • www.fullerton.edu
- 8 **Humboldt State University • S**
1 Harpst Street, Arcata, CA 95521-4957
(707) 826-4402 • (866) 850-9556 • www.humboldt.edu
- 9 **California State University, Long Beach • S**
1250 Bellflower Blvd., Long Beach, CA 90840-0106
(562) 985-5471 • www.csulb.edu
- 10 **California State University, Los Angeles • Q**
5151 State University Drive, Los Angeles, CA 90032-8530
(323) 343-3901 • www.calstatela.edu
- 11 **California Maritime Academy • S**
200 Maritime Academy Drive, Vallejo, CA 94590
(707) 654-1330 • www.csum.edu
- 12 **California State University, Monterey Bay • S**
100 Campus Center Drive, Seaside, CA 93955-8001
(831) 582-3738 • www.csUMB.edu
- 13 **California State University, Northridge • S**
18111 Nordhoff Street, Northridge, CA 91330-8207
(818) 677-3700 • www.csun.edu
- 14 **California State Polytechnic University, Pomona • Q**
3801 West Temple Avenue, Pomona, CA 91768-4003
(909) 869-5299 • www.csupomona.edu
- 15 **California State University, Sacramento • S**
6000 J Street, Sacramento, CA 95819-6112
(916) 278-7766 • www.csus.edu
- 16 **California State University, San Bernardino • Q**
5500 University Parkway, San Bernardino, CA 92407-2397
(909) 537-5188 • www.csusb.edu
- 17 **San Diego State University • S**
5500 Campanile Drive, San Diego, CA 92182-7455
(619) 594-6336 • www.sdsu.edu
- 18 **San Francisco State University • S**
1600 Holloway Avenue, San Francisco, CA 94132-4001
(415) 338-1113 • www.sfsu.edu
- 19 **San José State University • S**
One Washington Square, San José, CA 95192-0009
(408) 283-7500 • www.sjsu.edu
- 20 **California Polytechnic State University, San Luis Obispo • Q**
San Luis Obispo, CA 93407
(805) 756-2311 • www.calpoly.edu
- 21 **California State University, San Marcos • S**
333 S. Twin Oaks Valley Road
San Marcos, CA 92096-0001
(760) 750-4848 • www.csusm.edu
- 22 **Sonoma State University • S**
1801 East Cotati Avenue, Rohnert Park, CA 94928
(707) 664-2778 • www.sonoma.edu
- 23 **California State University, Stanislaus • S**
One University Circle, Turlock, CA 95382
(209) 667-3070 • www.csustan.edu

Undergraduate Admissions

Office of Admissions, Recruitment & Financial Aid
Administration Building (01), Room 206
805 756-2311 Fax: 805 756-5400
Tour Information Line: 805 756-5734
admissions.calpoly.edu/
email: admissions@calpoly.edu

ADMISSIONS

Cal Poly comprehensively reviews all applications, seeking students who have strong academic records and are active in and outside the classroom. Admission to Cal Poly is highly competitive. Beyond the basic California State University qualifications, Cal Poly considers other factors for admission deemed important to the campus and does so in an objective format. The faculty-developed Multi-Criteria Admission (MCA) process is utilized to screen and select applicants for admission. This multi-valued selection process combines academic factors with other objective values to comprehensively review all applicants for selection. To be fair to all applicants, the review process is systematic. Decisions are based on the competitive nature of the applicant compared to other applicants who apply to the same major. Admission decisions are based on the available spaces in each major. Regular decision candidates will be notified of a formal decision by April 1st.

FIRST-TIME FRESHMAN FACTORS

When a freshman application is reviewed, the following are considered:

- The applicant's intended program of study (the major to which application is made)
- The applicant's college preparatory courses in secondary school
- GPA earned in college preparatory courses
- Standardized test scores
- The applicant's extra-curricular activities and work experience

For a comprehensive look at Cal Poly's selection criteria for a freshman applicant, including deadlines, visit <http://admissions.calpoly.edu/apply/fcriteria>.

UPPER-DIVISION TRANSFER FACTORS

When an upper-division* transfer application is reviewed, the following are considered:

- The applicant's intended program of study (the major to which application is made)
- Number of units completed
- Completion of CSU and Cal Poly program required coursework with a grade of 'C' or better

- General Education (G.E. Breadth) or Intersegmental General Education Transfer Curriculum (IGETC) courses
- Academic performance in college courses (GPA)
- The applicant's extracurricular activities and work experience

For a comprehensive look at Cal Poly's selection criteria for a transfer applicant, including deadlines, visit <http://admissions.calpoly.edu/apply/tcriteria>.

The majors below have additional requirements:

- Art and Design – qualified freshman and transfer applicants will be requested to submit an electronic portfolio per specific instructions provided to the applicant
- Music – qualified freshman and transfer applicants will be requested to audition either in person or via specified media
- Architecture – qualified transfer applicants will be requested to submit a portfolio per specific instructions provided to the applicant

APPEALS

Cal Poly does not set aside spaces for students who appeal admission decisions. Every denied application has been reviewed for maximum consideration. Therefore, for an appeal to have merit it must bring to light new academic information as well as information pertaining to extenuating circumstances that was not present in the application – information that clearly shows the student to be stronger than had been earlier evidenced. Review the information on the Cal Poly Admissions website for complete information and instructions regarding submitting an appeal at <http://admissions.calpoly.edu/applied/appeal>.

APPLICATION PROCEDURES

For admission consideration, Cal Poly requires applicants to submit the online application (www.csumentor.edu) with the corresponding \$55.00 application fee which is both non-refundable and non-transferable. The application and fee cannot be used to apply to another term.

Applicants should not submit additional information beyond the information submitted on the application unless requested to do so by the Admissions Office. Applicants are advised to submit complete and accurate information on the application for admission. Failure to file complete,

* Cal Poly only considers transfer applicants at the junior level (60 or more transferable semester units or 90 quarter units by the time of transfer [end of previous spring term for fall admission]). Cal Poly does *not* accept applications for these categories:

- Lower-division transfer applicants (less than 60 transferable semester units or 90 transferable quarter units upon transfer)
- Students seeking a second baccalaureate degree
- Students seeking professional growth or professional development

accurate, and authentic application documentation may result in denial of admission, cancellation of academic credit, suspension, or expulsion (Section 41301 of Title V, California Code of Regulations).

View detailed online application information at <http://admissions.calpoly.edu/apply>.

CAL POLY APPLICATION FILING PERIODS

Cal Poly accepts undergraduate (freshman or transfer) applications for the fall term only.

Freshman Applicants have two options under which they may apply:

- The **“Regular Decision”** option is used by the vast majority of freshman applicants and requires applicants to submit Cal Poly’s online application with the corresponding fee during the application filing period of October 1st to November 30th.

Please note: Regular Decision applicants will receive notification of their admission status by April 1st and those selected must accept or decline Cal Poly’s offer of admission by May 1st.

- The **“Early Decision”** option is for freshman applicants for whom Cal Poly is a clear first-choice and requires applicants to submit Cal Poly’s online application with the corresponding fee and indicating Early Decision admission during the application filing period of October 1st to October 31st. For Early Decision, Cal Poly will use the ACT and/or SAT I (math and critical reading only) scores applicants have at the time of application.

Please note: Early Decision applicants will receive notification of their admission status in mid-December and those selected must accept or decline Cal Poly’s offer of admission by January 15th. Applicants not selected for Early Decision admission will also have their application reviewed through the Regular Decision process and will receive equal consideration through that process with those who applied directly for Regular Decision. International students and all applicants wishing to apply to the majors of Art and Design or Music cannot be considered for Early Decision admission.

Transfer Applicants apply through the **“Regular Decision”** process which requires applicants to submit Cal Poly’s online application with the corresponding fee during the application filing period of October 1st to November 30th.

Please note: Regular Decision applicants will receive notification of their admission status by April 1st and those selected must accept or decline Cal Poly’s offer of admission by May 1st.

Offers of admission to Cal Poly are conditional pending satisfactory compliance with the “Terms and Conditions of Admission” found online at <http://admissions.calpoly.edu/admitted/terms>.

FORMER/RETURNING STUDENTS

Former Students Returning in the Same Major

Students who were previously enrolled at Cal Poly and who wish to return to the University must follow the guidelines appropriate to their category.

Former students, **who left Cal Poly in good standing (2.0 or higher GPA)** before completing their degree, may essentially resume their former program of study (major) without competing for admission with new applicants, providing the following conditions are met:

1. The student has not registered for classes for three or more consecutive terms (counting summer term).
2. The student has **not** been on an approved leave of absence.
3. A CSU paper application and corresponding fee is filed or postmarked before the application deadline date listed below for the appropriate term:

Term	Deadline
Fall Quarter.....	July 1st
Winter Quarter.....	October 1st
Spring Quarter.....	February 1st

Former students **who did not leave the University in good standing** (i.e., were academically disqualified), will have their application and transcripts sent to their department/college for review before reinstatement can occur. Applicants in this category are advised to contact their department or advising center to begin dialogue about satisfying any requirements **before** submitting their application.

Former Students Returning in a New Major

Former Cal Poly students wishing to return to Cal Poly in a different major must file an online application with the corresponding fee by the same application deadline as new applicants. Applicants in this category will compete equally with new applicants for the available transfer openings in their declared major.

OTHER INFORMATION

Consistency with State Regulations

The philosophy of the Cal Poly Admissions Office is consonant with the mission of California Polytechnic State University and is in accordance with Title V, Chapter 1, Subchapter 3, of the California Code of Regulations, and specifically, the California Code of Regulations for the California State University System, Title V, Section 40600.

Graduate Admission Requirements

View online information for graduate admission at <http://admissions.calpoly.edu/apply/gradtips>.

Determination of Residence for Tuition Purposes

The Cal Poly Admissions Office determines the residence status of all new and returning students for tuition purposes. View comprehensive online information at <http://admissions.calpoly.edu/apply/residency>.

International Student Admissions

Office of Admissions, Recruitment & Financial Aid
Administration Building (01), Room 206
805 756-2311 Fax: 805 756-5400
Tour Information Line: 805 756-5734
admissions.calpoly.edu
email: admissions@calpoly.edu

ADMISSIONS

Cal Poly, as part of the California State University (CSU) system, assesses the academic preparation of international students using factors such as academic performance, verification of English proficiency, and financial resources (to meet federal regulations). For this purpose, international students include those who hold U.S. visas as students, exchange visitors, or those in other nonimmigrant classifications. The CSU uses separate requirements and application filing dates in the admission of international students.

Reference the International Admissions section on the Cal Poly Admissions website for detailed information, at <http://admissions.calpoly.edu/apply/icriteria>.

APPLICATION PROCEDURES

Cal Poly does not have a separate international application. International applicants submit the online application (www.csumentor.edu) appropriate to their level of entry with the corresponding \$55.00 application fee which is both non-refundable and non-transferable. The Cal Poly Admissions Office will contact each international applicant regarding additional requirements once the application has been received. View application information, deadlines and selection timelines by visiting <http://admissions.calpoly.edu/apply/ideadlines>.

For details on additional information required from international applicants, in addition to the application for admission:

International Freshman Applicants – visit <http://admissions.calpoly.edu/apply/ifchecklist>.

International Transfer Applicants – visit <http://admissions.calpoly.edu/apply/itchecklist>.

Please note: Cal Poly does not accept applications for undergraduate transfer students with less than 60 transferable semester units (90 quarter units) or applications for second undergraduate degrees.

International Graduate Applicants – visit <http://admissions.calpoly.edu/apply/igchecklist>.

After all required documents have been received, the Admissions Office will determine eligibility for admission and will notify the applicant of the result. International applicants admitted to Cal Poly receive a Certificate of Eligibility (I-20 form) which is necessary to obtain a student visa to enter the United States or for requesting permission from the U.S. Citizenship and Immigration Services (USCIS) for transfer to Cal Poly from another U.S. institution. Other requirements may be imposed by USCIS. Applicants should note the I-20 form is valid for enrollment only at Cal Poly for the term indicated and that it includes an expiration date.

DEADLINES

Undergraduate Deadlines for International Students

<i>Term</i>	<i>Application Filing Period</i>	<i>File Completion Deadline</i>
Fall	Oct 1 – Nov 30	May 1
Winter*	June 1 – June 30	Sept. 1

*Transfer students with 60 or more transferable semester units only.

Graduate Deadlines for International Students

<i>Term</i>	<i>Application Filing Period</i>	<i>File Completion Deadline</i>
Fall	Oct 1 – Nov 30	May 1
Winter	Oct 1 – June 30	Sept. 1

For detailed information about deadlines, visit <http://admissions/calpoly.edu/apply/ideadlines>.

International students should also visit the Cal Poly International Education and Programs website at www.iep.calpoly.edu for additional international student information and services.

Fees & Expenses

www.fees.calpoly.edu

The California State University (CSU) makes every effort to keep student costs to a minimum. Fees listed in published schedules or student accounts may need to be increased when public funding is inadequate. Therefore, CSU must reserve the right, even after initial fee payments are made, to increase or modify any listed fees, without notice, until the date when instruction for a particular semester or quarter has begun. All CSU listed fees should be regarded as **estimates** that are subject to change upon approval by the Board of Trustees.

Schedule of Fees

Please refer to www.fees.calpoly.edu for complete information on fees, including on-campus housing, meal costs, and parking fees.

All regularly enrolled students, both undergraduate and graduate, pay registration and tuition fees determined by the number of units per quarter. In addition to registration and basic tuition fees, nonresident and foreign students pay nonresident tuition fees. Mandatory system-wide tuition and other fees are waived for those individuals who qualify for such exemption under the provisions of the California Education Code (see Student Fee Waivers).

Registration and Tuition Fees Per Quarter

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

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

Cal Poly registration and tuition fees are due at the time of registration, and all prior term balances must be paid in full in order to register. Fees that are not paid by the fourth day following a student's registration become past due, and a registration hold is placed on the account that prevents adding or swapping classes. If registration and tuition fees are still past due as of the next published cancellation date, then the student may be canceled from all enrolled classes. Students who have accepted financial aid, have an approved third-party contract on file, or are receiving fee waivers are not subject to financial registration holds or class cancellation. Financial aid students whose awards are insufficient to pay fees in full are billed for the balance, and are unable to register for subsequent quarters until the balance has been paid.

Refund of Mandatory Fees, Including Nonresident Tuition

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

In order to receive a full refund of mandatory fees, including nonresident tuition, a student must cancel registration or drop all courses prior to the first day of instruction for the term. Information on procedures and deadlines for canceling registration and dropping classes is available online at www.ess.calpoly.edu/_records.

For state-supported semesters, quarters, and non-standard terms or courses of four (4) weeks or more, a student who withdraws during the term in accordance with the University's established procedures receives a refund of mandatory fees, including nonresident tuition, based on the portion of the term during which the student was enrolled. No student withdrawing after the 60 percent point in the term is entitled to a refund of any mandatory fees or nonresident tuition.

For state-supported non-standard terms or courses of less than four (4) weeks, no refund of mandatory fees and nonresident tuition is made unless a student cancels registration or drops all classes prior to the first day in accordance with the University's established procedures and deadlines.

Students also receive a refund of mandatory fees, including nonresident tuition, under the following circumstances:

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

Students who are not entitled to a refund as described above may petition the University for a refund demonstrating exceptional circumstances and the chief financial officer of the University or designee may authorize a refund if he or she determines that the fees and tuition were not earned by the University. Information concerning any aspect of the refund of fees may be obtained from the Student Accounts Office. Contact information can be found at www.afd.calpoly.edu/student_accounts.

Fees and Debts Owed to the University

Should a student or former student fail to pay a fee or a debt owed to the institution, the institution may "withhold permission to register, to use facilities for which a fee is authorized to be charged, to receive services, materials, food or merchandise, or any combination of the above from any person owing a debt" until the debt is paid (see Title 5, *California Code of Regulations*, Sections 42380 and 42381).

Prospective students who register for courses offered by the University, or who are registered in courses by the University in accordance with the University policies for prospective students, are obligated for the payment of tuition and other fees associated with registration for those courses. Failure to cancel registration in any course for an academic term prior to the first day of the academic term gives rise to an obligation to pay tuition and other fees for the reservation of space in the course.

The institution may withhold permission to register or to receive official transcripts of grades or other services offered by the institution from anyone owing fees or another debt to the institution. The institution may also report the debt to a credit bureau, offset the amount due against any future state tax refunds due the student, refer the debt to an outside collection agency and/or charge the student actual and reasonable collection costs, including reasonable attorney fees if litigation is necessary, in collecting any amount not paid when due. If a person believes he or she does not owe all or part of an asserted unpaid obligation, that person may contact the campus business office. The business office, or another office on campus to which the business office may refer the person, will review all pertinent information provided by the person and available to the campus and will advise the person of its conclusions.

Credit Cards

Master Card, Discover Card, and American Express may be used for payment of registration and tuition fees, nonresi-dent tuition fees, housing, dining plans and certain other University fees using the web credit card system. The University also accepts electronic check payments, known as eCheck or ACH, using the web on-line payment systems. Details concerning the use of electronic checks and credit cards for fee payments may be obtained from the University website under

www.afd.calpoly.edu/student_accounts/online_payments.asp.

Credit cards may be used for the purchase of theatre tickets from the Cal Poly Theatre Box Office, tickets for sports events from the Athletics Ticket Office, health services from the University Health Center, Bookstore purchases, parking permits and payment of parking citations with University Police, and for Continuing Education program fees. Contact the individual service center for specific credit card information.

Student Fee Waivers

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

- § 66025.3 – Qualifying children, spouses/registered domestic partners, or unmarried surviving spouses/registered domestic partners of a war period veteran of the U.S. military who is totally service-connected disabled or who died as a result of service-related causes; children of any veteran of the U.S. military who has a service-connected disability, was killed in action, or died of a service-connected disability and meets specified income provisions; any dependents or surviving spouse/registered domestic partner who has not remarried of a member of the California National Guard who in the line of duty and in active service of the state was killed or became permanently disabled or died of a disability as a result of an event while in active service of the state; and undergraduate students who are the recipient of or the child of a recipient of a Congressional Medal of Honor and meet certain age and income restrictions;
- § 68120 – Qualifying children and surviving spouses/registered domestic partners of deceased public law enforcement or fire suppression employees who were California residents and who were killed in the course of active law enforcement or fire suppression duties (referred to as Alan Pattee Scholarships); and
- § 68121 – Qualifying students enrolled in an undergraduate program who are the surviving dependent of any individual killed in the September 11, 2001 terrorist attacks on the World Trade Center in New York City, the Pentagon building in Washington, D.C., or the crash of United Airlines Flight 93 in southwestern Pennsylvania, if the student meets the financial need requirements set forth in Section 69432.7 for the Cal Grant A Program and either the surviving dependent or the individual killed in the attacks was a resident of California on September 11, 2001.

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

Procedure for the Establishment or Abolishment of Campus-Based Mandatory Fees

The law governing the California State University provides that fees defined as mandatory, such as a *student body association fee* and a *student body center fee*, may be established. A *student body association fee* must be established upon a favorable vote of two-thirds of the students voting in an election held for this purpose (Ed. Code § 89300). A *student body center fee* may be established only after a fee referendum is held which approves by a two-thirds favorable vote the establishment of the fee (Ed. Code § 89304). The campus President may adjust the *student body association fee* only after the fee adjustment has been approved by a majority of students voting in a referendum

established for that purpose (Ed. Code § 89300). The required fee shall be subject to referendum at any time upon the presentation of a petition to the campus President containing the signatures of 10 percent of the regularly enrolled students at the University. Once bonds are issued, authority to set and adjust *student body center fees* is governed by provisions of the State University Revenue Bond Act of 1947, including, but not limited to, Ed. Code Sections 90012, 90027, and 90068. *Student body association fees* support a variety of cultural and recreational programs, child care centers, and special student support programs.

The process to establish and adjust other campus-based mandatory fees requires consideration by the campus fee advisory committee and a student referendum. The campus President may use alternative consultation mechanisms if he/she determines that a referendum is not the best mechanism to achieve appropriate and meaningful consultation. Results of the referendum and the fee committee review are advisory to the campus President. The President may adjust campus-based mandatory fees, but must request the Chancellor establish a new mandatory fee.

For more information or questions, please contact the Financial Manager, Financing and Treasury in the CSU Chancellor's Office, at (562) 951-4570.

Financial Aid

Financial Aid Office
 Administration Bldg. (01), Room 212
 805 756-2927; Fax 805 756-7243
http://www.ess.calpoly.edu/_finaid

The University has a variety of scholarships, grants, part-time employment opportunities and loans designed to assist students financially. Additional current information may be obtained by accessing the Financial Aid Office website.

The application for Financial Aid is called the Free Application for Federal Student Aid (FAFSA). The FAFSA is available on the Web at www.fafsa.ed.gov or may be obtained from any university or college financial aid office or most high schools. Those who file the FAFSA by March 2 receive priority in the allocation of funds. All students are encouraged to file the FAFSA and qualified students are considered for scholarships.

Typical Student Expenses

Following are the average expenses per quarter for the 2010-11 academic year for the California resident student attending Cal Poly. Charges for room and board are payable in advance or in quarterly installments. Nonresident students should be prepared to pay additional tuition and fees. For the 2010-11 school year nonresident tuition was an extra \$248 per unit. Please see the "Fees and Expenses" section for more information. All State fees are subject to change upon approval by the Board of Trustees of the California State University.

University Estimated Expenses per Quarter

Registration fees	2,230
Room and board	3,357
Books and supplies	558
Personal and transportation	1,113
Estimated total per quarter	\$7,258

Cancellation of Registration or Withdrawal from the Institution and Financial Aid

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

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

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

UNIVERSITY SCHOLARSHIPS

General Information

Scholarships are awarded each year. Criteria include financial need, scholastic achievement, participation in school activities, community service, honors and organizational affiliations, and educational objectives. Some scholarships have additional requirements which relate to a concentration or field of study, geographic origin, class level, and project or design portfolios.

There are numerous scholarships available due to the generous support of individuals and corporations. Please refer to the Financial Aid web site for detailed information.

Generally, a student must have at least a 3.0 grade point average. Both undergraduate and graduate students enrolled full time in the spring term are considered for scholarships.

*Annual Deadline Date to Apply
 (Complete the FAFSA)
 for the following academic year:
 March 2*

How to Apply

The Financial Aid Office website offers the latest information at www.ess.calpoly.edu/_finaid. For need-based scholarships, completing the FAFSA is required. For priority consideration for financial aid programs *and* Cal Poly scholarships, complete the FAFSA by **March 2**.

Scholarship Notifications

Scholarships are normally awarded during the spring and summer for the following academic year. During that time award offer notices are sent which include scholarship amount, disbursement and donor information. Awardees must accept on-line scholarship offers acknowledging program responsibilities and requirements. Recipients must be in good academic standing and maintain full-time enrollment while receiving a scholarship (continuing education and Open University units are excluded). Some scholarships require recipients to have earned at least one-half the value of the scholarship during the previous year.

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

Athletic Program Grants-In-Aid

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

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

Other Scholarships

In addition to University scholarships, awards from various private donors and organizations are available to assist students with University expenses. Interested students should make inquiries for such awards directly to sponsoring organizations. Currently, Cal Poly students are beneficiaries of several million dollars of outside scholarship assistance each year. Students should exercise caution in using scholarship search services; many sell information that is readily available at no cost. Other sources of scholarship funding may be available from:

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

For valuable links visit the scholarship website at www.ess.calpoly.edu/_finaid/types_aid/scholarships.htm.

GRANTS

Federal Pell Grants are designed to help undergraduates and teaching credential candidates pay for their education. The Pell Grant amount is determined by the Expected Family Contribution, the cost of education, full-time or part-time enrollment and terms of enrollment. To apply, complete the FAFSA by **March 2** for the upcoming year.

Federal TEACH Grants are available to students who commit to four years of teaching in a high need area (science, mathematics, special education, and, in California, agriculture) in a school serving low income families. The grant converts to a federal unsubsidized loan if the teaching commitment is not met. To apply, complete the FAFSA by **March 2** for the upcoming year.

Federal Supplemental Educational Opportunity Grant (SEOG) is designed to assist undergraduate students who have substantial financial need. To apply, complete the FAFSA by **March 2** for the upcoming school year.

CAL GRANTS

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

For the latest information on the Cal Grant program, visit the CSAC website at www.csac.ca.gov.

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

Cal Grant B is awarded to low-income undergraduate students. First year recipients receive stipend only. Cal Grant B renewal recipients receive stipend plus a portion of registration fees. Eligibility is tied to the cost of attendance. Cal Grant B may be renewed until completion of four years of college attendance and students must meet eligibility standards. Students may be eligible for an additional year of Cal Grant B at Cal Poly if enrolled in a designated five-year program or the teaching credential program.

State Educational Opportunity Program Grant (SEOP) assists undergraduate students who have been admitted to the University through the Educational Opportunity Program (EOP). To apply, complete the FAFSA by **March 2** for the upcoming school year.

State University Grant (SUG) covers a portion of student registration fees. SUG is available to undergraduate and graduate students who are California residents and show financial need. To apply, complete the FAFSA by **March 2** for the upcoming year.

EMPLOYMENT

Federal Work-Study (FWS) is a need-based program which provides part-time employment for students. Work-Study jobs assist students financially and may provide career related work experience. FWS positions are either on- or off-campus with approved departments/organizations. Pay rates vary depending on job requirements and student skills. To receive priority consideration, complete the FAFSA by **March 2** for the upcoming school year.

LOANS

Loans are for educational purposes only, with specific provisions for repayment. There are four types: Federal Perkins Loans, Federal Direct Student Loans (FDSL), Federal Parent Loans (PLUS), and Cal Poly Long-Term Educational Loans. Also available are small, short-term emergency loans.

Federal Perkins Loan is a five percent interest loan available to both undergraduate and graduate students. Annual amounts are based on students' need as determined by the FAFSA data. Repayment begins nine months after the student leaves school or ceases to be enrolled at least half-time. The government pays the interest while the student is in school and during the grace period. There are cancellation and deferment provisions. To apply, complete the FAFSA by **March 2** for the upcoming school year.

Federal Subsidized Direct Loans are available to students through the U.S. Department of Education. Annual amounts are based on the students' need as determined by the FAFSA and federal limits. The federal government pays the interest on the loan while the student is in school and there are deferment provisions. To apply, complete the FAFSA by **March 2** for the upcoming year.

Federal Unsubsidized Direct Loans are available for students who are ineligible for some or all of a subsidized Federal Direct Loan. With the exception of demonstrated financial need, borrowers must meet all eligibility criteria under the Federal Direct Loan program. Interest payments begin immediately after the loan is disbursed or the borrower may elect to defer payment and add the interest to the amount owed. An additional amount of Unsubsidized Direct Loan, above the Federal Subsidized Direct limit, may be available to independent students and to dependent students whose parents are denied a PLUS Loan.

Federal Parent Loans (PLUS) enable borrowers to obtain low interest loans for educational costs through the U.S. Department of Education. PLUS loan repayment begins when the loan is disbursed. To apply, complete the FAFSA.

University Long-Term Educational Loans are available to students who demonstrate long-term financial need. Some require written application, recommendations and interviews. The interest rate is four percent on the unpaid balance during repayment. Typically, interest accrues after the specified due date, graduation or withdrawal from the University. A one percent service charge is deducted from each loan disbursement.

University Short-Term Emergency Loans are designed to help students cope with unanticipated, educationally-related financial emergencies. Registration fees, rent, or utility bills are expenses that students should plan and are not considered emergencies as defined under this program. Full-time enrollment and a minimum 2.0 GPA are required. Each application is reviewed on a case-by-case basis. For further information, visit the Financial Aid Office website at www.ess.calpoly.edu/_finaid/types_aid/special_programs, or stop by the office.

University Educational and Emergency Student Loans

There are numerous loans available due to the generous support of individuals and corporations. Please refer to the Financial Aid web site for detailed information.

Academic Advising

Our Vision and Mission

Cal Poly strives to provide effective academic advising in an encouraging and welcoming atmosphere to support students as they navigate their undergraduate academic experience and learn to value their education, in order to foster individual academic success.

Academic Advising at Cal Poly is an on-going, intentional, educational partnership dedicated to student success. Cal Poly is committed to building collaborative relationships and a structure that guides students to discover and pursue life goals, support diverse and equitable educational experiences, advance students' intellectual and cultural development, and teach students to become engaged, self-directed learners and competent decisionmakers.

Which Academic Advisor You Should See

Faculty Advisor

- Advising for major and support courses
- Concentration and elective selection
- Interpretation of courses
- Senior project
- Mentorship
- Internships
- Career/graduate school selection
- Referral to appropriate support services

College Professional Advisor

- Academic policy and procedure
- Overall degree requirements
- Students on academic probation and other specific student populations with specific needs
- Referral to appropriate support services

How to Maximize Your Advising Experience

- Think through what questions you have and contact the appropriate advisor.
- Take the initiative to meet with your academic advisor regularly and follow through with recommendations.
- When you email faculty or staff members, use your Cal Poly email account (@calpoly.edu) and be sure to sign your name. Be professional. Be sure to clearly explain questions or requests.
- Check your Cal Poly email daily, and reply in a timely manner to all correspondence methods (both email and phone calls).
- Silence your cell phone prior to advising appointments.

What We Expect of You, the Student

You are responsible for fulfilling all the requirements of the curriculum in which you are enrolled. Be an active learner by fully engaging in the advising process. Students share responsibility for a successful university experience and are expected to contribute to effective advising experiences by doing the following:

- Be on time for your scheduled appointments and cancel or reschedule if necessary.
- Be prepared to discuss your goals and educational plans during meetings with advisors.
- Keep and organize personal copies of all important documents relevant to your academic career and progress to degree.
- Become knowledgeable of the university catalog, campus-/college-/major-specific academic policies and procedures, academic calendar deadlines and degree or program requirements.
- Review your Degree Progress Report (DPR) each quarter and seek assistance to resolve any errors or questions in a timely manner.
- Inform an advisor of any concerns, special needs, deficiencies, or barriers that might affect academic success.
- Attend advising appointments and programs.
- Be open and willing to consider advice from advisors, faculty, and other mentors.
- Accept responsibility for your decisions and your actions (or inactions) that affect your educational progress and goals.

What You Can Expect of Your Advisors

Advisors share responsibility for a successful university experience and are expected to contribute to effective advising experiences by doing the following:

- Provide a respectful and confidential environment where you can comfortably discuss academic, career, and personal goals and freely express your concerns.
- Understand and effectively communicate the curriculum, degree/college requirements, graduation requirements, and university policies and procedures.
- Assist you in defining your academic, career, and personal goals, and empower you to create an educational plan that is consistent with those goals.
- Actively listen to your concerns, respect your individual values and choices, and empower you to make informed decisions.
- Serve as an advocate and mentor to promote your success.
- Encourage and support you as you gain the skills and knowledge necessary for success.
- Respond to your questions through meetings, phone calls, or email in a timely manner during regular business hours.

- Collaborate with and refer you to campus resources to enhance your success.
- Maintain confidentiality of your student records and interactions.
- Keep regular office hours and be available to meet with you.
- Participate in evaluating and assessing advising programs and services to better serve you.

Contact Information for College Advising Centers

Agriculture, Food & Environmental

Sciences Contact Department Offices

Architecture & Environmental Design 805-756-1325

Business 805-756-2601

Engineering..... 805-756-1461

Liberal Arts, by major:

ART, COMS, ENGL, JOUR, MU,

PHIL, TH 805-756-6200

CD, PSY, SOC, ANT/GEOG, SOCS 805-756-2808

ES, GRC, HIST, MLL, POLS 805-756-7452

Science and Mathematics..... 805-756-2615

Other Academic Advising Services

Academic Skills Center 805-756-1256

Admissions Office 805-756-2311

Athletic Advising 805-756-2762

Disability Resource Center 805-756-1395

Educational Opportunity Program 805-756-2301

Entry Level Mathematics (ELM, MAPE)..... 805-756-2268

General Education Program..... 805-756-2228

Graduate Programs..... 805-756-1508

Health Professions 805-756-2615

Student Academic Services 805-756-2301

Student Support Services..... 805-756-1395

Writing Skills Program (EPT, GWR)..... 805-756-2067

For more information, a list of advising resources, and an advising handbook, go to <http://advising.calpoly.edu>.

Academic Requirements & Policies

Office of the Registrar: Registration
Information 805 756-2531

Evaluations 805 756-2396

Veterans Affairs Coordinator 805 756-2531

ACADEMIC PLACEMENT

Placement Test Requirements

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

English Placement Test (EPT)

Purpose of the EPT

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

Who Must Take the EPT

The CSU EPT must be completed by all non-exempt entering undergraduates prior to enrollment in any course, including remedial courses. Students who score 147 or above on the EPT are placed in college-level composition classes.

Exemptions from the EPT are granted only to those who present proof of one of the following:

- A score of 500 or above on the critical reading section of the College Board SAT Reasoning Test.
- A score of 22 or above on the American College Testing (ACT) English Test.

- A score of 3 or above on either the Language and Composition or Composition and Literature examination of the College Board Scholastic Advanced Placement Program.
- Completion and transfer of the credits for a college course that satisfies the General Education A1 requirement in English Composition, provided such a course was completed with a grade of C or better.
- A score of “Exempt” or “Ready for college-level English courses” on the CSU Early Assessment Program (EAP) taken along with the English Language Arts California Standard Test in grade 11.

REGISTRATION HOLDS/DISENROLLMENT

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

Information about the EPT is mailed to all students subject to the requirement. The materials also may be obtained from the Test Office website: www.testoffice.calpoly.edu.

Remediation

All students who score below 147 on the EPT are required to enroll in Cal Poly’s Writing and Rhetoric Stretch Program during their first year of coursework. Students who do not make adequate progress in completing the program during their first year of enrollment face disqualification from the University.

In the Writing and Rhetoric Stretch Program, students complete two quarters of coursework as a cohort with the same instructor. Coursework is taken in the following sequence:

- First, students enroll in either ENGL 102: Basic Writing or ENGL 113: Basic Writing for English as a Second Language Students
- After earning credit for either ENGL 102 or ENGL 113, students enroll in ENGL 103: Writing Lab Tutorial *concurrently* with either ENGL 134: Writing and Rhetoric or ENGL 133: Writing and Rhetoric for English as a Second Language Students.

Note: Failure to complete successfully ENGL 102/ ENGL 113 or ENGL 103 results in a grade of F in ENGL 134/ ENGL 133.

Upon successful completion of the Writing and Rhetoric Stretch Program, students fulfill their remediation requirement and earn credit in GE Area A1.

Entry Level Mathematics (ELM) Exam

Purpose of the ELM

The ELM examination is designed to assess the skill levels of entering CSU students in the areas of mathematics typically covered in three years of rigorous college preparatory courses in high school (normally Algebra I, Algebra II, and Geometry). Undergraduate students

who do not demonstrate college-level skills are advised to enroll in courses or programs designed to help them attain these skills. The ELM is not a condition for admission to the CSU, but it is a condition of enrollment.

Who Must Take the ELM

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

- A score of 550 or above on the mathematics section of the College Board SAT Reasoning Test or on a College Board SAT Subject Test in Mathematics (level 1 or level 2).
- a score of 23 or above on the ACT Mathematics Test.
- A score of 3 or above on the College Board Advanced Placement Calculus AB or Calculus BC exam or on the College Board Advanced Placement Statistics exam.
- A score of “Exempt” or “Ready for college-level Mathematics courses” on the CSU Early Assessment Program (EAP), taken in grade 11 in conjunction with the CST in Summative High School Mathematics or Algebra II.
- A score of “Conditionally ready for college-level Mathematics courses” or “Conditional” on the CSU Early Assessment Program (EAP) taken in grade 11 along with the California Standards Test in Summative High School Mathematics or Algebra II, provided successful completion of a CSU-approved 12th grade math course that require Algebra II as a prerequisite.
- For transfer students, completion and transfer to CSU of a college course that satisfies the requirement in Quantitative Reasoning, provided such a course was completed with a grade of C or better.

REGISTRATION HOLDS/DISENROLLMENT

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

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

At Cal Poly, students **may not** enroll in any college level mathematics or statistics course without satisfying the ELM requirement.

Students who need to take the ELM exam are sent the information about the exam and how to register. This information is also available from the ELM/MAPE Office (805 756-2268), or online at <http://math.calpoly.edu/elmmape.html>.

Cal Poly Mathematics Placement Examination (MAPE)

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

Precalculus MAPE

Students who anticipate taking Trigonometry or Calculus (MATH 119, 141, 161, or 221) must pass the precalculus MAPE unless they have presented proof of *one* of the following exemptions:

- a score of 600 or above on the mathematics section of the SAT I Test or on the SAT II Mathematics Tests Level I, IC (Calculator), II, or IIC (Calculator);
- a score of 30 or above on the American College Testing (ACT) Mathematics Test;
- a score of 3 or above on the College Board Advanced Placement Mathematics (Calculus AB or BC) examination;
- completion of MATH 118 at Cal Poly *or* transfer of a college course equivalent to MATH 118

NOTE: For MATH 141, students must also have credit for college or high school trigonometry, completed with grade C or better.

Intermediate Algebra MAPE

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

For MATH 118:

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

- a score of 65 or above on the ELM test.

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

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

EVALUATION OF TRANSFER CREDIT

The Office of the Registrar evaluates previous college work as it relates to the requirements at Cal Poly. Each student seeking a degree is issued an Evaluation of Transfer Credit, which serves as a basis for determining the remaining requirements for the student's specific degree objective. Semester units transferred to Cal Poly are converted to quarter units by multiplying the semester units by one and one-half.

An Evaluation of Transfer Credit is completed for every student admitted with transfer credit. While every effort is made to complete this evaluation in a timely fashion, it is important that new transfer students review their previous college work in terms of the degree requirements outlined in the catalog to make a tentative selection of courses for their first quarter of enrollment. Students should consult a faculty advisor in their major department or the appropriate Advising Center for assistance in the selection of courses. They can also use the "By Major" agreements on www.assist.org for assistance with work from California community colleges.

Students are notified by an email from evaluations@calpoly.edu when their evaluation is complete; they will be instructed to access their Degree Progress Report.

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

While students may follow the specific academic requirements for the catalog year on which their Evaluation of Transfer Credit is based, they are responsible for complying with any and all changes in other regulations, policies, and procedures, which may appear in subsequent catalogs. These include CSU-mandated changes and changes approved by Cal Poly's Academic Senate and/or administration.

Credit for Community College Courses

Course credit earned at regionally accredited community colleges is evaluated by the Evaluations Unit in the Office of the Registrar in accordance with the following provisions:

- Community college credit is allowed up to a maximum of 105 quarter units (70 semester units). Credits earned above this allowable maximum may still be used to satisfy subject and grade point requirements, but may

not be applied toward the total units required for graduation (Example: a student in a program with 180 units, who has 110 quarter units of community college credit satisfying subject requirements, must still complete **75** units of non-community college work [not 70 units]).

- Upper division credit is never granted for community college work.

Cal Poly maintains articulation agreements at www.assist.org with all of the California Community Colleges (CCC), the California State University (CSU) and University of California (UC) campuses. The CCC campuses publish the CSU General Education (GE) and Intersegmental General Education Transfer Core (IGETC) course lists on the ASSIST website.

Transfer credit for GE courses is accepted from California institutions, as approved by the CSU Chancellor's office. The GE Area letters and numbers at Cal Poly (e.g., GE A1, D4) may be different from other colleges; see the flyer located on the Office of the Registrar's website for help in understanding these differences. Note: GE certification, whereby transfer students can complete all lower-division GE at a CCC or CSU, does not exempt students from meeting the requirement of 72 units of GE overall. Many Cal Poly programs require specific GE courses in the Major and/or Support; these courses must be met with articulated equivalencies. See catalog page 39 and following for General Education requirements.

OTHER ACADEMIC CREDIT

Advanced Placement (AP) Credit

Cal Poly grants credit for AP exams successfully completed through the College Board AP program. AP scores may be requested from Educational Testing Service (ETS)/AP Programs and should be sent to Cal Poly electronically. *To request scores: ETS/AP Program, PO Box 6671, Princeton, NJ 08541-6671 or (609) 771-7300.* Cal Poly cannot accept paper score reports which have been opened by the student.

Exams passed with a score of 3 or higher result in nine (9) quarter units of credit, except where otherwise noted on the credit matrix. All credit is given on a credit/no credit basis; units do not calculate into the GPA. Credit may vary from year to year, as Cal Poly requirements and AP Exams change. AP credit matrices are available on the Office of the Registrar web-site: www.ess.calpoly.edu/records/Degree_Progress/. Please refer to the matrix for the **specific** year the exam was taken; credit is always extended based on the year of the exam.

International Baccalaureate (IB) Exam Credit

The Cal Poly Academic Senate adopted a credit policy regarding the IB program in February 1990, as follows:

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

The International Baccalaureate **transcript** is required to receive University credit.

Credit is awarded for classes at the **Higher** level. No credit is extended for Standard level exams.

All credit is given on a credit/no credit basis; units do not calculate into the GPA.

For each exam score of 5 or higher, a maximum of 8 units of credit is awarded.

IB credit matrices are available on the Office of the Registrar web-site: www.ess.calpoly.edu/records/Degree_Progress/. Please refer to the matrix for the **specific** year the exam was taken; credit is always extended based on the year of the exam.

Credit for Non-collegiate Instruction

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

Credit for Military Service

Nine quarter units of elective credit are allowed toward graduation to any student submitting evidence of satisfactory completion of basic training in the military service of the United States. Cal Poly requires the DD-214 form to extend credit: 4 units satisfy GE Area D4, and 5 units are elective credit. Credit is allowed in accordance with the recommendations by the Commission on Educational Credit and Credentials of the American Council on Education. The numbers 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 some College Level Entrance Program (CLEP) examinations.

CLEP tests acceptable for credit are:

- College Algebra-Trigonometry with a passing score of 50;
- Pre-Calculus with a passing score of 50
- General Chemistry with a passing score of 50
- Calculus with Elementary Functions with a passing score of 51.

4.5 quarter units of credit may be earned with an assigned grade of credit (CR), which is not included in the GPA calculation.

Credit for CLEP and other externally developed examinations is *not* 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.

Challenging Cal Poly Courses

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

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

The examination may include written, oral, or skills tests, or a combination of all three types, and is 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 (CR/NC), except for courses which have CR/NC grading only. The length of the examination is consistent with the unit value of the course.

Arrangements to obtain course credit by exam may be made with the head of the department in which the course is taught. Units of credit received through this procedure do not apply toward the residence requirements or the Cal Poly GPA for any of the degrees or credentials offered by the University. Detailed instruction for applying for credit by examination may be obtained from the Office of the Registrar.

General Requirements – Bachelor's Degree

CHOICE OF CATALOG/CATALOG RIGHTS

Cal Poly issues a new catalog every one or two years, and the requirements for degree programs may change from one catalog to the next. Students have the right to choose

the catalog they will use, as described in Section 40401 of Title 5 of the *California Code of Regulations*.

An undergraduate student remaining in attendance in regular sessions at any California State University campus, at any California community college, or any combination of California community colleges and campuses of the California State University, may for purposes of meeting graduation requirements, elect to meet the catalog 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 granting the degree, or
- (3) at the time of graduation, or
- (4) as allowed by campus policy: Cal Poly also allows students to elect the requirements of any catalog in effect during their regular attendance.

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.

Choice of Catalog Older than 10 years for Returning Students

Returning students may request to complete their degrees on a catalog older than 10 years only if all remaining degree requirements at the time they left Cal Poly do not exceed 16 units. The decision to approve or disapprove a student's request is based on: (1) her/his willingness to commit to completing outstanding degree requirements within a specified timeframe, and (2) her/his ability to demonstrate, with written documentation, reasonable currency of knowledge and skills in her/his degree field to the satisfaction of the faculty in the applicable major, as certified by the department chair. Both the college dean and the Vice Provost for Academic Programs must give approval. Currency in the degree field may be demonstrated by additional coursework and/or by relevant work experience, to be determined by the department chair.

The expiration of a catalog is determined by adding 10 years to the last term in which that catalog was in effect (e.g., the 2009-11 catalog will be “older than 10 years” after Spring Quarter 2021).

Students are not allowed to complete a degree that is no longer offered by the University.

Note: In addition to remaining degree requirements on the student's catalog, s/he may also be required to complete the GWR. Check with the Evaluations Unit in the Office of the Registrar.

GENERAL GRADUATION REQUIREMENTS

There are eight general requirements, which all students must meet in order to earn the bachelor's degree from Cal Poly and participate in commencement. *Students must be formally admitted to the major in which they wish to graduate, and must matriculate, in order to earn a degree.* The more students understand their progress toward meeting these requirements and relate them to the many programs available, the better the chance of creating an exciting educational experience and avoiding errors which may delay graduation.

The specific requirements for each degree program are shown under the academic department offering the major and include a curriculum display with courses listed by Major, Support, General Education, and Electives. The department may have a flow chart, which shows the recommended sequence of courses leading to the degree.

Students are responsible for meeting all requirements. Advice is available from faculty advisors, college advising centers, the Office of the Registrar, and students' online Degree Progress Reports. Students should plan their degree programs carefully and review them frequently with their advisors.

MINIMUM REQUIREMENTS FOR GRADUATION

1. Minimum Number of Units

Baccalaureate degree programs minimum 180 units

Individual baccalaureate degree programs may require more than 180 units. (Title 5, Sections 40500, 40501, 40505, 40507) A minimum of 60 units overall must be upper division (defined as any course completed by the student at the 300- or 400-level).

Degree	Minimum # of major units at 300-400 level
Bachelor of Arts (BA)	18
Bachelor of Science (BS)	27
Bachelor of Fine Arts (BFA)	27
Bachelor of Architecture (BArch)	41
Bachelor of Landscape Architecture (BLA)	41

2. Grade Point Average (GPA)

Students must earn at least a 2.0 GPA in: 1) all Higher Education units attempted (all college-level work), 2) Cal Poly cumulative units attempted, and 3) the major (the courses listed as major courses in the curriculum display). For a definition of GPA and quality points and hours, please refer to Grading.

3. U. S. Cultural Pluralism (USCP) Requirement

Students must complete the USCP requirement as indicated on page 44.

4. General Education (GE) Courses

Students must complete the GE requirements as indicated in the degree program and shown in the GE section of this catalog (see page 39).

5. Graduation Writing Requirement (GWR)

Students must demonstrate competency in writing skills as described below.

6. Senior Project

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

7. Academic Residence Requirements

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

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

Extension credit or credit by examination may not be used to fulfill the residence requirements. However, a maximum of 36 quarter units of extension credit may be counted toward the bachelor's degree.

8. Evaluation for Graduation

Students should request a graduation evaluation from the Office of the Registrar **four** quarters prior to their anticipated graduation date. The evaluation confirms remaining requirements for graduation and is a formal statement on the expected quarter of graduation. The actual date of graduation is the end of the quarter in which all requirements have been met; this date may differ from the student's last quarter of enrollment (an example is a student who completes the Graduation Requirement (GWR) after the last term of enrollment).

Students are encouraged to submit any and all paperwork (substitutions, transcripts for requirements completed elsewhere, etc.) in a timely fashion in order to expedite conferral of degrees.

Graduating students receive a complimentary diploma. Additional diplomas may be ordered through El Corral Bookstore. The diploma is not ordered until all degree requirements have been completed. The diploma is mailed to the student's mailing address approximately five to six weeks after the degree has been awarded. It is the student's responsibility to update her/his mailing address on her/his my.calpoly.edu portal.

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

COMMENCEMENT

For a student to participate in graduation ceremonies, the student must satisfy *at least one* of the following:

- * shall have completed all degree requirements and not have participated in a graduation ceremony previously;
- * shall currently be enrolled in classes that would complete all of that student's degree requirements;
- * shall be registered for classes for the following term that would allow the student to complete all of her/his degree requirements.

Students completing all degree requirements in the Winter, Spring or Summer term are automatically eligible to participate in the Spring Commencement. Students completing all degree requirements in the Fall term are eligible for Fall commencement.

GRADUATION WRITING REQUIREMENT (GWR)

All students must demonstrate competency in writing skills as a requirement for graduation. Information on currently available ways to meet this graduation requirement may be obtained from the Writing Skills Office, Agriculture Building (10) Room 130 (805-756-2067), or on the Writing Skills webpage, www.writingskills.calpoly.edu.

The Board of Trustees of the California State University has mandated that all students earning undergraduate or graduate degrees in the CSU must be certified as proficient in writing at the upper-division level.

Students must earn proficiency after reaching 90 units, and are strongly encouraged to attempt the GWR before their final quarter of enrollment. Students should review their program requirements to determine which option is appropriate. The GWR, if taken at another CSU campus (within seven years), may be approved if the student is pursuing a Cal Poly degree.

At Cal Poly, students may meet the Graduation Writing Requirement (GWR) through one of the following options:

1. Pass the Writing Proficiency Exam.
2. Pass an approved upper-division course with a grade of C or better (**C- or below does not qualify**) AND receive certification of proficiency in writing based on a 500-word in-class essay. The course may be taken on a credit/no credit basis, but the student must earn a minimum grade of C in order to satisfy the GWR component of the class.

The following courses are approved for GWR credit:

- *Non-GE writing courses: ENGL 301, 302, 310, 317, or 326;
- *GE C4 literature courses: ENGL 330, 331, 332, 333, 334, 335, 339, 340, 341, 342, 343, 345, 346, 347, 349, 350, 351, 352, 354, 370, 371, 372, 380, 381, or 382.

SENIOR PROJECT

Definition: The senior project is a capstone experience required for all Cal Poly students receiving a baccalaureate degree. It integrates theory and application from across the student's undergraduate educational experiences. The senior project consists of one or more of the following:

- (1) a design or construction experience,
- (2) an experiment,
- (3) a self-guided study or research project,
- (4) a presentation,
- (5) a report based on internship, co-op, or service learning experience,
- (6) a public portfolio display or performance.

Where the senior project does not consist primarily of a written document, departments, may, where they deem appropriate, require some written documentation (length to be determined by the department) to accompany the senior project. The precise nature or form of a senior project is to be determined by the department or program of the student's major. The senior project is normally related to the student's field of study, future employment, and/or scholastics goals, and is carried out under direct faculty supervision.

Expected Outcomes

At the discretion of the major department, students are expected to have the ability to:

- Reduce a topic to specific points of analysis.
- Organize the points of analysis into a logical sequence.
- Apply acquired competencies to the successful completion of a project.
- Obtain, evaluate, synthesize, and apply project-related information.
- Develop and follow a project plan.
- Estimate hours of labor and/or cost of materials necessary to complete a project.
- Organize, illustrate, and write clear and concise project documentation.
- Accept supervision when needed.

Requirements

1. The total number of senior project units must be 1 to 6 quarter units.
2. The senior project requirement is the same for all students in a given curriculum, but not for all students in the university, because of the nature of the various curricula.

3. Normally 30 hours of student work is required for each unit of credit granted.
4. Projects requiring an excessive amount of time are discouraged.
5. The number of students participating in a group senior project should not be so large as to unduly limit individual experience or responsibility and initiative.
6. The student is responsible for identifying costs and potential funding sources for his or her senior project prior to initiation of the project. Costly projects are discouraged.
7. It is the student's responsibility to become informed about the university's intellectual properties policy and human subject policy (where applicable).

Library Copy

1. The academic department may send one copy of each senior project to the University Library where it is reproduced on microfiche or in an electronic format. A microfiche or electronic copy of the project becomes part of the Library's archival collection where it is available for public use.
2. After being copied on microfiche or electronically, the original project is returned to the academic department of its origin, as applicable. Non-print media (slides, audio/video tapes, CD's, floppy disks, etc.), however, comprising all or part of a project is permanently retained in the Library collection.
3. All projects submitted to the Library include a completed Senior Project Requirement Form and a title page. The Form must be signed by the student's advisor or academic department head before it can be accepted for processing by the Library. The title page should follow a standardized format.
4. Each student whose senior project is submitted to the library is required to pay a library-processing fee for making her/his senior project available.

OTHER INFORMATION

Academic Minors

A minor is an integrated, coherent group of courses (24 to 30 quarter units), which gives the student knowledge in an area that lies outside of the major field of study. Please see page 11 for the list of minors.

- At least half of the units must be from upper-division courses (300- or 400-level)
- At least half of the units must be taken at Cal Poly
- Not more than one-third of the courses in a minor can be graded Credit/No Credit (CR/NC), except for courses that have mandatory CR/NC grading
- A minimum 2.0 GPA is required in all units counted for completion of the minor (foreign language minors must have a 2.75 GPA)

The minor must be completed prior to, or at the same time as, the requirements for the bachelor's degree. A major and a minor may not be taken in the same degree program, and a minor is not required for a degree.

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. Students may select a minor which has requirements from a catalog that is different from that of their major. The minor form can then be submitted to the Office of the Registrar. The completion of the minor is noted on the student's transcript, but is not shown on the diploma. In no case is a diploma awarded for the minor.

Academic Honors

The **Dean's Honors List** is compiled at the end of each quarter to honor undergraduate students who have completed 12 or more letter-graded units during the quarter with a 3.5 grade point average or better for that term. Units with a grade of CR do not count toward the 12-unit minimum. 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 the following **Cal Poly grade point averages** are awarded honors at graduation. **Only courses taken at Cal Poly calculate into the Cal Poly grade point averages.** The GPA is officially calculated at the time the student has *completed* graduation requirements:

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

These honors are noted on both the diploma and the transcript.

Blended BS+MS Programs

Blended programs provide an accelerated route to a graduate professional degree, with simultaneous award of both bachelor's and master's degrees. See individual programs and/or page 60 for additional information.

Change of Major

This policy goes into effect beginning with students admitted for Fall 2010. Students admitted before Fall 2010 may use either this policy or the previous change of major policy in their respective catalog.

Applies to matriculated undergraduate students at Cal Poly wishing to change major. The "target" major is the major into which a student wishes to transfer.

Policy Statement

Cal Poly students are required to declare a major at the time of application. Some students find that their interests and abilities lead them in a different direction. The University

must offer a transparent and timely process for all students who seek to change majors.

Process

I. General Guidelines

A. Minimum Time at Cal Poly

Students must complete at least one quarter at Cal Poly before requesting a change of major.

B. Basic Criteria that may be used in advising for determining Target Major Options

All academic departments should give careful consideration when determining target major options. The following criteria may be considered:

1. The majors for which the student was eligible at time of admission,
2. College academic record (e.g., GPA, coursework, etc.), and
3. Remaining coursework and the student's ability to complete degree requirements in the new major within the published unit maximums for that major.

C. One Chance to be Accepted

Students who enter into an individualized change of major agreement (ICMA) and do not complete the ICMA requirements will *not* be eligible to request that major again later in their career at Cal Poly.

D. Completion of Change of Major

The change of major will be approved once the student has successfully met all of the requirements of the ICMA.

E. Timeframe

The ICMA must be feasible to complete and be completed in no more than two quarters.

F. Publication of Change of Major Criteria

As applicable, departments' web sites should post the minimum criteria required of all students to change major into their program including timelines.

G. Impact Constraints

Per the Office of the Chancellor's *The California State University Enrollment Management Policy and Practices*, other admissions requirements for all transfer students (internal and external) entering the target majors on impacted campuses must be the same (e.g., portfolios, auditions, etc.).

H. Academic Standing

A change of major agreement will be void if a student is academically disqualified prior to the completion of the agreement.

II. Requesting a Change of Major

- A. Meet with current advisor to review major options and talk about career paths. Consider, also, consulting with Career Services, other advisors, and faculty and/or department heads/chairs in both current and target majors.

- B. Meet with the department head/chair or designee in the target major to determine the likelihood of success in the new major.
- C. Review the curriculum requirements for the target major.
- D. If the target major is not a good fit for the student, the student will be advised to look at other options.
- E. If the student receives a positive assessment based on consideration of I.B., and it is clear that he/she can complete degree requirements in the new major within the unit maximum (unit maximum is 24 units above program requirements), then an ICMA will be developed (see below).

III. Individualized Change of Major Agreement (ICMA)

The change of major will be approved once the student has successfully met all of the requirements of the ICMA.

The ICMA will cover no more than two quarters. The ICMA may include the following components:

- A. Maximum of three specified courses or 12 units in the target major.
- B. Additional courses and/or units to allow the student to meet minimum progress standards and complete degree applicable units in both majors, whenever possible (e.g., GE courses or electives a student could use to meet degree requirements in both current and target majors).
- C. GPA requirements, as determined by the department (e.g., overall/term GPA, GPA in major-specified courses, GPA in past two quarters).
- D. If applicable, specific steps to be met to resume good academic standing status.

General Information

As much as possible, entering students are encouraged to make careful and informed decisions about the initial application to their declared majors. All majors at Cal Poly are impacted and it will be difficult to change into some majors despite a student's best efforts. Nevertheless, sometimes students will find that their interests, abilities, or talents will take them in a different direction than they had identified when they originally applied to Cal Poly and they may seek to change to a different major. Depending on the degree of impact of the target major (i.e., the relationship between the number of applicants to the major and the number of places available), there might only be a few spaces available for change of majors, or no spaces at all. Students who are unable to change into their desired majors might also need to consider applying to another university in the major of their choice.

If a student makes the decision to change major, doing so early in the academic career will better allow a student to make degree progress in a timely manner and stay within the University's minimum progress to degree standards; major changes late in the academic career will be restricted

by the University's minimum progress standards, including the unit maximum.

All students, whether lower division (those with fewer than 90 Cal Poly units) or upper division (those with more than 90 Cal Poly units or 90 transfer units), intending to change majors must demonstrate that they can complete the new major within the minimum progress standards and the unit maximum set forth by the University. This is likely to be a greater challenge for upper division students, who will have fewer remaining degree requirements. Further, students need to be aware that not all departments can accommodate upper division change of majors.

Course Substitution

Although a curriculum is specified for each major, under certain conditions a student may be permitted some deviation from the established curriculum. See the major department for substitutions involving major or support courses.

All Cal Poly students are expected to complete the GE courses specified in their degree program. Cal Poly GE courses must be selected from the GE requirement list. Substitutions are not permitted except in extraordinary circumstances. Students requesting exceptions must follow petition procedures, outlined on the GE web site. This process may take several weeks.

Double Majors or Degrees

If a student has completed the requirements for two or more majors leading to the same baccalaureate degree (e.g., two BS degrees), those majors are acknowledged on a single diploma. The major which the student requests as her/his **primary** major will appear first on the diploma. If a student has completed the requirements for two or more majors leading to different baccalaureate degrees (e.g., a BS and a BA), those degrees and the completed major or majors leading to each degree are acknowledged on two separate diplomas. If a student has completed concurrently the requirements for two or more degrees, at least one of which is a graduate degree, Cal Poly issues a separate diploma for each degree earned.

A student who adds a second major to her/his degree objective is expected to fulfill all requirements for both majors. However, a student may be allowed to use one senior project to fulfill the requirements for two majors. The program in which the student seeks to replace the senior project must grant permission before the student begins the project. Permission must be obtained using a major/support substitution.

Graduate Courses Taken by Undergraduates for Graduate Credit

Cal Poly undergraduates who have achieved senior standing may take courses in the 400 or 500 series for possible graduate credit while still undergraduates. If they subsequently enter a Cal Poly master's or credential program, they may petition to have such course credit applied toward their master's degree or credential program, **if** the units were not used for the baccalaureate degree. A

Graduate Petition for Special Consideration is the means of petitioning for this allowance.

Student Classification/Standing

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

Lower Division

Freshman fewer than 45 units
Sophomore..... 45 to 89 units

Upper Division

Junior 90 to 134 units
Senior..... 135 or more units

For the purposes of this calculation, earned units include transfer and Advanced Placement credit, in addition to Cal Poly units.

General Education

Program Goals

Consistent with E.O. 1033, Cal Poly's General Education Program is designed to assure graduates have made noteworthy progress toward becoming truly educated persons and to provide means whereby graduates have:

- The ability to think clearly and logically, to find information and examine it critically, to communicate orally and in writing, and to reason quantitatively;
- Appreciable knowledge about their own bodies and minds, about how human society has developed and how it now functions, about the physical world in which they live, about the other forms of life with which they share the world, and about the cultural endeavors and legacies of their civilizations;
- An understanding and appreciation of the principles, methodologies, value systems, and thought processes employed in human inquiries.

LEAP Essential Learning Outcomes Framework

Cal Poly has defined its GE learning outcomes to fit within the framework of the four Essential Learning Outcomes drawn from the Liberal Education and America's Promise (LEAP) campaign, an initiative of the Association of American Colleges and Universities:

- Knowledge of Human Cultures and the Physical and Natural World
- Intellectual and Practical Skills
- Personal and Social Responsibility
- Integrative Learning

Foundational Courses

Students are expected to complete GE Area A classes during their freshman year. The three-course Communications sequence provides instruction and practice in the kinds of skills in writing, speaking, and critical thinking that students will need in their later courses. Completion of Area A is a prerequisite for many other GE classes. Students are also

encouraged to complete their lower-division foundational GE classes in Areas B, C, and D (Science and Math, Arts and Humanities, and Society and the Individual) by the end of their sophomore year to give them the skills and knowledge to succeed in all their upper-division classes.

Technology Elective (Area F)

Most majors are required to take this upper-division elective which is integrative in nature, requiring the application and generalization of basic scientific and mathematical knowledge from foundation GE courses. Particular technologies are critically examined from multiple perspectives, which may include ethical, social, ecological, political, or economic viewpoints.

Advising

Some support courses fulfill both GE and major requirements and are listed on the program curriculum displays. Students should consult academic advisors during their freshman year for clarification on these GE/major support courses. GE course offerings are updated online each quarter in PASS.

Double-Counting

Courses from the student's Major department may not be used to fulfill GE Area C4 or D5.

GE Course Substitutions

Students are expected to complete the GE courses published for their degree program. Cal Poly GE courses must be selected from the approved GE list. Substitutions are not permitted except in extraordinary circumstances. Students requesting exceptions must follow petition procedures, outlined on the GE web site. This process may take several weeks.

GE Study Abroad

Students are strongly encouraged to submit a GE Study Abroad petition before going abroad in order to determine which study abroad courses will be granted GE credit. For assistance with GE Study Abroad petitions, see the International Education and Programs office.

Transfer Credit

Transfer credit for GE courses is accepted from California institutions, as approved by the CSU Chancellor's office. The GE Area letters and numbers at Cal Poly (e.g., GE A1, D4) may be different at other colleges; see the flyer located on the Office of the Registrar's website. Some Cal Poly programs specify particular GE courses for major or support; these courses must be met with articulated equivalencies. Refer to www.assist.org for California Community College CSU GE lists and articulation agreements.

GE Requirementswww.ge.calpoly.edu/

Most Majors=Colleges of Agriculture, Food & Environmental Sciences, Architecture & Environmental Design, Business, Science & Mathematics. **CLA, LS & LAES**=College of Liberal Arts, Liberal Studies and LAES majors. **ENGR**=Engineering Programs.

Some programs indicate specific GE courses to fulfill Major and Support course requirements.

Courses from student's Major department may not be used to fulfill Areas C4 or D5.

✓ non-unit requirement

All GE courses are 4 units unless otherwise indicated.

	Most Majors	CLA, LS & LAES	ENGR only
GE Units Taken in Residence	12	12	12
GE Upper Division Units Required	12	12	8
AREA A COMMUNICATION	12	12	12
A1 Expository Writing	4	4	4
A2 Oral Communication	4	4	4
A3 Reasoning, Argumentation, and Writing	4	4	4
AREA B SCIENCE & MATH	16	20	28
B1 Mathematics/Statistics	8	8	8
B2 Life Science	4	4	4
B3 Physical Science	4	4	4
B4 One lab taken with B2 or B3 course	✓	✓	✓
B5 elective (for CLA, LS & LAES students only) CLA, LS & LAES students may take B5, or any course from B1-B4		4	
B6 Upper-division (Engineering)			4
Engineering: Additional Area B			8
AREA C ARTS AND HUMANITIES	20	16	16
C1 Literature	4	4	4
C2 Philosophy	4	4	4
C3 Fine and Performing Arts	4	4	4
C4 Upper-division elective	4	4	4
Area C Elective (One from C1-C4)	4		
AREA D/E SOCIETY/INDIVIDUAL	20	20	16
D1 The American Experience (40404)	4	4	4
D2 Political Economy	4	4	4
D3 Comparative Social Institutions	4	4	4
D4 Self Development (CSU Area E)	4	4	4
D5 Upper-division elective	4	4	
AREA F TECHNOLOGY (upper-div)	4	4	
TOTAL GE UNITS	72	72	72

General Education Courses

	Most Majors	CLA, LS & LAES	ENGR only
AREA A: COMMUNICATION	12	12	12
A1 Expository Writing	4	4	4
ENGL 133 Writing and Rhetoric for ESL Students ENGL 134 Writing and Rhetoric			
A2 Oral Communication	4	4	4
COMS 101 Public Speaking COMS 102 Principles of Oral Communication HNRS 101 Public Speaking			
A3 Reasoning, Argumentation, and Writing	4	4	4
COMS 126 Argument and Advocacy COMS 145 Reasoning, Argumentation and Writing ENGL 145 Reasoning, Argumentation, and Writing ENGL 148 Reasoning, Argumentation, and Professional Writing ENGL 149 Technical Writing for Engineers HNRS 145 Reasoning, Argumentation, and Writing HNRS 148 Reasoning, Argumentation, and Professional Writing HNRS 149 Technical Writing for Engineers PHIL 126 Logic and Argumentative Writing			
	Most Majors	CLA, LS & LAES	ENGR only
AREA B: SCIENCE & MATH	16	20	28
B1 Mathematics/Statistics	8	8	8
HNRS 141 Calculus I HNRS 142 Calculus II HNRS 143 Calculus III MATH 112 Nature of Modern Math MATH 117 Pre-Calculus Algebra II MATH 118 Pre-Calculus Algebra MATH 119 Pre-Calculus Trigonometry MATH 141 Calculus I MATH 142 Calculus II MATH 143 Calculus III MATH 161 Calculus for the Life Sciences I MATH 162 Calculus for the Life Sciences II MATH 182 Calculus for Architecture and Construction Mgmt MATH 221 Calculus for Business and Economics MATH 227 Mathematics for Elementary Teaching I STAT 130 Intro Statistical Reasoning STAT 217 Intro to Statistical Concepts and Methods STAT 218 Applied Statistics for the Life Sciences STAT 221 Intro Probability and Statistics STAT 251 Statistical Inference for Management I (5) STAT 252 Statistical Inference for Management II (5) STAT 313 Applied Experimental Design and Regression Models			
B2 Life Science (B2&4=lab course)	4	4	4
ANT 250 Biological Anthropology ASCI 112 Principles of Animal Science BIO 111 General Biology (B2&4) BIO 113 Animal Diversity and Ecology (B2&4) BIO 114 Plant Diversity and Ecology (B2&4) BIO 115 Animal/Human Structure and Function (B2&4) BIO 161 Introduction to Cell and Molecular Biology (B2&4)			

BIO 227 Wildlife Conservation Biology BOT 121 General Botany (B2&4) MCRO 221 Surv Microbiology (B2&4) MCRO 224 Gen Microbiology I (5) (B2&4) PPSC 110 Peoples, Pests and Plagues (B2&B4) <i>For Engineering students only; concurrent enrollment required:</i> BIO 213 Life Science for Engineers (2) and ENGR/BRAE 213 Bioengineering Fundamentals (2)			
B3 Physical Science (B3&4=lab course)	4	4	4
ASTR 101 Intro to the Solar System ASTR 102 Intro to Stars and Galaxies ASTR 112 Introduction to the Stars and Galaxies (B3&4) CHEM 110 World of Chemistry (B3&4) CHEM 111 Survey of Chemistry (5) (B3&4) CHEM 124 General Chemistry for Engineers I (B3&4) CHEM 125 General Chemistry for Engineers II (B3&4) CHEM 127 General Chemistry I (B3&4) GEOL 102 Introduction to Geology GEOL 205 Earthquakes HNRS 131 General Physics I (B3&4) HNRS 132 General Physics II (B3&4) HNRS 134 General Physics IA PHYS 104 Introductory Physics PHYS 107 Introduction to Meteorology PHYS 111 Contemporary Physics for Nonscientists PHYS 115 Physics of Sound and Music PHYS 121 College Physics I (B3&4) PHYS 122 College Physics II (B3&4) PHYS 131 General Physics I (B3&4) PHYS 132 General Physics II (B3&4) PHYS 133 General Physics III (B3&4) PHYS 141 General Physics IA PSC 101 Physical Environment: Matter and Energy (B3&4) PSC 103 The Physical Environment: Earth			
B4 One lab taken with B2 or B3 course	✓	✓	✓
B5 elective (GE option for College of Liberal Arts, Liberal Studies & LAES students)	--	--	--
CLA, LS & LAES: (Select one from B1-B5)	0	4	0
BIO 112 Conservation Biology & Environmental Science BIO 302 Human Genetics BIO 305 Biology of Cancer BOT 311 Plants, People and Civilization FSN 210 Nutrition GEOL 203 Fossils and History of Life HNRS 319 Natural Resource Ecology, Theories and Applications MATH 326 Mathematics and Visual Art NR 319 Natural Resource Ecology, Theories and Applications PSC 201 Intro to Physical Oceanography PSY 340 Biopsychology SS 121 Intro to Soil Science			
B6 Upper-division Area B (ENGR only)	0	0	4
CHEM 305 Physical Chemistry for Engineers CSC 341 Numerical Engineering Analysis GEOL 305 Fundamentals Seismology MATH 304 Vector Analysis MATH 344 Linear Analysis II MATH 408 Complex Analysis I PHYS 412 & 452 Solid State Physics & Lab PHYS 417 Nonlinear Dynamical Systems STAT 312 Statistical Methods for Engineers STAT 321 Probability and Statistics for Engineers and Scientists STAT 350 Probability and Random Processes for Engineers			

Engineering: Additional Area B	0	0	8
	Most Majors	CLA, LS & LAES	ENGR only
AREA C: ARTS AND HUMANITIES	20	16	16
C1 Literature	4	4	4
ENGL 230 Masterworks British Literature through 18 th Century ENGL 231 Masterworks British Lit: Late 18 th Century – Present ENGL 240 American Tradition in Literature ENGL 251 Great Books I: Ancient and Classical World ENGL 252 Great Books II: Emergence of Europe ENGL 253 Great Books III: Age of Revolution FR 233 Critical Readings in French Literature GER 233 Critical Readings in German Literature HNRS 232 Masterworks British Lit: Late 18 th Century – Present HNRS 251 Great Books I: Ancient and Classical World SPAN 233 Introduction to Hispanic Readings			
C2 Philosophy	4	4	4
HNRS 230 Philosophical Classics: Knowledge and Reality HNRS 231 Philosophical Classics: Ethics and Political Philosophy PHIL 230 Philosophical Classics: Knowledge and Reality PHIL 231 Philosophical Classics: Ethics and Political Philosophy			
C3 Fine and Performing Arts	4	4	4
ARCH 217 History of Architecture ARCH 218 History of Architecture ARCH 219 History of Architecture ART 101 The Fundamentals of Drawing ART 111 Introduction to Art ART 112 Survey of Western Art ART 148 Sculpture COMS 208 Performance of Literature DANC 221 Dance Appreciation LA 211 History of Landscape Arch: Ancient Civs – Col America LA 212 History of Modern and Contemporary Landscape Arch MU 101 Introduction to Music Theory MU 120 Music Appreciation MU 221 Jazz Styles (USCP) MU 229 Music of the 60's: War and Peace (USCP) TH 210 Introduction to Theatre TH 227 Theatre History I TH 228 Theatre History II			
C4 Upper-division elective	4	4	4
<i>Courses from student's Major Dept do not receive C4 credit</i> ARCH 320 Topics in Architectural History ARCH 326 Native American Architecture and Place (USCP) ART 311 Art History – Nineteenth Century Art ART 314 History of Photography ART 318 Asian Art: National, Religion and Intel Movements ART 370 Michelangelo ART 371 Topics in Renaissance Art COMS 308 Group Performance of Literature DANC 311 Dance in American Musical Theatre DANC 321 Cultural Influences on Dance in America (USCP) ENGL 330 Brit Lit: Age of Belief to 1485 ENGL 331 Brit Lit: Age of Discovery, 1485-1600 ENGL 332 Brit Lit: Age of Enlightenment, 1660-1798 ENGL 333 Brit Lit: Age of Romanticism, 1798-1832 ENGL 334 Brit Lit: Age of Industrialism, 1832-1914 ENGL 335 Brit Lit: Age of Modernism: 1914-Present ENGL 338 Intro Shakespeare: London			

ENGL 339 Intro Shakespeare	PHIL 337 Business Ethics			
ENGL 340 Literary Sources American Character: 1600-1865	PHIL 339 Biomedical Ethics			
ENGL 341 Literary Sources American Character: 1865-1914	PHIL 340 Environmental Ethics			
ENGL 342 Literary Sources American Character: 1914-1956	PHIL 341 Professional Ethics			
ENGL 343 Multiple Voices Contemp Amer Lit: 1956 – Present	PHIL 342 Philosophy of Religion			
ENGL 345 Women Writers of 20 th Century (<i>USCP</i>)	PHIL 350 Aesthetics			
ENGL 346 Ethnic American Lit (<i>USCP</i>)	RELS 301 Religions of Asia			
ENGL 347 African American Literature (<i>USCP</i>)	RELS 302 Monotheisms: Judaism, Christianity, and Islam			
ENGL 349 Gender in 20 th -Century Literature (<i>USCP</i>)	RELS 304 Judaism			
ENGL 350 Modern Novel	RELS 306 Hinduism			
ENGL 351 Modern Poetry	RELS 307 Buddhism			
ENGL 352 Modern Drama	RELS 310 Christianity			
ENGL 353 Drama in London	RELS 311 Islam			
ENGL 354 Bible as Literature and in Literature and the Arts	RELS 370 Religion, Gender and Society (<i>USCP</i>)			
ENGL 370 World Cinema	RELS 372 Spiritual Extremism: Asceticism, Mysticism, Madness			
ENGL 371 Film Styles and Genres	RELS 374 Religion and Violence			
ENGL 372 Film Directors	RELS 378 Religion and Contemporary Values			
ENGL 380 Literary Themes	SPAN 305 Significant Writers in Spanish			
ENGL 381 Diversity in 20 th -Century American Lit (<i>USCP</i>)	SPAN 340 Chicano/a Authors (<i>USCP</i>)			
ENGL 382 LGBT Literature and Media (<i>USCP</i>)	SPAN 350 Hispanic Literature in English Translation			
ENGL 386 Creative Nonfiction	SPAN 351 Latino/a Writers in U. S. (<i>USCP</i>)			
ENGL 387 Fiction Writing	TH 310 Women's Theatre			
ENGL 388 Poetry Writing	TH 320 Black Theatre (<i>USCP</i>)			
ES 300 Chicano/a Non-Fiction Literature (<i>USCP</i>)	TH 360 Theatre in the United States			
ES 326 Native American Architecture and Place (<i>USCP</i>)	TH 390 Global Theatre and Performance			
ES 340 Cultural Production and Ethnicity	UNIV 361 Modernism			
ES 360 Ethnicity and the Land (<i>USCP</i>)	WGS 370 Religion, Gender and Society (<i>USCP</i>)			
FR 305 Significant Writers in French	Area C Elective (one course from C1-C4)	4	0	0
FR 350 French Literature in English Translation		Most Majors	CLA, LS & LAES	ENGR only
GER 305 Significant Writers in German	AREA D/E: SOCIETY & INDIVIDUAL	20	20	16
GER 350 German Literature-English Translation	D1 The American Experience (40404)	4	4	4
HNRS 304 Values and Technology	ES 112 Race, Culture, Politics in the U.S. (<i>USCP</i>)			
HNRS 320 Values, Media, Culture	HIST 206 American Cultures (<i>USCP</i>)			
HNRS 333 Brit Lit: Age of Romanticism, 1798-1832	HIST 207 Freedom and Equality in American History (<i>USCP</i>)			
HNRS 380 Literary Themes	HIST 207 Freedom and Equality in American History (<i>USCP</i>)			
HUM 303 Values and Technology	HNRS 112 Race, Culture, Politics in the U.S. (<i>USCP</i>)			
HUM 310 World Cultures	POLS 112 American and California Government			
HUM 312 Chicano/a Culture (<i>USCP</i>)	D2 Political Economy	4	4	4
HUM 320 Values, Media, Culture	ECON 201 Survey of Economics			
HUM 361 Modernism	ECON 222 Macroeconomics			
MU 324 Music and Society	HIST 213 Modern Political Economy			
MU 328 Women in Music	HIST 214 Political Economy of Latin America and Middle East			
NR 360 Ethnicity and the Land (<i>USCP</i>)	HNRS 201 Survey of Economics			
PHIL 311 Greek Philosophy	SOC 218 International Political Economy			
PHIL 312 Medieval Philosophy	D3 Comparative Social Institutions	4	4	4
PHIL 313 Early Modern Rationalism	ANT 201 Cultural Anthropology			
PHIL 314 Early Modern Empiricism	ANT 202 World Prehistory			
PHIL 315 Kant and 19 th Century European Philosophy	ES 212 Global Origins of U.S. Cultures (<i>USCP</i>)			
PHIL 316 20 th Century European Philosophy	ES 241 Survey of Indigenous Studies (<i>USCP</i>)			
PHIL 317 History of Analytic Philosophy	ES 242 Survey of Africana Studies (<i>USCP</i>)			
PHIL 320 Asian Philosophy	ES 243 Survey of Latino/a Studies (<i>USCP</i>)			
PHIL 321 Philosophy of Science	ES 244 Survey of Asian American Studies (<i>USCP</i>)			
PHIL 322 Philosophy of Technology	GEOG 150 Intro to Cultural Geography			
PHIL 331 Ethics	HIST 210 World History I (5000 B.C.E. to 1789)			
PHIL 332 History of Ethics	HIST 216 Comparative Social Movements			
PHIL 333 Political Philosophy	HIST 221 World History, Beginnings to 1000			
PHIL 334 Philosophy of Law	HIST 222 World History, 1000-1800			
PHIL 335 Social Ethics (<i>USCP</i>)	HIST 223 World History, 1800 to Present			
PHIL 336 Feminist Ethics, Gender and Society (<i>USCP</i>)	HNRS 212 Global Origins of U.S. Cultures (<i>USCP</i>)			

HNRS 223 World History, 1800 to Present RELS 201 Religion, Dialogue and Society SOC 110 Comparative Societies			
D4 Self Development (CSU Area E)	4	4	4
FSN 250 Food and Nutrition: Customs and Culture (USCP) KINE 250 Healthy Living KINE 255 Personal Health: Multi-cultural Approach (USCP) KINE 260 Women's Health Issues (USCP) PSY 201 General Psychology PSY 202 General Psychology			
D5 Upper-division elective	4	4	0
<i>Courses from student's Major Dept do not receive D5 credit</i> ANT 325 Precolumbian Mesoamerica ANT 330 Indigenous South Americans ANT 344 Sex, Death and Human Nature ANT 345 Human Behavioral Ecology ANT 360 Human Cultural Adaptations BUS 311 Managing Technology International Legal Environ CRP 334 Cities in a Global World ECON 303 Econ of Poverty Discrimination Immigration (USCP) ECON 304 Comparative Econ Systems ECON 322 Economic History of the Advanced World ES 308 Fire and Society ES 310 Hip-Hop, Poetics and Politics (USCP) ES 320 African American Cultural Images (USCP) ES 321 Native American Cultural Images (USCP) ES 322 Asian American Cultural Images (USCP) ES 323 Mexican American Cultural Images (USCP) ES 330 Chinese American Experience (USCP) ES 335 Filipina/o American Experience (USCP) ES 380 Critical Race Theory (USCP) ES 381 The Social Construction of Whiteness (USCP) GEOG 300 Geography of United States GEOG 301 Geography of Resource Utilization GEOG 308 Global Geography GEOG 370 Geography of Latin America HIST 306 The Witch-Hunt in Europe, 1400-1800 HIST 307 European Thought, 1800-2000 HIST 308 The Trans-Atlantic Slave Trade HIST 309 Cultures of West Africa and the African Diaspora HIST 310 East Asian Culture and Civilization HIST 316 Modern East Asia HIST 317 The Lure of the Sea HIST 318 The City in the Modern World, c. 1800-2000 HIST 319 Modern South and Southeast Asia HIST 320 Colonial and Revolutionary America HIST 321 Civil War America HIST 322 Modern America HIST 323 Versions of the Past: Novels, Comics and Movies HIST 324 The Historical Novel in the U.S., '60's to Present HIST 336 Britain at War: 1939-1945 HNRS 303 Econ of Poverty Discrimination Immigration (USCP) HNRS 324 The Historical Novel in the U.S., '60's to Present HNRS 391 Appropriate Tech/World's People: Development HUM 315 Critical Issues in Latin American Studies HUM 316 London: From Roman Colony to World Capitol KINE 323 Sport and Gender (USCP) KINE 324 Sport, Media and American Popular Culture (USCP) NR 308 Fire and Society NR 323 Human Dimensions Natural Resource Management POLS 325 Global Political Issues			

POLS 338 Critical Issues American Politics POLS 339 Authoritarian and Democratic Rule POLS 348 Early American Political Thought POLS 349 Contemporary American Political Thought PSY 311 Environmental Psychology PSY 318 Psychology of Aging PSY 352 Conflict Resolution: Violent and Nonviolent RELS 344 Religious Studies: The Making of a Discipline SOC 315 Global Race and Ethnic Relations SOC 326 Sociology of the Life Cycle SOC 377 Sociology of Religion UNIV 391 Appropriate Tech/World's People: Development WGS 301 Introduction to Women's and Gender Studies (USCP) WGS 320 Women in Global Perspective WGS 340 Sexuality Studies			
	Most Majors	CLA, LS & LAES	ENGR only
AREA F: TECHNOLOGY ELECTIVE (upper division)	4	4	0
AERO 310 Air and Space AG 315 Organic Agriculture AG 330 Cal Poly Land: Nature, Technology and Society AG 350 The Global Environment AG 360 Holistic Management ASTR 324 Longitude, Navigation, and Timekeeping BIO 307 World Aquaculture: Applics, Methods and Trends BOT 329 Plants, Food, and Biotechnology BRAE 340 Irrigation Water Mgmt BRAE 348 Energy for a Sustainable Society BUS 350 The Global Environment CHEM 349 Chemical and Biological Warfare CRP 338 Digital Cities CSC 302 Computers and Society CSC 310 Computers for Poets EDES 350 The Global Environment ENGR 302 Transportation and Manufacturing in 21 st Century ENGR 350 The Global Environment ENVE 324 Introduction to Air Pollution ES 350 Gender, Race, Science and Technology (USCP) FSN 319 Food Technology/Customer GEOG 317 The World of Spatial Data/Geographic Info Tech GRC 377 Desktop Publishing for Print and World Wide Web HCS 329 Plants, Food, and Biotechnology HIST 354 History Network Technology HIST 359 Living in the Material World HNRS 310 Air and Space HNRS 311 Computers for Poets HNRS 392 Appropriate Tech for the World's People: Design HUM 302 Human Values in Agriculture HUM 330 Cal Poly Land: Nature, Technology and Society HUM 350 The Global Environment IME 320 Human Factors and Technology IT 330 Issues of Packaging IT 336 Textile Technology IT 341 Plastics Processes and Applications LA 317 The World of Spatial Data/Geographic Info Tech MATE 359 Living in the Material World ME 320 Consumer Energy Guide ME 321 Solar Energy NR 312 Technology of Wildland Fire Management			

NR 317 The World of Spatial Data/Geographic Info Tech
 NR 321 Water Systems Technology, Issues and Impacts
 POLS 333 World Food Systems
 PSC 307 Nuclear Weapons in Post 9/11 World
 PSC 320 Energy, Society and the Environment
 SCM 320 Technology in London
 SCM 325 Genetic Engineering Technology
 SCM 330 Ocean Discovery through Technology
 SCM 335 Nuclear Science and Society
 SCM 350 The Global Environment
 UNIV 330 Cal Poly Land: Nature, Technology and Society
 UNIV 333 World Food Systems
 UNIV 339 Disaster-Resistant Sustainable Communities
 UNIV 350 The Global Environment
 UNIV 392 Appropriate Tech/World's People: Design
 WGS 350 Gender, Race, Science and Technology (USCP)

Total GE Units	72	72	72
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U.S. Cultural Pluralism Requirement

United States Cultural Pluralism (USCP) courses must focus on all of the following:

- One or more diverse groups (defined as specifically inclusive of, but not limited to, an individual's race/ethnicity, sex/gender, socioeconomic status, cultural heritage, disability, and sexual orientation), whose contributions to contemporary American society have been impeded by cultural conflict or restricted opportunities, as stated in the Diversity Learning Objectives
- Contemporary social issues resulting from cultural conflict or restricted opportunities, including, but not limited to, problems associated with discrimination based on age, ethnicity, gender, nationality, abilities, religion, sexual orientation, socioeconomic status, or race
- Critical thinking skills used by students to approach these contemporary social issues in a sensitive, responsible manner; examine their own attitudes; and consider the diverse perspectives of others
- The contributions of people from diverse groups to contemporary American society

Students are required to complete *one* USCP course. This course also fulfills a requirement for Major, Support, General Education, or Free Elective category.

The following courses fulfill the United States Cultural Pluralism requirement. Consult the Schedule of Classes (PASS) or your academic advisor for an up-to-date list.

* = *Course also satisfies GE requirement*

AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (4)
 ANT 415 Native American Cultures (4)
 ARCH 326 Native American Architecture & Place (4) C4*
 COMS 416 Intercultural Communication (4)
 CRP 215 Planning for and with Multiple Publics (4)
 DANC 321 Cultural Influences/Dance in America (4) C4*
 ECON 303 Econ Poverty/Discrim/Immigration (4) D5*
 ENGL 345 Women Writers (4) C4*
 ENGL 346 Ethnic American Literature (4) C4*
 ENGL 347 African American Literature (4) C4*

ENGL 349 Gender in 20th Century Literature (4) C4*
 ENGL 381 Diversity in 20th Century Amer. Lit. (4) (C4)*
 ENGL 382 LGBT Literature and Media (4) (C4)*
 ES 112 Race, Culture, and Politics--United States (4) D1*
 ES 114 Race in American Culture (4)
 ES 212 Global Origins of U.S. Cultures (4) D3*
 ES 215 Planning for and with Multiple Publics (4)
 ES 241 Survey of Indigenous Studies (4) D3*
 ES 242 Survey of Africana Studies (4) D3*
 ES 243 Survey of Latino/a Studies (4) D3*
 ES 244 Survey of Asian American Studies (4) D3*
 ES 300 Chicano/a Non-Fiction Literature (4) C4*
 ES 310 Hip-Hop, Poetics and Politics (4) D5*
 ES 320 African American Cultural Images (4) D5*
 ES 321 Native American Cultural Images (4) D5*
 ES 322 Asian American Cultural Images (4) D5*
 ES 323 Mexican American Cultural Images (4) D5*
 ES 325 Sex & Gender in African Amer. Communities (4)
 ES 326 Native American Architecture and Place (4) C4*
 ES 330 Chinese American Experience (4) D5*
 ES 335 The Filipina/o American Experience (4) D5*
 ES 350 Gender, Race, Science and Technology (4) Area F
 ES 360 Ethnicity and the Land (4) C4*
 ES 380 Critical Race Theory (4)
 ES 381 The Social Construction of Whiteness (4) D5*
 FSN 250 Food and Nutrition: Customs/Culture (4) D4*
 HIST 206 American Cultures (4) D1*
 HIST 207 Freedom & Equality American History (4) D1*
 HIST 208 Survey of California History (4)
 HIST 333 African American History from 1865 (4)
 HIST 435 American Women's History since 1870 (4)
 HNRS 112 Race, Culture, and Politics—U. S. (4) D1*
 HNRS 212 Global Origins of U.S. Cultures (4) D3*
 HNRS 303 Econ Poverty/Discrim/Immigration (4) D5*
 HUM 312 Chicano/a Culture (4) C4*
 JOUR 219 Multicultural Society and the Mass Media (4)
 KINE 255 Personal Health: Multicultural Approach (4) D4*
 KINE 260 Women's Health Issues (4) D4*
 KINE 323 Sport and Gender (4) D5*
 KINE 324 Sport/Media/American Popular Culture (4) D5*
 MU 221 Jazz Styles (4) C3*
 MU 229 Music of the 60s: War and Peace (4) C3*
 MU 325 America's Music (4)
 NR 360 Ethnicity and the Land (4) C4*
 PHIL 335 Social Ethics (4) C4*
 PHIL 336 Feminist Ethics, Gender and Society (4) C4*
 POLS 310 Politics of Ethnicity and Gender (4)
 POLS 343 Civil Rights in America (4)
 PSY 472 Multicultural Psychology and Diversity (4)
 RELS 370 Religion, Gender and Society (4) C4*
 SOC 316 American Ethnic Minorities (4)
 SPAN 111 Elementary Hispanic Language and Culture (4)
 SPAN 123 Spanish for Heritage Speakers (4)
 SPAN 340 Chicano/a Authors (4) C4*
 SPAN 351 Latino/a Writers in the U. S. (4) C4*
 TH 300 Topics in Diversity on the American Stage
 TH 310 Women's Theatre (4) C4*
 TH 320 Black Theatre (4) C4*
 WGS 301 Introduction to Women's and Gender Studies (4)
 WGS 350 Gender, Race, Science & Technology (4) Area F
 WGS 370 Religion, Gender and Society (4) C4*
 WGS 435 American Women's History since 1870 (4)
 WGS 450 Feminist Theory (4)

Registration

Students are required to enroll in courses by using the web registration system (CPRReg). The courses selected should meet the requirements specified for each student's major course of study.

Credit for coursework completed is given only when the student is properly registered. A student is not properly registered until fee requirements have been met and enrollment in classes through the CPRReg system has been confirmed. **Students are strongly advised to print copies of their schedule for their records.** Individuals are not permitted to attend courses unless they are officially registered as regular students, as approved extension students, or as enrolled auditors (see Audit).

Information concerning registration for classes is available at www.ess.calpoly.edu/_records/registration. Information concerning payment of fees is available at www.fees.calpoly.edu.

ENROLLMENT POLICY

State funding is allocated to the University based on student enrollment each term. Any attendance/participation in classes where the student is not officially enrolled during the term of participation (and where appropriate registration fees have not been paid) is against campus policy. This includes enrollment in Internship courses and acceptance of a position through the Cooperative Education program. All registration should be completed by the end of the Add Period, the 8th day of the term.

Official term enrollment requires the awarding of grades for classes attempted.

CLASS ATTENDANCE

Students are expected to attend class regularly to keep the quality and quantity of their work high. Absence from classes is regarded as serious. 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 in no way excuses the student from the work required.

"Excusable" Reasons for Missing Class

It is strongly urged that instructors accept the following "excusable" reasons for allowing students to make up missed work:

- Illness with a doctor's statement
- Serious illness or death of close relatives
- Active participation in university events (an instructor may require a statement from the adviser involved certifying that the student was actively participating in a recognized university event)
- Field trips
- Religious holidays
- Selective service and military reasons

- NCAA athletic competitions
- Instructionally Related Activities (IRA)/competitions
- Jury duty or any other legally required court appearances
- Job or internship interviews

Any student seeking to make up missed work pursuant to the above listed "excusable" reasons must inform the instructor of their intent in a timely manner.

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. A student's records are held until the obligation is cleared to the satisfaction of the office or department placing the Hold.

ENROLLMENT STATUS

Full-time undergraduate students are those enrolled in 12 or more units of coursework in any regular quarter. *Half-time undergraduate students* are those enrolled in 6 to 11 units, and part-time undergraduate students are those enrolled for 5 or less units. Verification of enrolled units is based on enrollment status at the time of the verification request. Full-time status for graduate students is defined in the "Graduate Studies" section of this catalog.

MAXIMUM UNIT LOAD

The maximum load for all students is 22 quarter units including audited courses and concurrent work at other colleges. Exceptions may be made with the advance approval of the student's major department head or graduate advisor. Increase in maximum unit load is not available to students on academic probation. Maximum load requirements may be waived only on presentation of evidence of ability to carry successfully such a group of courses. A petition to carry an excess load is available from the Office of the Registrar.

ADD/DROP

All changes to individual class registration or enrollments are the **responsibility of the student**. The add/drop period continues through CPRReg initial registration cycles until the end of the 8th day of instruction of each term. During this period, the student has the opportunity to add or drop classes. See specific dates for completing these transactions at www.ess.calpoly.edu/records/Calendars_Deadlines. Students are responsible for knowing and adhering to these published timelines and for their enrollments.

Adding

Closed classes: If a class is full, students may use a permission number, issued by the instructor, during the first 8 days of instruction. See www.ess.calpoly.edu/_records/registration for details.

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

Eligibility: Students must meet prerequisite and Schedule of Classes 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 CPreG with a permission number issued by the instructor of the class.

Dropping

Students have until the end of the 8th day of instruction to drop a class through CPreG. No entry is made on their academic records. At the end of the regular add/drop period the instructor must assume that any student who has not dropped voluntarily remains officially enrolled in the class. For information on withdrawing after the end of the regular add/drop period see Withdrawals from Courses.

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

Footnote requirement: An instructor **may** drop a student from a class if the footnote requirements, as stated in the online Schedule of Classes on PASS, 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 are automatically dropped and have no reporting responsibilities.

LEAVES OF ABSENCE

Students are permitted to take a Planned Educational Leave or a Medical Leave with a written request and approval by campus officials.

Eligibility for All Leaves

1. A student on Educational or Medical Leave is considered to be in continuous attendance with the purpose of returning to the same curriculum that was in effect when the leave began.
2. A student on Educational or Medical Leave is not required to apply for readmission or pay an application fee provided that the student returns to the same major and within the time period agreed upon when the application was approved.
3. No more than two leaves are available to each student (totaling a maximum of 8 terms).
4. A student on leave may return and enroll for any term prior to the term when the leave is scheduled to end. NO leave is extended beyond the two-year limitation for any reason.
5. Any student on leave who fails to return and enroll within the time limits specified by the leave agreement is required to reapply for admission, pay the reapplication fee, and may be held to any new curriculum requirements which may be in effect.

Educational Leaves:

1. A Planned Educational Leave must be for a purpose that contributes to the student's educational objective and is approved by the student's major department head or chair.
2. To be considered for an Educational Leave, the student must be eligible to enroll for the term in which the leave begins and not be on academic probation.
3. The application for Educational Leave must be initiated and approved before the leave begins and is not granted retroactively.
4. Application forms and information concerning Leaves of Absence may be obtained from the Office of the Registrar.

Medical Leaves:

1. A Medical Leave provides time for the student to receive treatment or to recover from a disabling injury or other medical condition and is approved by a medical doctor.
2. The Medical Leave begins the term following the student's last term in attendance and may be granted retroactively based on the student's personal situation.
3. A written letter together with medical documentation is required. Information concerning Leaves of Absence may be obtained from the Office of the Registrar.

RETURNING STUDENTS

Matriculated students who have not registered for three consecutive quarters and who have not been on an approved leave of absence must file an application for readmission. The application fee must accompany the application for readmission. See the Admissions section for application deadlines for returning students.

Summer Quarter is a regular quarter and is counted in determining the length of absence.

INTRASYSTEM AND INTERSYSTEM ENROLLMENT PROGRAMS

Students enrolled at any CSU campus have access to courses at other CSU campuses on a space available basis unless those campuses or programs are impacted or admission to the desired program or admission categories are closed. This access is offered without students being required to be admitted formally to the host campus and sometimes without paying additional fees. Although courses taken on any CSU campus transfer to the student's home CSU campus as elective credit, students should consult their home campus academic advisors to determine how such courses may apply to their specific degree programs before enrolling at the host campus.

There are two programs for enrollment within the CSU and one for enrollment between CSU and the University of California or California community colleges. Additional information about these programs is available from the Office of the Registrar, Admin. 222.

CSU Concurrent Enrollment – matriculated students in good standing may enroll on a space available basis at both

their home CSU campus and a host CSU campus during the same term. Credit earned at the host campus is reported to the home campus to be included on the student's transcript at the home campus. This counts as residential credit towards the degree but is shown as transfer credit.

CSU Visitor Enrollment – matriculated students in good standing enrolled at one CSU campus may enroll on a space available basis at another CSU campus for one term. Credit earned at the host campus is reported to the home campus to be included on the student's transcript at the home campus as transfer credit.

Intersystem Cross Enrollment – matriculated CSU, UC, or community college students may enroll on a space available basis for one course per term at another CSU, UC, or community college and request that a transcript of record be sent to the home campus and recorded as transfer credit.

HEALTH SCREENING

Students graduating from a California public high school only need to complete the Cal Poly Health History Form, available on the Mustang Health Portal. **NO immunization records need to be sent in.**

All **other** entering CSU students are required to present proof of the following immunizations to the CSU campus they are attending before the beginning of their first term of enrollment. If proof cannot be presented at that time, then the following conditions must be met:

- **Measles and Rubella:** Students must submit proof of immunity to measles and rubella within one year of the time of first enrollment. Students will not be allowed to register for a second year until they have fulfilled this requirement.
- **Hepatitis B:** Students who are 18 years of age or younger at the start of their first term at a CSU campus must provide proof of full immunity against Hepatitis B prior to their second quarter. Full immunization against Hepatitis B consists of three timed doses of vaccine over a minimum 4 to 6 months period. ***Students will not be allowed to register for a second quarter*** until they have presented proof to Health Services that they have received at least one shot, and must complete the series prior to the second year of enrollment.

Meningococcal Disease. Each incoming freshman who resides in on-campus housing is required to return a form indicating that they have received information about meningococcal disease, the availability of the vaccine to prevent contracting the disease, and indicating whether or not the student has chosen to receive the vaccination. These are *not* admission requirements, but are required of students as conditions of living in on-campus housing.

Compliance with the immunization requirements can be met in the following ways:

- Immunization cards or other medical records can be faxed to 805-756-5298 or copies sent to Cal Poly Health Services, Bldg 27, California Polytechnic State University, San Luis Obispo, CA 93407-0210.
- Students can receive immunizations at the Cal Poly Health Center.
- Students can have immunities checked by blood test performed at Cal Poly Health Center or other licensed lab.
- Students can sign a waiver declining immunizations for health reasons or due to personal beliefs. Students who sign such a waiver may be barred from campus in the case of a measles or rubella outbreak. Waivers are available at the Cal Poly Health Center.
- Contact Health Services (805 756-1211) for further information or visit www.hcs.calpoly.edu.

Grading

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

Earned Hours are all hours for which credit was earned (excludes grades of F, WU, and NC).

Quality Hours carry grade point value (excludes CR and NC).

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

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

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

Transcripts are the official record of academic history. Once a degree has been posted, subsequent revision and alteration of any transcript entry is permitted only for correction of proven error as certified by the appropriate academic dean and the Registrar. No changes are made to the academic record after 60 days following the posting of the degree.

GRADING SYMBOLS

Academic Grading Symbols Earned		Quality Points Earned
A	Superior Attainment of Course Objectives	4.0
A–	Superior Attainment of Course Objectives	3.7
B+	Good Attainment of Course Objectives	3.3
B	Good Attainment of Course Objectives	3.0
B–	Good Attainment of Course Objectives	2.7
C+	Acceptable Attainment of Course Objectives	2.3
C	Acceptable Attainment of Course Objectives	2.0
*C–	Acceptable Attainment of Course Objectives	1.7
**D+	Poor Attainment of Course Objectives	1.3
D	Poor Attainment of Course Objectives	1.0
D–	Poor Attainment of Course Objectives	0.7
F	Non-Attainment of Course Objectives	0.0
CR	Credit	–
NC	No Credit	–

* Certain sequenced courses may have a C– prerequisite for advancement.

** If a grade of D+ or less is received in a course that is a prerequisite for another course, the student is encouraged to repeat the prerequisite course before attempting the next course in sequence.

Administrative Grading Symbols

AU	Audit	–
I	Incomplete (authorized)	–
RD	Report Delayed	–
RP	Report in Progress	–
W	Withdrawn	–
WU	Withdrawal Unauthorized	0

Credit/No Credit Grading

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

- Students desiring to elect a course on a Credit/No Credit grading basis must be currently enrolled in the course and must elect the Credit/No Credit grading option through the registration system. This request can be made through the 8th day of the quarter. Students may **not** change from one grading system to the other after the end of the 8th day of the term.
- Undergraduate students are given a grade of CR for accomplishment equivalent to a grade of C– or better. No credit (NC) is given for D+ or lower grades. Graduate students receive a grade of CR that is based on an

evaluated grade of B– or higher and NC for assigned grades of C+ or lower. Instructors submit conventional letter grades to the Registrar's Office where they are converted to Credit/No Credit grades. **NOTE: Some post-baccalaureate programs penalize students for a grade of CR.**

- The applicant for a Credit/No Credit grade must have at least a 2.0 grade point average in cumulative Cal Poly work. This requirement is waived for first-time students.
- No more than two courses may be selected for Credit/ No Credit grading in any term.
- Units earned in courses for which the grade was CR count toward satisfaction of all degree requirements.
- Undergraduate students may elect a maximum of 16 units of Credit/No Credit grading. Up to 4 units of Credit/No Credit grading is allowed in major or support courses, if allowed by the student's major department, and up to 4 units of Credit/No Credit grading is allowed in General Education courses. The remainder can be taken as free electives. These unit maximums refer to the **selection of credit/no credit grading**, regardless whether a student earns a grade of CR or NC.
- Credit/No Credit grading is removed for courses not meeting the above guidelines; the grade is reversed to the letter grade assigned by the instructor.
- Non-matriculated students, including those in the Extension Program, Summer Session, and Workshops must meet the same requirements as matriculated students to elect courses on a Credit/No Credit grading basis. (The 2.0 GPA requirement is waived in the case of non-matriculated students having no previous coursework recorded at Cal Poly.)

Administrative Grading Symbols

Audit

An auditor is a student who attends a course and receives no credit for the course. Enrollment as an auditor is subject to permission of the instructor. Enrollment in a course as an auditor shall be permitted only after students otherwise eligible to enroll on a credit basis have had an opportunity to do so.

Auditors are subject to the same fee structure as credit students, and regular class attendance is expected. Once enrolled as an auditor, a student may not change to credit status unless such a change is requested prior to the last day to add classes. Courses enrolled in with audit grades are not considered when determining enrollment status (for financial aid and other purposes).

An instructor is authorized to submit a change-of-grade form to change an AU to NC for students who audit a class but do not attend or do not meet agreed-upon criteria.

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

Incomplete (Authorized)

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

The instructor designates terms of the contract and length of time allowed to complete work, not to exceed one year. Failure to complete the assigned work results in the I being counted as equivalent to an F (or NC) for grade point average computation. All remaining grades of I are changed to F (or NC) at the time the student's degree is awarded.

Withdrawal Unauthorized

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

Report In Progress

The "RP" symbol is used in connection with courses that extend beyond one academic term. It indicates that work is in progress but that assignment of a final grade must await completion of additional work. Work is to be completed within one year except for graduate degree theses, which have a three-year time limit.

Cumulative enrollment in units attempted may not exceed the total number applicable to the student's educational objective. Reenrollment is permitted prior to the assignment of the final grade provided that the total permissible number of units for the course or courses is not exceeded. Work is to be completed within a stipulated time period.

The RP symbol shall be replaced with the appropriate final grade within one year or the grade is converted to an F, except that grades of RP for graduate degree theses convert to a grade of No Credit (NC) if a final grade has not been assigned within three years. All remaining RP grade symbols are changed to F or NC at the time the student's degree is awarded.

Repeating a Course

Undergraduate students cannot repeat courses in which they have earned a C or better grade. If a course that was originally taken for a letter grade is re-taken with *credit/no credit grading*, the original grade is not excluded from the GPA. With the exception of the reasons listed below, the repeat adjustment is made automatically at the end of the

term in which the course is repeated. A repeat petition is required for the following reasons only:

- the course was originally taken at Cal Poly before Fall 1987
- the course was originally taken at another institution
- the course has changed prefix or number
- the course was taken through Cal Poly Continuing Education

Repeat petitions for the situations listed above must be turned in to the Office of the Registrar by the end of the seventh week of the quarter in which the course is repeated.

Course Repeats with Grade Forgiveness

Undergraduate students may repeat a maximum of 16 units at Cal Poly for purposes of improving their GPA. If the second grade is equal to or higher than the first, then it replaces the first grade. The original grade is "forgiven" from the GPA computation, but both grades appear on the student's transcript. **Grade forgiveness does not apply if the second grade is lower than the first grade. In this case, both grades are averaged into the student's GPA.** Effective Summer 2007, any course is eligible for grade forgiveness one time only. Consecutive attempts beyond the second attempt are averaged into the GPA along with the second attempt while the grade from the first attempt remains forgiven. *Clarification added, effective Summer 2011.*

Course Repeats with Grades Averaged

Students may repeat an additional 18 units in addition to the 16 units for which grade forgiveness is permitted. Once the 16 unit forgiveness limit is reached, the grade from the repeat attempt shall not replace the original grade; instead both grades shall be calculated into the overall GPA.

Once students accumulate 34 units (16 units with forgiveness + 18 units with averaging) of repeated courses, they will no longer be allowed to repeat any future courses.

WITHDRAWALS / RENEWAL**Withdrawals from Courses**

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

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

The withdrawal petition also requires the signature of the course instructor and the student's academic advisor.

Between the end of the 7th week of instruction and the last day of instruction, withdrawals are permitted only if the

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

Undergraduate students may withdraw from no more than 28 quarter units

Cancellation of Registration or Withdrawal from the Term

Students who find it necessary to cancel their registration or to withdraw from all classes after enrolling for any academic term are required to follow the University's official withdrawal procedures. Failure to follow formal University procedures may result in an obligation to pay fees as well as the assignment of failing grades in all courses and the need to apply for readmission before being permitted to enroll in another academic term.

Students may drop their classes on CPReg all the way through the add/drop period, until the end of the 8th day of the term. Grades are not assigned for courses dropped during this period.

With the approval of campus officials, a student is permitted to withdraw from all classes for the quarter for serious and compelling reasons until the end of the 7th week of instruction. After the 7th week and through the last day of instruction, withdrawals for the term must be based on an emergency situation clearly beyond the control of the student, and approved by campus officials.

The student is required to initiate a request for a term withdrawal with the Registrar and to complete required exit procedures. If the student is unable to appear in person, he/she may write or call the Office of the Registrar, 805-756-2531, to request withdrawal. The request must specify reasons for leaving the institution and include the student's signature. The date of the withdrawal is established according to the guidelines contained in the institutional policies governing term withdrawals or as determined by the Registrar.

The student may be eligible for a full or partial refund of registration fees depending upon the time and circumstances of withdrawal. If eligible for a refund, the refund remains in the student's account on campus, unless the student files a written application for the refund to be sent to the student. Fee refund policy information is available at www.fees.calpoly.edu.

Students who receive financial aid funds must consult with the Financial Aid and Student Account Offices prior to withdrawing from the University regarding any refunds or repayments of grant or loan assistance received for that

academic term. If a Title IV financial aid recipient withdraws from the University during a payment period, the grant or loan assistance received is subject to federal refund and repayment provisions.

Withdrawal from Previous Terms

A student may petition to have all grades retroactively changed to the administrative grade of "W" if he/she can demonstrate and document that there were serious and compelling reasons or circumstances that resulted in the unofficial withdrawal for the quarter in question. A student may not retroactively withdraw from selected courses during a particular quarter, but must petition to withdraw from the entire quarter. **The petition must be submitted within one year following the end of the term.** Refunds of registration fees are not available for withdrawals following the last day of instruction. For more information, contact the Office of the Registrar.

Academic Renewal

The Trustees of the California State University have established a program of Academic Renewal whereby students who are having difficulty meeting graduation requirements due to a grade point deficiency may petition to have up to two semesters or three quarters of previous undergraduate coursework discounted from all considerations associated with meeting requirements for the baccalaureate degree. None of the courses taken in such terms can be applied toward the degree.

Academic Renewal, as defined by campus policy, is processed only at the point of graduation. Academic Renewal is intended only to enable graduation from Cal Poly and is not available for individuals who already possess a baccalaureate degree or who meet graduation requirements without the approval of a petition for Academic Renewal.

Conditions: In order to qualify for Academic Renewal all of the following conditions established by the Trustees must be met:

1. Five years must have elapsed since the term or terms to be disregarded were completed. The terms to be disregarded may have been taken at any institution.
2. Since completion of the term(s) to be disregarded, the student must have completed coursework at Cal Poly of at least one of the following:
 - 22 units with a minimum GPA of 3.00,
 - 45 units with a minimum GPA of 2.50,
 - 67 units with a minimum GPA of 2.00
3. The student must present evidence that the coursework to be disregarded was substandard and not representative of the student's present scholastic ability and level of performance.

Final determination, that one or more terms shall be disregarded, shall be based on careful review of evidence by a committee appointed by the President, which shall

include the designee of the chief academic officer and consist of at least three members (E.O. 1037).

For additional information about Academic Renewal, contact the Evaluations Unit of the Office of the Registrar.

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 receive maximum benefit from the educational opportunities provided. Each student is responsible for his or her enrollments and timely adds, drops and withdrawals following campus policy.

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

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

In classroom settings, instructors have the authority and responsibility to establish rules, maintain order, and to dismiss students from a class session for violation of the rules or misconduct. Violations or misconduct warranting more than a single dismissal from a class session should be referred by the instructor to the Office of Student Rights and Responsibilities (805-756-2794) for disciplinary action.

Expected Academic Progress (EAP) Policy

Expected Academic Progress is defined as making appropriate degree progress each academic year by earning a certain percentage of degree applicable units that meet major, support, general education, concentration, and free elective (if applicable) requirements that are directly associated with the student's declared major.

Expected Academic Progress (EAP) is monitored for all students every spring quarter. Students who fall behind in their EAP will be designated as having an **EAP deficiency** and may be required to meet with their academic advisor. Although this designation will not be noted on their transcript, students will be expected to make up this deficiency.

Those students who are required to meet with their advisor are expected to review and discuss their academic progress, and to create a reasonable academic plan to help get the student back on track. Attending summer session, either at Cal Poly, a community college, or another regionally accredited institution may be suggested. Should the student decide to attend another institution, he or she must confirm that the courses they decide to take at that institution will apply to their Cal Poly degree requirements upon transfer.

If the student continues to have an EAP deficiency, their department or college **may have a hold placed on their registration for the next term or place them on Administrative Academic Probation (see the section on Administrative Academic Probation).**

Those students who have a demonstrated need to attend Cal Poly on a part-time basis for at least three consecutive quarters may be considered exempt from the EAP policy. These students will be required to submit an EAP Exemption Request through their advisors in order to be evaluated for exemption.

In addition to the university's EAP policy, the College of Engineering has additional requirements. Please see the College of Engineering Advising Center for details.

I. Native EAP Policy

Every full-time undergraduate student is required to make reasonable academic progress toward completion of the bachelor's degree. EAP is monitored for all Cal Poly students in order to help them graduate in a timely manner.

Students entering Cal Poly as first-time freshmen and who are enrolled in four-year degree programs (e.g., BA, BS, BFA) are expected to graduate in twelve quarters. Normally, this will not include summer terms, as summer is considered an opportunity to make up for any lack of progress in prior quarters or to bank progress for future quarters.

To maintain Expected Academic Progress, the following standards should be met by the end of each respective year:

First year: Completion of at least **20%** of the total number of units required for the degree.

Second year: Completion of at least **45%** of the total number of units required for the degree.

Third year: Completion of at least **75%** of the total number of units required for the degree.

Fourth year: Completion of at least **100%** of the total number units required for the degree.

Example: A student enrolled in a four-year degree program requiring 180 total units would need to complete no fewer than 36 units by the end of the first year, no fewer than 81 units by the end of the second year, no fewer than 135 by the end of the third year, and no fewer than 180 by the end of the fourth year.

To determine the standards for programs requiring more than 180 total units, multiply the total units required by .20, .45, .75, or 1.0 for each respective year. Students enrolled in a five-year degree (e.g., BArch, BLA) or blended programs must also demonstrate Expected Academic Progress and should consult with their major department for specific requirements.

Benchmark Courses: In addition to monitoring the number of required units completed, some departments

may identify specific benchmark courses that should be completed by the end of each respective year. Students should check with their advisor for such requirements.

Degree Applicable Units: Departments rely on data derived from each student's Degree Progress Report (DPR) to verify that the expected number of units completed constitute degree-applicable units (units that advance the student toward degree completion). In tallying these units for the purpose of monitoring EAP, degree-applicable credits earned from Advanced Placement (AP), International Baccalaureate (IB), and accredited baccalaureate-level transfer work will be included.

Concentrations: If the student's major requires a concentration, units taken for the concentration are included in assessing the EAP. The concentration should be declared no later than reaching 90 units (junior standing).

Minors: Minors are optional at Cal Poly and are not a part of a student's EAP. Depending on the student's major, courses taken for the minor may or may not represent degree-applicable units (see "Maximum Units" below). Students who decide to pursue a minor should declare their minor no later than the end of their junior year. Minors must be completed within the EAP requirements identified (i.e., maximum number of units and quarters allowed for the degree). No minor will be awarded after the baccalaureate degree requirements have been met.

Maximum Units: Students graduating on time (this would be 12 quarters, excluding summers, for students enrolled in four-year degree programs) have no cap on the number of units they may complete at Cal Poly. **Students who do not graduate on time may complete no more than 24 Cal Poly units above the number required for the degree.** Exceeding the allowable 24 units may result in a hold being placed on the student's registration or the student being placed on administrative academic probation. The student will be required to submit a **Degree Completion Plan** to the major department before he or she is allowed to continue their education at Cal Poly. The Degree Completion Plan may only include degree applicable units as the student will not be allowed to take non-degree applicable classes during this period. In tallying the Maximum Units, *only Cal Poly units* will be included. Credit earned from AP, IB, and transfer work will not be used in the Maximum Units calculation.

Failure to make reasonable academic progress as prescribed by this policy may result in a hold being placed on the student's registration or the student being placed on administrative-academic probation. Notification that a hold has been placed or being placed on administrative-academic probation will be sent to the student's Cal Poly email address. Continued failure to meet EAP standards may result in disqualification from the University.

Exemptions: Students who have to comply with an externally imposed set of degree progress standards (e.g.,

athletes following NCAA regulations) may continue to follow those guidelines. Other students for whom the Expected Academic Progress policy represents undue hardship may appeal for exemption through their advisors. Such appeals should be supported with documentation as appropriate (e.g. a physician's note).

II. Transfer EAP Policy

Every full-time undergraduate student is required to make reasonable academic progress toward completion of their bachelor's degree. EAP is monitored for all Cal Poly students in order to help them graduate in a timely manner.

Ideally, those who enter Cal Poly as upper division transfer students and who are enrolled in four-year degree programs (BA, BS, BFA) are expected to graduate in two years (six quarters). However, EAP policy does allow students three years (nine quarters, *excluding summer quarters*) to complete their degree requirements at Cal Poly, should they still have remaining lower division requirements after they are admitted as junior transfers.

To maintain Expected Academic Progress, the following standards should be met by the end of the specified year of study at Cal Poly (note that these standards are based on the assumption that all upper division transfer students enter with at least 90 degree-applicable units and are General Education (GE) certified for lower division GE not specified by the major):

First year: Completion of at least **55%** of the total number of units required for the degree.

Second year: Completion of at least **80%** of the total number units required for the degree.

Third year: Completion of **100%** of the total number of units required for the degree.

Example: A transfer student enrolled in a four-year degree program requiring 180 total units would need to have completed no fewer than 99 degree-applicable units by the end of the first year, no fewer than 144 degree-applicable units by the end of the second year, and no fewer than 180 degree-applicable units by the end of the third year of study.

To determine the standards for programs requiring more than 180 total units, multiply the total units required by .55 or .80 or 1.0 for each respective year. Students enrolled in five-year degrees (e.g., BArch, BLA) or blended programs must also demonstrate Expected Academic Progress and should consult with their major department for specific requirements.

Benchmark Courses: In addition to monitoring the number of degree-applicable units completed, some departments may identify specific benchmark courses that should be completed by the end of each respective year. Students should check with their advisor for such requirements.

Degree Applicable Units: Departments rely on data derived from each student's Degree Progress Report (DPR)

to verify that the minimum number of units completed constitute degree-applicable units (units that advance the student toward degree completion). In tallying these units for the purpose of monitoring satisfactory progress, degree-applicable credit earned from Advanced Placement (AP), International Baccalaureate (IB), and accredited baccalaureate level transfer work will be included.

Concentrations: If the student's major requires a concentration, units taken for the concentration are included in assessing the EAP. The concentration should be declared as soon as possible and no later than the end of the second quarter of study at Cal Poly.

Minors: Minors are optional at Cal Poly and are not a part of a student's Expected Academic Progress. Depending on the student's major, courses taken for the minor may or may not represent degree-applicable units (See "Maximum Units" below). Students electing a minor should declare the minor as soon as possible and no later than the end of the first year of study at Cal Poly. Minors must be completed within the EAP requirements identified (e.g., maximum number of units and quarters allowed for the major). No minor will be awarded after the baccalaureate degree requirements have been met.

Maximum Units: Transfer students graduating on time (in 9 quarters, excluding summers, for transfer students enrolled in four-year degree programs) have no cap on the number of units they may complete at Cal Poly. **Transfer students who are NOT on track to graduate on time may complete no more than 24 Cal Poly units above the number required for the degree.** Exceeding the allowable 24 units may result in a hold placed on the student's registration or the student being placed on administrative-academic probation. A **Degree Completion Plan** must be submitted to the major department before they will be allowed to continue their education at Cal Poly; such transfer students may enroll *only* in degree-applicable units. In tallying the Maximum Units, *only Cal Poly units* will be included. Credit earned from AP, IB, and transfer work will not be used in the Maximum Units calculation.

Failure to make reasonable academic progress as prescribed by this policy may result in a hold being placed on the student's registration or the student being placed on administrative-academic probation. Notification that a hold has been placed or being placed on administrative-academic probation will be sent to the student's Cal Poly email address. Continued failure to meet EAP standards may result in disqualification from the University.

Exemptions: Students complying with an externally imposed set of degree progress standards (e.g., athletes following NCAA regulations) may continue to follow those guidelines. Other students for whom the Expected Academic Progress policy represents undue hardship may appeal for exemption through their advisors. Such appeals

should be supported with documentation as appropriate (e.g., a physician's note).

Academic Probation and Disqualification

The quality of academic performance is considered in the determination of a student's eligibility to remain enrolled. 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 college taking the action. Students who have been disqualified for inadequate progress or performance are not readmitted until presentation of satisfactory evidence that they have improved their chances of academic success. The request for readmission is referred to the dean of the college 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. These include, but are not limited to, such groups as: athletic teams, debate teams, drama casts, judging teams, ASI councils, boards and committees. Such students may not hold an office in a student organization, nor may they be editors, managers, or hold similar positions on student publications. However, students on academic probation may participate in such activities as club membership, intramurals, and music that do not include travel and the official representation of the University.

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

An undergraduate student becomes subject to academic probation or disqualification under the conditions shown below. For minimum scholarship standards applicable to graduate and post-baccalaureate students see the Graduate Programs section.

I. Academic Probation

An undergraduate student is automatically placed on academic probation when the grade point average drops below 2.0 (C). The grade point average applies to the current term (unadjusted for any subsequent grade forgiveness), the Cal Poly cumulative, or the higher education cumulative. The student is advised promptly, by email or other means, of being placed on probation. It is the student's responsibility to check his/her campus email account regularly.

Note: For first-time freshmen with Cal Poly coursework only, academic probation in their first quarter of attendance will also equate to subject to disqualification (see below).

II. Academic Disqualification

- A. An undergraduate student is subject to disqualification when any of the following is true:
- (1) The student's Cal Poly cumulative, or higher education cumulative grade point average is below 2.0.
 - (2) The student is on academic probation for two consecutive quarters.
 - (3) The student has been on academic probation for four non-consecutive quarters.
- An undergraduate student who is subject to disqualification may be disqualified at the discretion of his/her college.
- B. An undergraduate student will be disqualified when either of the following is true:
- (1) The student has been on academic probation three consecutive quarters.
 - (2) The student has been on academic probation three or more non-consecutive quarters and has a current Cal Poly cumulative or higher education cumulative grade point average that is below 2.0.

III. Notice of Disqualification

Students who are disqualified at the end of a quarter are notified before the beginning of the next consecutive regular quarter. Students disqualified at the beginning of a summer enrollment break are notified at least one month before the start of the fall quarter.

The Office of the Registrar will notify the student by email. It is the student's responsibility to check his/her campus email account regularly.

IV. Administrative-Academic Probation

An undergraduate or graduate student may be placed on administrative-academic probation by action of the dean of the college 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. (Note: a student whose withdrawal is directly associated with a chronic or recurring medical condition or its treatment is not subject to administrative-academic probation for such withdrawal.)
- B. Repeated failure to make Expected Academic Progress (see the section on Expected Academic Progress) toward the stated degree or program objective, including that resulting from assignment of 15 units of NC, 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, the student is notified in writing and is provided with the conditions for removal from

probation and the circumstances which would lead to disqualification, should probation not be removed.

Academic Petitions

Academic petitions are handled through the academic affairs division of the University. The process of review may include the academic department, academic advising offices, administrative offices, and/or college dean's office. Typical academic petitions include, but are not limited to, transferring from one program to another, academic requirement or policy deviation requests, and admission/re-admission issues. Contact the appropriate office for specific academic petition procedures.

Academic Petition Appeals

Following a petition decision, and under limited circumstances, students may appeal to the Vice Provost for Programs and Planning or his/her designee. The right to an appeal is not guaranteed and an appeal is only granted if the student can show that one or more of the following exist:

1. A requirement or policy was incorrectly applied to the petition.
2. A requirement or policy is unclear or ambiguous.
3. There is new information that should be considered in the evaluation of the petition.
4. There are special circumstances warranting the granting of the appeal.

The granting of an academic petition appeal gives students the opportunity to present the merits of their petition to the Vice Provost. The Vice Provost's decisions regarding appeals represent the University's final decision on academic petitions. Contact the Office of Academic Programs at 805 756-2246 for more information on the procedures for filing an academic petition appeal.

Student Grievances

The University provides students with a variety of mechanisms to address student grievances or concerns. In all such matters, the University encourages students to attempt to resolve their grievance or concern at the source of the issue (i.e., with the professor, department chair or administrator, or college associate dean). The Dean of Students' Office (805-756-0327) is available to any campus community member to assist with identifying and clarifying appropriate campus policies and procedures for addressing student grievances or concerns.

For general questions about grievances, contact the Dean of Students' Office, 805-756-0327. The following list contains the offices or programs designated to address the more common student grievances at the University:

- **Grade Grievances** – The Fairness Board: Contact the Academic Senate Office, 805-756-1258 (See page 16 for more detail on the functions of this Board)

- **Individual Student Misconduct** – Office of Student Rights and Responsibilities, 805-756-2794 (See page 306 for more detail on the functions of this office)
- **Student Club Misconduct** – Student Life and Leadership, 805-756-2476 (See page 307 for more detail on the functions of this office)

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 Conduct and Discipline

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

While enrolled, students are subject to the regulations governing discipline stated in *Education Code* Section 66017 and in Title 5 of the *California Code of Regulations*, Sections 41301–41302, 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. Other applicable regulations are contained in this Catalog, in the *Campus Administrative Policies*, the Standards for Student Conduct, Rights and Responsibilities, and in other official university publications, including the Cal Poly web site.

Graduate Programs

Research and Graduate Programs Office
Math and Science Bldg. (38), Room 154
805 756-1508 FAX 805 756-1725

Master's Degree Programs

Accounting, MS
Financial Accounting Specialization
Tax Specialization
Aerospace Engineering, MS *
Research Specialization
Space Systems Engineering Specialization
Agribusiness, MS
Agricultural Education, Master of
Agriculture, MS
Agricultural Engineering Technology Specialization
Animal Science Specialization
Crop Science Specialization
Dairy Products Technology Specialization
Environmental Horticulture Specialization
Food Science and Nutrition Specialization
Irrigation Specialization
Plant Protection Science Specialization
Recreation, Parks, and Tourism Management
Specialization
Soil Science Specialization
Architecture, MS
Architectural Engineering Specialization
Biological Sciences, MA, MS
Biomedical Engineering, MS
Business Administration, MBA
Agribusiness Specialization
General Management Specialization
Graphic Communication Document Systems
Management Specialization
Business and Technology, MS
City and Regional Planning, MCRP
Civil and Environmental Engineering, MS
Computer Science, MS
Education, MA
Counseling and Guidance Specialization
Educational Leadership and Administration
Specialization
Special Education Specialization
Electrical Engineering, MS *
Engineering, MS
Biochemical Engineering Specialization *
Bioengineering Specialization *
Biomedical Engineering Specialization *
Integrated Technology Management Specialization *
Materials Engineering Specialization *
Water Engineering Specialization
Engineering Management (Specialization), MBA/MS
Engineering
English, MA
Fire Protection Engineering, MS
Forestry Sciences, MS
History, MA
Industrial Engineering, MS *
Kinesiology, MS

Mathematics, MS *
Mechanical Engineering, MS*
Polymers and Coatings Science, MS
Psychology, MS
Public Policy, MPP
Transportation Planning (Specialization), MCRP/MS
Engineering

Cal Poly offers studies leading to advanced degrees through its instructional departments. University policy governing graduate study emphasizes the need for students to demonstrate maturity, responsibility and scholarly integrity. Graduate students should have a command of the basic knowledge, techniques, and skills essential for independent and self-directed study.

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

Regulations governing fees, grading, and financial aid are located elsewhere in the catalog. This section of the catalog reviews university 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 are found in the descriptions of master's degree programs within each school's description. It is important that graduate students, in consultation with their advisors, familiarize themselves with these requirements. Failure to do so may result in a substantial delay in progress towards the degree and graduation. It is the responsibility of the student to ascertain and comply with all university, college and departmental procedures and requirements.

Application for Admission

An application for graduate studies may be obtained from the Admissions Office of any CSU campus. The application form and official transcripts should be sent directly to the Admissions Office at Cal Poly. An electronic version of the CSU graduate application is available on the World Wide Web at www.csumentor.edu. The CSU Mentor system allows students to browse through general information about CSU's twenty-three campuses, view multimedia campus presentations, send and receive electronic responses to specific questions, and apply for admission and financial aid.

All graduate and post-baccalaureate applicants (e.g., joint PhD and EdD applicants, master's degree applicants, those seeking educational credentials or certificates, and where permitted, holders of baccalaureate degrees interested in

* Blended BS+MS programs available, see page 60.

taking courses for personal or professional growth) must file a complete graduate application as described in the graduate and post-baccalaureate admission materials at www.csumentor.edu. Applicants who completed undergraduate degree requirements on a CSU campus and graduated the preceding term are also required to complete and submit an application and the \$55 nonrefundable application fee. Since applicants for post-baccalaureate programs may be limited to the choice of a single campus on each application, rerouting to alternative campuses or later change of campus choice is not guaranteed. To be assured of initial consideration by more than one campus, it is necessary to submit separate applications (including fees) to each. Applications submitted by way of www.csumentor.edu are expected unless submission of an electronic application is impossible.

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

All master's and credential applicants must submit the following documents to the Office of Admissions to establish their admission portfolio:

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

Deadlines

Master's and credential applicants may file an application for admission at any time. In order to be considered for admission in the "targeted" quarter, the portfolio must be completed by the dates provided at the following websites:

Deadlines for graduate programs are available at www.ess.calpoly.edu/_admiss/grad/regular.html.

Deadlines for credential programs are available at <http://soe.calpoly.edu>.

Graduate and Post-Baccalaureate Admission Requirements

Admission Requirements

Graduate and post-baccalaureate applicants may apply for a degree objective, a credential or certificate objective. Depending on the objective, the CSU considers an application for admission as follows:

- **General Requirements** -- The minimum requirements for admission to graduate and post-baccalaureate 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 at the time of enrollment:
 - (1) have completed a four-year college course of study and hold an acceptable baccalaureate degree from an institution accredited by a regional accrediting association, or shall have completed equivalent academic preparation as determined by appropriate campus authorities;
 - (2) be in good standing at the last college or university attended;
 - (3) have attained a grade point average of at least 2.5 (A = 4.0) in the last 60 semester (90 quarter) units attempted or have earned a grade point average of at least 2.5 on the last degree completed by the candidate; 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.
- A student who meets the minimum requirements for graduate and post-baccalaureate studies may be considered for admission in one of the four following categories:
 - **Graduate Classified** -- To pursue a graduate degree, candidates are required to fulfill all of the professional, personal, scholastic, and other standards, including qualifying examinations, prescribed by the campus.
 - **Graduate Conditionally Classified** -- Candidates may be admitted to a graduate degree program in this category if, in the opinion of appropriate campus authority, deficiencies can be remedied by additional preparation.
 - **Post-Baccalaureate Classified**, e.g., *admission to an education credential program* -- Candidates who wish to enroll in a credential or certificate program are required to satisfy additional professional, personal, scholastic, and other standards, including qualifying examinations, prescribed by the campus.
 - **Post-Baccalaureate Unclassified** -- To enroll in undergraduate courses as preparation for advanced degree programs or to enroll in graduate courses for professional or personal growth, a candidate must be admitted as a postbaccalaureate unclassified student. By meeting the minimum requirements, the candidate is eligible for admission as a postbaccalaureate unclassified student. Admission in this status does not constitute admission to, or assurance of consideration for admission to, any graduate degree or credential program, and requires approval from the Dean of Research and Graduate Programs.

If your transcript is not received by the Admissions Office prior to the first day of what would be your second quarter, or if your degree was not awarded for a preceding term, you are required to reapply for a subsequent quarter. A second application and fee to a post-baccalaureate program are not 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 not be allowed to register.

Under special circumstances graduate coordinators may recommend admission of applicants who do not meet eligibility requirements. The Dean of Research and Graduate Programs acts on these recommendations.

Residency Status Determination

The campus Admissions Office determines the residency status of all new and returning students for nonresident tuition purposes. Responses to the application for admission and, if necessary, other evidence furnished by the student are used in making this determination. A student who fails to submit adequate information to establish a right to classification as a California resident is classified as a nonresident. For detailed explanation please refer to Determination of Residence for Nonresident Tuition Purposes," page 523.

International (Foreign) Student Admission Requirements

International master's and credential applicants must file an application for admission with the Office of Admissions. For this purpose, "foreign students" include those who hold U.S. temporary visas as students, exchange visitors, or in other non-immigrant classifications. The application may be filed at any time, but in order to be considered for admission in the targeted quarter the portfolio must be completed by the dates listed below.

	Application Deadline	File Completion Date
Fall Quarter	November 30	April 1 st
Winter Quarter	June 30	September 1 st

All master's and credential applicants must submit the following documents to establish their admission portfolio:

- Application form, Parts A and B
- \$55 application fee
- Certified transcripts from all schools attended, showing coursework. All official documents must be accompanied by a certified English translation from one of the following
 - Institute for International Education (IIE)
 - AMIDEAST
 - Saudi Arabian Education Mission
 - United States Embassy or Consulate
- Confidential financial statement

- Promissory note agreeing to purchase required health insurance
- International Educational Background form
- AACRAO credential analysis fee of \$75 in the form of a U.S. Postal Money Order or an International Money Order, made payable to "AACRAO" (American Association of Collegiate Registrars and Admissions Officers)
- Spouse/Dependent Declaration form

All graduate and post-baccalaureate applicants, regardless of citizenship, whose native language is not English and 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 either the Test of English as a Foreign Language (TOEFL) or the International English Language Testing system (IELTS) exam.

The TOEFL must have been taken within the last two years with a minimum score of 550 (paper version), 213 (computerized version) or 80 (internet based). The minimum score for the IELTS is 6.0, although individual programs may require higher scores. Applicants are advised to review program-specific information.

The TOEFL or IELTS requirement is waived for applicants whose native language is English. Applicants from countries listed on the following website will be considered native English speakers.

www.ess.calpoly.edu/_admiss/international/toefl.html

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

The Office of Admissions notifies all applicants of the documents needed to complete their portfolios. Graduate coordinators may require additional documentation to assist them in determining an applicant's suitability for the program of study.

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

HEALTH SCREENING

All new and readmitted students must provide proof of full immunization against measles and rubella prior to enrollment. All students 18 years of age or younger at the start of their first term must provide proof of full immunization against Hepatitis B before enrolling. These are *not* admission requirements, but are required of students as conditions of enrollment in CSU. Proof of measles and rubella immunizations is also required for certain groups of

enrolled students who have increased exposure to these diseases. See page 47 for more information, or contact Health Services (805 756-1211) or visit www.hcs.calpoly.edu.

Academic Requirements and Responsibilities

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

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

Graduate Student Continuous Enrollment Policy

Effective Fall Quarter 2009, graduate students are required to maintain continuous enrollment from the time of first enrollment in a graduate program until completion of the degree. Continuous enrollment is defined as being enrolled during Fall, Winter, and Spring quarters each year. All graduate students must be enrolled during the quarter in which they graduate. Therefore, a student graduating summer quarter must be enrolled during the summer. Students can maintain continuous enrollment by being enrolled as regular students; obtaining approval for an education or medical leave prior to the quarter when such a

leave would begin; or registering in a special course designated for this purpose, during quarters in which they are not regularly enrolled. The special course, GS 597, is listed in the University catalog and is taken through Cal Poly Continuing Education. GS 597 is a one-unit course, offered credit/no credit; credits in GS 597 do not count toward meeting degree requirements. Students who fail to fulfill this continuous enrollment requirement will be not be permitted to graduate—even if all degree requirements have been completed—until payment has been made for all quarters of non-enrollment. This requirement is not retroactive to terms prior to Fall 2009.

For further information and a registration form, visit the Continuing Education website at: www.continuing-ed.calpoly.edu/academic/continuous_enrollment.html

General Policies Governing Graduate Studies

Academic Probation

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

A student who has been admitted as post-baccalaureate classified in order to pursue a credential program shall be subject to academic probation for failure to maintain a cumulative grade point average of at least 3.0 in all units taken in the credential program.

A post-baccalaureate 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 post-baccalaureate standing.

Academic Disqualification

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

Administrative Academic Disqualification

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

Advancement to Candidacy

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

The student may request advancement to candidacy only after a formal program of study has been submitted, the graduation writing requirement has been satisfied, and sufficient coursework has been completed to allow the department to make a judgment about the student's potential to complete the program.

Advisement

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

Departmental advisors and graduate coordinators share the responsibility for advising master's degree students throughout their work toward a degree. Students are urged to maintain a personal file of transcripts and other records of all undergraduate and graduate work undertaken, and to make this file available whenever they seek advising.

Blended BS+MS Programs

Academic Objectives

Blended programs provide an accelerated route to a graduate professional degree, with simultaneous conferring of both bachelor's and master's degrees. Most blended programs allow for the possibility of students' earning graduate credit for several of their senior electives, effectively decreasing the summed unit requirements for both degrees. Blended programs provide a seamless process whereby students can progress from undergraduate to graduate status without having to apply through the Admissions Office (thereby eliminating the need to pay the application fee). In addition, blended BS+MS programs provide a meaningful capstone experience that in most cases integrates the senior project with the graduate thesis/project.

Process for Changing Status

Students who are interested in pursuing blended programs should submit a request to the department head or graduate coordinator for a change of degree objective.

The department head/graduate coordinator, with assistance of the Evaluations Office, determines whether students

meet the eligibility criteria (see below). If criteria are met, the coordinator sends a change of degree objective form to Evaluations. Students are notified of their acceptance upon receipt of the signed Change of Objective form.

Eligibility for Blended Programs

The following are minimum eligibility criteria; *individual departments may have more stringent requirements.*

1. Students must successfully complete a minimum of 180 units / maximum 192 units (for engineering programs the maximum number of units is 205). These units must count toward one or the other of the two degrees (BS or MS) that ultimately are awarded in the blended program; they are not restricted to those counting toward the undergraduate degree alone.
2. Students cannot enter the blended BS+MS program if they have exceeded the maximum number of units as defined in #1, above.
3. Students must have a minimum 2.5 GPA in the last 90 quarter units attempted. (*Note that students, once admitted to graduate standing, must maintain a 3.0 GPA or better in courses counting toward the graduate degree.*)

In addition, students are strongly encouraged to complete the Graduation Writing Requirement (GWR).

Process to Graduate with Both Degrees

1. Students must be enrolled in BMS status for a minimum of two quarters prior to graduation.
2. Students must submit the Formal Study Plan to the Graduate Programs Office (only for courses counting toward MS); request Advancement to Candidacy; and maintain a minimum 3.0 GPA for courses counting toward MS.
3. When all requirements are met for both the undergraduate and graduate programs, both degrees will be awarded at the same time and graduation ceremony.
4. If a student fails to complete the MS program requirements, the BS degree may be granted when all requirements for that degree are met.

Change of Post-Baccalaureate Objective

If students wish to change their post-baccalaureate objective, they must formally file this intention by obtaining a Post-baccalaureate Change of Objective form, available in the Graduate Programs Office or at www.rgp.calpoly.edu/gradpolicies.html

Comprehensive Examination

A comprehensive examination is one of the possible culminating experiences for the master's degree and assesses the student's ability to integrate knowledge, show critical and independent thinking, and demonstrate mastery of the subject matter. The results of the examination should provide evidence of these abilities and achievement. A

record of the examination questions and responses is maintained.

Courses Counting Towards Graduation and Credit/No Credit Grading

Only those letter-graded courses in which an A, B, or C is earned (C- is acceptable) count towards satisfying the total unit requirement for the degree. Courses which are offered only on a credit/no credit basis 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 that are not part of their formal program of study on a credit/no credit basis.

Credit by Exam for Coursework

See page 33.

Culminating Experience

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

Enrollment in Graduate Courses

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

Formal Study Plan

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

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

Only 400- and 500-level courses are allowed in an approved graduate plan of study. In those programs where specific courses below the 400-level may be essential for a student's success, the student may be conditionally accepted to the program contingent upon completing those

courses. Courses below the 400-level may not constitute any part of the approved units in the plan of graduate study.

No fewer than 32 quarter units of a 45-unit program shall be completed in residence. In programs with more than 45 units an equivalent proportion (32/45) of units must be taken "in residence". A course taught "in residence" is normally a catalog offering taught by a Cal Poly faculty member. Continuing Education courses may not be used to fulfill the residency requirement. However, summer session courses, and up to 12 units taken through Open University, can be counted as courses in residence. Petitioned graduate courses taken at Cal Poly as an undergraduate count as taken in residence. Courses for which students received credit by examination may be petitioned to count as taken in residence. These situations are explained further below.

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

No more than 12 Open University quarter units shall be approved in the submission of a formal study plan. Open University courses are counted for "in residence" credit.

In addition to the above rules governing "in-residence" courses, the following apply to courses included on the formal study plan:

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

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

No more than 12 quarter units of approved post-baccalaureate (unclassified) course credit may be accepted for the master's degree.

Full-Time Graduate Student Status

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

Grade Point Calculation for Graduate Degree

Satisfaction of the GPA requirement for the conferring of the master's degree requires a GPA of 3.0 or more in the courses taken in the formal study plan. Repeating a course does not remove a lower letter grade from the overall GPA calculation on the student's transcript.

Graduate Courses Taken by Undergraduates for Graduate Credit

Cal Poly undergraduates may take courses in the 400 or 500 series for graduate credit while still undergraduates. If they subsequently enter a Cal Poly master's or credential

program, they may petition to have such course credit applied toward their master's degree or credential program, if the units were not used for the baccalaureate degree.

Graduation

A student planning to graduate should request a final graduation evaluation from the Evaluations Office approximately two quarters prior to the anticipated date of degree completion. The Request for Graduation Evaluation is submitted to the Graduate Programs Office after both the Formal Study Plan and Advancement to Candidacy have been approved. A student cannot graduate without this evaluation.

Graduation with Distinction

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

Graduation Requirement in Writing Proficiency

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. In accordance with this mandate, all Cal Poly students must demonstrate competency in writing skills as a requirement for graduation.

Graduate students seeking a Master's Degree should attempt to fulfill the GWR during their first quarter of residency. (Note: Students who do not complete the GWR will not be advanced to candidacy.)

To fulfill the GWR, graduate students should review their program requirements and determine which of the following three options is appropriate:

1. Pass the Writing Proficiency Exam (WPE).
2. Earn both a grade of B or better (B- or below does not qualify) AND certification of writing proficiency based on a 500 to 800 word in-class essay in a GWR-approved upper-division course selected from the eligible classes listed on PASS. The GWR-approved course may be taken on a CR/NC basis, but the required final course grade of B or better must still be earned in order to satisfy the GWR component of the class.
3. Document that the GWR was met as part of an undergraduate program of study at Cal Poly or another CSU campus within seven years of matriculation as a graduate student.

The Graduation Writing Requirement may be waived, at the discretion of campus authorities, in the following circumstances:

1. An equivalent upper-division, graduation writing requirement was satisfied at another 4-year college or university. Again, no more than seven (7) years may elapse between meeting the requirement elsewhere and beginning graduate study at Cal Poly. Students requesting a waiver must complete the "Application

Process and Checklist for a GWR Waiver at Cal Poly" (available on the Writing Skills Program webpage, <http://writingskills.calpoly.edu>) before presenting their official, dated documentation to the Writing Skills Program Office, Agriculture Building 10, Room 130.

2. An advanced degree at least equivalent to a Master's was earned. **Supporting documentation, such as a transcript showing the graduation date, must be presented to the Writing Skills Program Office.**

Further information on the GWR may be obtained from the Writing Skills Program Office, Agriculture Building (10) Room 130 (805-756-2067), or on the Writing Skills Program webpage, <http://writingskills.calpoly.edu>.

Leaves of Absence

See undergraduate section, page 46.

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 do not count toward fulfillment of the unit requirement for the degree.

Registration

The schedule and instructions for registration and payment of fees are available through the registration and enrollment tab at the MyCalPoly web portal. 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.

Research Involving Special Conditions

Research that involves the use of human subjects, vertebrate animals, hazardous materials, or information and materials subject to export-control regulations requires special campus review before the study begins. If your research involves any of these special conditions, check with your graduate coordinator and the Graduate Programs Office for procedures.

Residence Courses

See "Formal Study Plan."

Returning Students

Matriculated students who have not registered for three consecutive quarters and have not been on an approved leave of absence must file an application for readmission before the deadline dates listed below. The application fee must accompany the application for readmission.

Matriculated students who have not registered for one quarter or two consecutive quarters are entitled to their registration priority without applying for readmission.

Summer Quarter is a regular quarter and is counted in determining the length of absence.

Application Deadlines for Returning Students

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

Second Master's Degree

A student can earn only one master's degree in any one of the graduate programs offered. A student who wishes to complete a second master's degree in another discipline, or two master's degrees simultaneously, must complete all 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 requirements for a thesis/project committee: 1) that the graduate student have a thesis/project advisor who is a permanent full-time faculty member from the student's program; 2) that the thesis/ project advisor and the student recommend, for approval by the graduate coordinator and/or department head, a thesis/project committee comprising at least three faculty members; 3) that two of these members, one of which is the committee chair, be from the student's program. Exceptions to the thesis/ project committee composition must be approved by the Graduate Programs Office.

If a thesis or project report is required in a master's degree program, a committee-approved copy must be completed in accordance with university specifications. Guidelines to be followed in preparing final copy for filing with the University can be obtained from the Graduate Programs Office, or online at www.rgp.calpoly.edu.

A copy of the thesis or project report must be received and reviewed by the Thesis Editor in the Graduate Programs Office. Upon completion of any required corrections, the student submits the electronic thesis/project report to the DigitalCommons@CalPoly, a digital archive for the University. These steps must be completed before the degree is awarded.

Time Limit for Degree

The time allowed to complete all coursework in the formal study plan, including thesis and project courses, is seven years. The University, at its option, and in exceptional cases, may extend the time frame. Students who wish to extend the seven-year limit must file a petition for special consideration with the Graduate Programs Office, explaining the reasons why the extension is necessary; what courses are requested for inclusion in the study plan that will be over seven years old at the proposed time of graduation; and what evidence is offered to support claims of currency in that coursework.

College of *Agriculture, Food & Environmental Sciences*

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

David J. Wehner, Dean

Mary E. Pedersen, Associate Dean

Mark D. Shelton, Associate Dean

Tanya Kiani, Assistant Dean

ACADEMIC PROGRAMS

Agribusiness.....	<i>MS, Minor</i>
Agribusiness Specialization	<i>MBA</i>
Agricultural and Environmental Plant Sciences	<i>BS</i>
Agricultural Business	<i>BS</i>
Agricultural Communication.....	<i>Minor</i>
Agricultural Education	<i>MAGEd</i>
Agricultural Science.....	<i>BS</i>
Agricultural Systems Management	<i>BS</i>
Agriculture	<i>MS, Credential</i>
Animal Science	<i>BS</i>
BioResource & Agricultural Engineering	<i>BS</i>
Crop Science	<i>Minor</i>
Dairy Science	<i>BS, Minor</i>
Disaster Management/Homeland Security	<i>Minor</i>
Earth Sciences	<i>BS</i>
Environmental Management and Protection.....	<i>BS</i>
Equine Science	<i>Minor</i>
Food Science	<i>BS, Minor</i>
Forestry and Natural Resources	<i>BS</i>
Forestry Sciences	<i>MS</i>
Fruit Science.....	<i>Minor</i>
Geographic Info Systems for Agriculture	<i>Minor</i>
Land Rehabilitation.....	<i>Minor</i>
Landscape Horticulture	<i>Minor</i>
Meat Science and Processing	<i>Minor</i>
Military Science	<i>Minor</i>
Nutrition	<i>BS, Minor</i>
Ornamental Plant Production	<i>Minor</i>
Plant Protection	<i>Minor</i>
Poultry Management	<i>Minor</i>
Rangeland Resources	<i>Minor</i>
Recreation, Parks, and Tourism Admin. ...	<i>BS</i>
Soil Science	<i>BS, Minor</i>
Sustainable Agriculture	<i>Minor</i>
Water Engineering Specialization	<i>MS</i>
Water Science	<i>Minor</i>
Wine and Viticulture	<i>BS, Minor</i>

The College of Agriculture, Food and Environmental Sciences (CAFES) offers programs reflecting the growing diversity of choices available and skills required in modern agriculture, life sciences, and related professions.

Mission Statement

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

Learning Outcomes

All students who complete a program in CAFES should be able to:

- Demonstrate expertise and the use of technology in their respective discipline.
- Demonstrate effective oral and written communication skills.
- Make choices based on an understanding of personal and professional ethics and respect for diversity of people and ideas.
- Recognize leadership principles and skills.
- Evaluate and solve problems using critical thinking.
- Demonstrate an appreciation for sustainability and global perspectives.

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

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

CAFES faculty 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.

Academic advising is provided to all students through their major department in the college. Each student is assigned a faculty advisor. Students are encouraged to meet with their advisors quarterly to plan their schedule, review curriculum information, discuss career opportunities, and receive information on internships, enterprise projects and co-ops. Additionally, some departments have academic advising centers/resources to provide guidance on university and college policies and procedures including course transfers, substitutions and other general information.

Student clubs are active in every department. The 43 clubs, most of which are affiliated with national professional organizations, provide an excellent forum for student and faculty interactions. Active club members may practice leadership skills, and attend national, state and local professional meetings, as well as participate in a variety of professional and social events.

AGRICULTURAL LANDS AND OUTDOOR LABORATORIES

Nearly 5,000 acres of agricultural production, processing and research land and facilities are available for student use at Cal Poly. These facilities provide students with unique opportunities for hands-on experiences which augment classroom instruction.

The campus farm includes a dairy, beef center, horse, sheep, swine and poultry units, horse training and show arenas, an animal nutrition center, veterinary clinic and rodeo facilities. Also available are irrigated and dryland fields for annual crops, orchards and vineyards, an irrigation demonstration field, erosion research facility, large-scale composting operation, hoop houses, arboretum, wholesale and retail nurseries, putting greens and turf research plots, a wine lab, and greenhouses. Eleven acres of certified organic farmland support a thriving Community Supported Agriculture program.

Other Labs and Special Facilities

Special facilities include several microcomputer laboratories, laboratories with modern equipment for soil-plant-water testing, engineering testing and manufacturing shops, complete food processing units for dairy products, meats, fruit and vegetables, and four biotechnology and embryology laboratories.

Santa Cruz County Properties

The 3,200 acre Swanton Pacific Ranch and 600 acre Valencia Creek forest in Santa Cruz County were generously donated by Al Smith, alumnus of Cal Poly's former Crop Science Department. These properties provide students with an opportunity to live and work on a commercial farm with forestry, watershed management, cattle and organic crop production activities. The lands also support a wide range of research topics for undergraduate and graduate students.

EXPERIENTIAL LEARNING

Students have many opportunities to participate in experiential learning activities which exemplify Cal Poly's "learn by doing" philosophy. For example, more than 80% of CAFES classes include laboratories or activity sessions. Enterprise projects offer students practical experience in animal, plant, and food production, processing, and research. Some of these are financially backed by the Cal Poly Corporation and offer students entrepreneurial experiences similar to those found in private industry.

COURSES

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

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

Support. The support courses draw from courses in agriculture, life sciences, and closely allied fields which support and supplement the block of courses constituting the student's major.

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

Free Electives. Course selection from electives is designed to provide freedom for students to pursue interests of their choosing in any university department.

RECOMMENDED PREPARATION

In addition to pursuing the CSU mandated entrance requirements, high school and community college students are encouraged to participate in co-curricular activities as part of their preparation for admission to majors in Cal Poly's College of Agriculture, Food and Environmental Sciences. 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 are explained by the instructor at the first meeting of the class.

AGRICULTURAL COMMUNICATION MINOR

Brock Center for Agricultural Communication
Agriculture Bldg. 10, Room 235, 805 756-6138

Coordinator: Richard Gearhart

This interdisciplinary minor enhances the students' ability to seek careers in dynamic professions associated with the agricultural industry, including print journalism, broadcast journalism, and public relations.

The minor is a cooperative effort between CAFES and the College of Liberal Arts and students are advised by faculty members assigned to the Brock Center for Agricultural Communication. Students have the opportunity to participate in the Cal Poly chapter of the national Agricultural Communicators of Tomorrow Association.

Required Courses

JOUR 203 News Writing and Reporting	4
JOUR 205 Agricultural Communications	4
COMS 301 Business/Professional Communication	4
AGED 404 Agricultural Leadership	3

Approved electives..... 15
For Majors in the College of Agriculture, Food and Environmental Sciences:

A minimum of 10 units must be at 300-400 level; two courses must be selected from JOUR, COMS, ENGL.

For Majors in Journalism, Communication Studies, and other Non-agriculture Majors:

A minimum of 10 units must be at 300-400 level

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ENVIRONMENTAL STUDIES MINOR

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

GEOGRAPHIC INFORMATION SYSTEMS FOR AGRICULTURE MINOR

BioResource and Agricultural Engineering
 Bldg. 08, Room 101, 805 756-2378

Coordinator: Tom Mastin

An interdisciplinary program sponsored by three departments in CAFES: BioResource and Agricultural Engineering, Natural Resources Management, and Horticulture and Crop Science. New technologies of geographic information systems (GIS), global positioning systems (GPS), and orthophotography (uniform scale aerial photographs) are revolutionizing the management of resources. There are great employment opportunities for those who understand these technologies. Students interested in this minor may come from the following majors: forestry and natural resources, crop science, soil science, landscape architecture, agricultural systems management, bioresource and agricultural engineering, animal science or earth sciences.

Required Courses

- BRAE 133 Intro. to Engr. Design Graphics (1) *and*
 BRAE 151 CAD for Agric. Engr. (1),
or
- CE 112 Design Principles in Civil Engr (2) *and*
 CE 113 Computer Aided Drafting in Civil Engr (2) 2/4
- BRAE 239 Engineering Surveying 4
- BRAE 345 Aerial Photogrammetry/Remote Sensing 3
- NR/LA 318 Applications in GIS 3
- NR 418 Applied GIS *or*
 BRAE/LA/HCS 470 Selected Adv. Topics 3

Emphasis areas (select one)..... 12

- Environmental Information Emphasis*
- BRAE 447 Adv Surveying-GIS Applications (4)
- NR 306 Natural Res Ecology/Habitat Mgt (4) *or*
 BIO 325 General Ecology (4)
- NR 416 Environmental Impact Analysis/Mgmt (4)

Precision Agriculture Emphasis

- CRSC 244 Precision Farming (4)
- Select two of the following (8):
 BRAE 447; CRSC 445; HCS 410; PPSC 405, 431;
 SS 433; VGSC 423

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LAND REHABILITATION MINOR

Earth and Soil Sciences
 Bldg. 52, Room C43, 805 756-2261

Coordinator: Lynn E. Moody

Students completing the minor gain skills in recognizing, assessing, and treating disturbed lands for numerous purposes, including erosion and sediment control, water quality improvement, habitat restoration, and aesthetic enhancement. They develop proficiency in plant identification and selection, soil properties and processes, and ecological principles, and also learn to set criteria and judge the feasibility, prudence, efficiency, and effectiveness of rehabilitation efforts.

Before being admitted to the minor, students must have successfully completed the following courses:

- BOT 121 or BIO 114, SS 121, MATH 118

At least one-half of the units must be at the 300-400 level. Generally, courses required for the student's major degree cannot be counted toward the minor, except that courses selected in the required core may count in both the major and minor programs. This and other course exceptions must be approved by the minor coordinator. As a guideline, students should take at least 20 units from outside their major degree program.

Each student is required to complete a hands-on rehabilitation or restoration field project that provides practical experience in recognizing, assessing, and treating a landscape disturbance. Before beginning the treatment phase, the student must prepare a written plan that includes a problem assessment, treatment design, anticipated outcome, and budget. This plan must be approved by the faculty advisor and the minor coordinator before land treatment begins. Project may be carried out individually or in small groups. Contact the minor coordinator for more details.

Required core courses (Minimum of 14 units) 14

- Plant area (select one course):*
 BOT 238, 433; EHS 381
- Soils area (select one course):*
 SS 321 Soil Morphology (4) *or*
 SS 440 Forest and Range Soils (4)
- Ecological Principles (select one course):*
 BOT 326; NR 306; AG 360
- Project (select one course)*
 May be selected from Special Problems, Selected Advanced Topics, Senior Project or other course approved by the minor coordinator.

Approved electives..... 12

- Select 4 courses from the following list:
 ASCI 329; BOT 313, 324;
 BRAE 340, PPSC 321, 327;
 EHS 382; NR/LA 318; GEOG 318;
 NR 307, 320, 408; HCS 124;
 MCRO 436; ERSC 202; SS 221

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RANGELAND RESOURCES MINOR

Animal Science
Bldg. 10, Room 141, 805 756-2419

Coordinator: Marc R. Horney

This interdisciplinary minor prepares students for careers which involve managing semi-arid grasslands, shrublands, and savannas, including wildlife habitats and livestock pasture. A main objective is to connect practical knowledge of rangeland ecosystems to management of herbivorous animals. Students learn methods and principles of assessing and monitoring the environmental and ecological health and productivity of rangelands. Courses give students a better understanding of the interactions of plants, animals, water, soil and landscape features in these ecosystems, and how to establish reasonable management goals and objectives. Associated careers include rangeland specialists with the federal government (BLM, NPS, NRCS, USFS) or private consultants, ecologists, wildlife biologists, wildland managers, ranch managers, and other natural resource management specialists. This minor offers sufficient courses to allow students to meet the basic educational requirements for California Certified Rangeland Manager.

Before being admitted to the program, students must have successfully completed the following courses:

BOT 121 or BIO 162, GE Area B1 MATH course, SS 121.

Required courses. At least one-half of the units must be 300-400 level. Select courses with advisor approval.

<i>Range Resource Area</i>	7
ASCI 329 and AG 360	
<i>Rangeland Animal Management Area.</i>	
Select one course from:	4
ASCI 223/311/339; BIO 427	
<i>Rangeland Plant Physiology Area</i>	4
BIO 435	
<i>Rangeland Ecology Area.</i> Select one course from:	4
BOT 326; NR 306; PPSC 321	
<i>Rangeland Measurements Area.</i>	
Select one course from:	4
BIO 419; CRSC 411; ERSC 202; SS 321/440	
<i>Rangeland Policy/Planning Area.</i>	3
Select one course from:	
ASCI 476; CRP 342/404/408; NR 404/408; SS 433	

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SUSTAINABLE AGRICULTURE MINOR

Horticulture and Crop Science
Bldg. 11, Room 230, 805 756-1237

Coordinator: David H. Headrick

Students approach modern agricultural problems from a holistic perspective, emphasizing agricultural planning integrated with ecological principles. Through experience in sustainable agricultural practices, students learn about a farm in the context of an agro-ecosystem: a system whose processes and relationships can be manipulated to allow production with fewer adverse environmental impacts and external inputs. Students develop knowledge and skills involving holistic management, crop production, and adaptive decision-making in a hands-on environment. The minor is available to all Cal Poly students.

Required courses

AG 315 Organic Agriculture	4
AG 339 Internship in Agriculture	4
AG 360 Holistic Management	4
CRSC 203 Organic Farming Enterprise Project	2

Area Studies 15

Select minimum of one course from each of the following areas. Minimum 4 units at 300-400 level.

Agriculture and Society Area:

AG 350, AGB 312, GEOG 301, GEOG 333, NR 142, UNIV/POLS 333

Production Agriculture Area:

AGB 212, 401; ASCI 221, 223, 311; BOT 323; BRAE 340; BUS 212; CRSC 445; PPSC 321, 431, 441; SS 221

Agroecology Area:

NR 306, 319, 323; PPSC 421; ERSC 202; SS 321

Environmental Design Area:

EDES 406; EHS 381; LA 202, 221

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WATER SCIENCE MINOR

BioResource and Agricultural Engineering
Bldg. 08, Room 101, 805 756-2378

Coordinator: Stuart W. Styles

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

Required core courses

BRAE 340 Irrigation Water Management	4
SS 121 Introductory Soil Science	4
NR 408 Water Resource Law and Policy	3

Select one emphasis area..... 13-18

Irrigation Emphasis (13)

Select 13 units from the following:

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

Water Policy Emphasis (17-18)

AGB 315 Land Economics (4)
AGB 409 California Agricultural Law (4) or
NR 404 Environmental Law (3)
NR 320 Watershed Mgt and Restoration (4)
NR 435 Natural Resources Policy Analysis (4)
SS 433 Land Use Planning (3)

Watershed Management Emphasis (16)

NR 306 Natural Res Ecology/Habitat Mgt (4)
NR 320 Watershed Management (4)
NR 420 Advanced Watershed Hydrology (4)
SS 440 Forest and Range Soils (4)

24-29

Graduate Programs

Mark Shelton, Associate Dean of Graduate Programs
and Research

Agricultural Sciences Bldg., Room 211

805 756-2161

mshelton@calpoly.edu

[http://cafes.calpoly.edu/about_cafes/
grad_programs.html](http://cafes.calpoly.edu/about_cafes/grad_programs.html)

Programs of Study/Specializations Available

Agribusiness – MS, see page 73

Agricultural Education – Master of, see page 78

Agriculture – MS with Specializations in:

Agricultural Engineering Technology

Animal Science

Crop Science

Dairy Products Technology

Environmental Horticultural Science

Food Science and Nutrition

Irrigation

Plant Protection Science

Recreation, Parks, and Tourism Management

Soil Science

Forestry Sciences – MS, see page 115

General Characteristics

Graduate studies in the College of Agriculture, Food and Environmental Sciences (CAFES) allow the student to pursue either a professional program designed to enhance the competencies of agricultural educators, or an academic program of graduate-level scholarly activities and research in one of several specializations. Graduates are prepared for:

- * professional-level positions with business and industry, government, and foreign service in agriculture and related fields;
- * continued graduate work at other institutions.

Admission/Acceptance Requirements – MS only

- File an application for Graduate Admission via www.csumentor.edu by the deadlines specified at www.ess.calpoly.edu/_admiss/grad/regular.htm
- Submit Graduate Record Exam (GRE) General Test scores **electronically to Institution Code: R4038**
- Three Letters of Recommendation

Prerequisites

For consideration as a graduate student, an applicant will have completed a bachelor's degree from an accredited college/university with a minimum grade point average of 2.75 in the last 90-quarter units. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must

make up any deficiencies before advancement to classified graduate standing.

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), taken within the last 2 years with a minimum score of 550 (paper version), 213 (computerized version), or 80 (internet based). Submit scores electronically to Institution Code: 4038. This requirement does not apply if your country of citizenship is listed on Cal Poly Admissions website:

www.ess.calpoly.edu/_admiss/international/toefl.htm

Each specialization below may list additional prerequisites/requirements for the specific program.

Programs of Study

There are four graduate degree programs in the college: MS Agribusiness, Master of Agricultural Education (non-thesis), MS Forestry Sciences, and MS Agriculture with the following specializations: Agricultural Engineering Technology, Animal Science, Crop Science, Dairy Products Technology, Environmental Horticultural Science, Food Science and Nutrition, Irrigation, Plant Protection Science, Recreation, Parks, and Tourism Management, and Soil Science.

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

Formal Study Plan. Graduate students must file the formal study plan for the degree with the CAFES Graduate Coordinator 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 units required by the committee as reflected on the formal study plan 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. All candidates must meet the current Graduation Writing Requirement; see page 62. All students are required to pass an oral comprehensive examination which is normally given during the final quarter of the program of study. A written comprehensive exam may also be required by the master's degree committee, but this is optional. For students in a thesis program the final oral comprehensive examination includes, but is not necessarily limited to, a defense of the thesis.

Master of Science in Agriculture

MS Agriculture, Specialization in AGRICULTURAL ENGINEERING TECHNOLOGY

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

	<i>Units</i>
Required Courses	23
BRAE 599 Thesis (6)	
AG 581/BRAE 581 Graduate Seminar (1)	
SS 501 Research Planning (4)	
STAT 512 Statistical Methods (4)	
STAT 513 Applied Experimental Design and Regression Models (4)	
BRAE 521 Systems Analysis of Ag Systems (4)	
Approved electives	22
Any 400 and 500 level courses approved by the student's graduate committee. At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.	
	45

MS Agriculture, Specialization in ANIMAL SCIENCE

Additional prerequisites: Prospective students are required to: (1) submit a cover letter identifying interests, goals and experience relevant to the MS program, and (2) submit a résumé.

The program provides students with an interdisciplinary, science-based program, where students develop basic scientific knowledge, apply that knowledge to a research project, then write and defend a thesis. An individual's coursework and research project is focused based upon his or her interests and goals in Animal Science, and under the guidance of the advisor and thesis committee.

	<i>Units</i>
Required Courses	18
ASCI 581 Graduate Seminar (3)	
AG 581 Graduate Seminar (1)	
STAT 512 Statistical Methods (4)	
STAT 513 Applied Experimental Design and Regression Models (4)	
AG 599 Thesis (6)	
Select 16 units from the following	16
AG 500 Individual Study in Agriculture (6)	
ASCI 403 Applied Biotech in Animal Science (5)	
ASCI 405 Domestic Livestock Endocrinology (4)	
ASCI 406 Applied Animal Embryology (5)	
ASCI 415 HACCP for Meat and Poultry Ops (3)	
ASCI 420 Animal Metabolism and Nutrition (3)	
ASCI 438 Systemic Animal Physiology (4)	
ASCI 440 Immunology and Diseases of Animals (4) or ASCI 540 Advanced Immunology and Diseases of Animals (4)	

- ASCI 450 Computer Apps in Animal Science: Spreadsheet Analysis (4)
- ASCI 500 Individual Study in Animal Science (6)
- ASCI 503 Adv Molecular Tech in Animal Sci (4)
- ASCI 593 Stem Cell Research Internship (5)
- ASCI 594 Applications in Stem Cell Research (2)
- AGED 438 Instructional Processes in Agric Ed (4)
- BIO 501 Molecular and Cellular Biology (4)
- BIO 524 Developmental Biology (2)
- CHEM 528 Nutritional Biochemistry (3)
- NR 532 Apps in Biometrics and Econometrics (4)

Approved electives	11
Any 400 and 500 level courses approved by the student's graduate committee. At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.	
	45

MS Agriculture, Specialization in CROP SCIENCE

For students with undergraduate preparation in plant agriculture. Research currently is focused primarily in postharvest technology, viticulture, and integrated pest management, with additional work being done in other areas, including agronomy, horticulture, and precision farming.

	<i>Units</i>
Required Courses	25
CRSC 445 Cropping Systems (4)	
CRSC 581 Graduate Seminar (3)	
CRSC 599 Thesis (6)	
HCS 511 Ecological Biometrics (4) or STAT 513 Applied Exp Design & Regression Models (4)	
HCS 570/571 Selected Topics Lecture (3)/Lab (1)	
SS 501 Research Planning (4)	
Approved electives	20
Any 400 and 500 level courses, approved by the student's graduate committee. At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.	
	45

MS Agriculture, Specialization in DAIRY PRODUCTS TECHNOLOGY

Additional prerequisites: Prospective students are required to: (1) submit a cover letter identifying interests, goals and experience relevant to the MS program, and (2) submit a résumé.

An applied program for students who desire to use their academic preparation in food science and nutrition, dairy science, microbiology, chemistry, engineering, biochemistry and related fields to address applied research questions of impact to the field of dairy science and technology. The program requires the demonstration of strong analytical thinking, effective oral and written communication, and project management. Coursework and thesis experience are designed with flexibility to enhance and increase proficiency in scientific methods while enriching students' overall

preparation to enter the workforce. Graduates enter research and development positions with major food companies, leadership positions in dairy food processing and other allied areas, or further graduate study for the Ph.D. Students have opportunity to work on funded research projects of the Dairy Products Technology Center and interact with multidisciplinary teams of scientists from throughout the world. International students are encouraged to apply.

	<i>Units</i>
Required Courses	27
DSCI 401 Physical and Chemical Properties of Dairy Products (4)	
DSCI 444 Dairy Microbiology (4)	
DSCI 570 Selected Topics in Dairy Science (3)	
DSCI 571 Selected Adv. Lab in Dairy Science (3)	
DSCI 581 Graduate Seminar in Dairy Science (3)	
DSCI 599 Thesis (6)	
STAT 523 Design and Analysis of Experiments (4)	
Approved electives	18
Any 400 and 500 level courses, approved by the student's graduate committee. At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.	
	45

MS Agriculture, Specialization in ENVIRONMENTAL HORTICULTURAL SCIENCE

For students interested in careers in teaching, applied research positions in industry, or to students planning on continuing on for a Ph.D. It would also appeal to foreign students interested in an American graduate degree, particularly since California is internationally famous for its horticulture industry.

	<i>Units</i>
Required Courses	25
CRSC 581 or EHS 581 Graduate Seminar (3)	
HCS 500 Individual Study (4)	
HCS 511 Ecological Biometrics (4) <i>or</i> STAT 513 Applied Exp Design & Regression Models (4)	
HCS 570/571 Selected Topics/Lab (4)	
SS 501 Research Planning (4)	
EHS 599 Thesis (6)	
Approved electives	20
Any 400 and 500 level courses approved by the student's graduate committee. At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.	
	45

MS Agriculture, Specialization in FOOD SCIENCE AND NUTRITION

For students with undergraduate preparation in food science, nutrition, or other science-based curricula. A thesis is required. Research areas vary with faculty expertise and interest; refer to Food Science and Nutrition Department and College of Agriculture, Food and Environmental Sciences

web pages for more information on faculty research. Graduates are prepared for further study in doctoral programs or for responsible positions in nutrition and food industries.

	<i>Units</i>
Required Courses	15-17
FSN 581 Graduate Seminar (3)	
FSN 599 Thesis (6)	
SS 501 Research Planning <i>or</i> other 400-500 level research methods course (2-4)	
STAT 512 Statistical Methods (4)	
Approved electives	28-30
Any 400 and 500 level courses, approved by the student's graduate committee. At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.	
	45

MS Agriculture, Specialization in IRRIGATION

Additional prerequisites: B.S. or B.A. with proficiency in basic chemistry and math. Students must have successfully completed at least one undergraduate class in general irrigation, soil science, crop science, calculus, and hydraulics, plus be familiar with spreadsheets. Students may complete prerequisite courses at Cal Poly if necessary.

	<i>Units</i>
Required Courses	37
BRAE 405 Chemigation (1)	
BRAE 414 Irrigation Engineering (4)	
BRAE 435 Drainage (4)	
BRAE 440 Agricultural Irrigation Systems (4)	
BRAE 438 Drip/Micro Irrigation <i>or</i> BRAE 439 Vineyard Water Management (4)	
BRAE 500 Individual Study (3)	
BRAE 532 Water Wells and Pumps (4)	
BRAE 533 Irrigation Project Design (4)	
BRAE 599 Thesis (6)	
400-500 level research methods or statistics course (3)	
Approved electives	8
Any 400 and 500 level courses approved by the student's graduate committee. At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.	
	45

MS Agriculture, Specialization in PLANT PROTECTION SCIENCE

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

Required Courses	<i>Units</i> 25
CRSC/EHS 581 Graduate Seminar (3)	
HCS 511 Ecological Biometrics (4) <i>or</i> STAT 513 Applied Exp Design & Regression Models (4)	
HCS 570/571 Selected Topics/Lab (4)	
PPSC 521 Plant-Pest Interactions (4)	
PPSC 599 Thesis (6)	
SS 501 Research Planning (4)	
Select 8 units from the following	8
PPSC 405 Advanced Weed Management (4)	
PPSC 414 Grape Pest Management (4)	
PPSC 427 Disease and Pest Control Systems for Ornamental Plants (4)	
PPSC 431 Insect Pest Management (4)	
PPSC 441 Biological Control of Insects (4)	
Approved electives	12
Any 400 and 500 level courses approved by the graduate committee. At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.	
	45

MS Agriculture, Specialization in RECREATION, PARKS, AND TOURISM MANAGEMENT

Prerequisite: In order to develop an academic background in this discipline, students who have not completed a BS/BA degree in Recreation, Parks and Tourism Administration may be required to take the following courses: RPTA 360 and STAT 512.

Required Courses	<i>Units</i> 27
POLS 510 Research Design (4)	
RPTA 450 Resource and Grant Development (4)	
RPTA 527 Leisure Behavior and Theory (4)	
RPTA 581 Graduate Seminar (2)	
RPTA 599 Thesis (9)	
STAT 513 Applied Experimental Design and Regression Models (4)	
Approved electives	18
Any 400 and 500 level courses approved by the graduate committee. At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.	
	45

MS Agriculture, Specialization in SOIL SCIENCE

Provides graduate level knowledge and skills for soils interpretation and management, for teaching, or for continuation into a PhD program. Department facilities include modern instrumentation, laboratories, and a glasshouse. Students have access to several thousand acres of agricultural, forest, and range lands. Graduates 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.

Required Courses	<i>Units</i> 40
SS 422 Soil Microbiology and Biochemistry (4)	
SS 423 Soil and Water Chemistry (5)	
SS 431 Soil Resource Inventory (4)	
SS 432 Soil Physics (5)	
SS 501 Research Planning (4)	
SS 508 Environmental Assessment for Erosion Control (3)	
SS 522 Advanced Soil Fertility (3)	
SS 581 Graduate Seminar in Soil Science (3)	
SS 582 GIS in Advanced Land Management (3)	
SS 599 Thesis (6)	
Approved electives	5
Any 400 and 500 level courses approved by the graduate committee. At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.	
	45

Soil Science students with credit in SS 422, SS 423, SS 431, or SS 432 from the undergraduate degree may substitute other courses in the Required Courses list.

MBA, Specialization in AGRIBUSINESS

The Orfalea College of Business and the Agribusiness Department jointly offer an Agribusiness Specialization in the Master of Business Administration program. The program is part of the MBA curriculum and requires the completion of six graduate classes taught by the Agribusiness Department (see page 152, the Orfalea College of Business). Information and application materials may be obtained by writing to the MBA Coordinator, Orfalea College of Business.

MS Engineering, Specialization in WATER ENGINEERING

The College of Engineering and the BioResource and Agricultural Engineering Department jointly offer the Water Engineering Specialization under the M.S. Engineering. Please see College of Engineering section of this catalog for more information.

Agribusiness

Agriculture Bldg. (10), Room 210
805 756-5000
FAX 805 756-5040

Department Chair, Jay E. Noel

James J. Ahern	Michael McCullough
William H. Amspacher	Charles Nicholson
Xiaowei Cai	Eivis Qenani-Petrela
Lynn L. Hamilton	Christiane Schroeter
Wayne H. Howard	Kenneth C. Scott
Sean P. Hurley	Marcia L. Tilley
Jennifer James	Marlin D. Vix
Neal MacDougall	Marianne McGarry Wolf

ACADEMIC PROGRAMS

Agricultural Business – BS
Agribusiness – MS, Minor

The Agribusiness Management program prepares students for rewarding and satisfying careers in the dynamic and increasingly global agrifood and fiber system. The program provides a course of study that develops the requisite interpersonal and communication skills, critical thinking skills, and applied business skills that are required to have successful careers in an ever changing economic, technological, political, and social environment. Graduates are highly sought after by firms that produce and market food and fiber products, provide logistics and transportation services, market research services, banking and finance services, state and federal government agencies, agricultural organizations that provide commodity promotion, lobbying, and information services, and non-food and fiber businesses. Many graduates have gone on to earn law, masters of science, and masters of business administration degrees.

The Agribusiness Department curriculum provides a solid foundation in communication and leadership skills, economics, accounting, finance, marketing, and food and fiber policy. Students are encouraged to get involved with academic clubs, student teams, and internship programs. In addition, the curriculum allows for students to gain knowledge of the technical and scientific issues associated with production agriculture. The upper division curriculum structure provides students coursework that develops quantitative skills while having the flexibility to choose courses that allow them to pursue a generalist agribusiness perspective or focus on a specific agribusiness interest area, such as food marketing or finance. The course of study concludes with capstone courses that provide for the application of the interpersonal and communication skills, critical thinking skills, and applied business skills developed earlier in the curriculum.

BS Wine and Viticulture

The Agribusiness Department is involved with this multi-disciplinary major by providing a wine business concentration. Please see pages 100, 104 for the information on the BS Wine and Viticulture major in the Horticulture and Crop Science Department section of the catalog.

BS AGRICULTURAL BUSINESS

☐ 60 units upper division ☐ GWR
☐ 2.0 GPA ☐ USCP
* = Required in Support; also satisfies GE

MAJOR COURSES

AGB 101 Introduction to Agribusiness	4
AGB 202 Sales, Communication, Leadership	4
AGB 212 Agricultural Economics	4
AGB 214 Agribusiness Financial Accounting	4
AGB 260 Agribusiness Information Technology	4
AGB 301 Food and Fiber Marketing	4
AGB 310 Agribusiness Credit and Finance	4
AGB 312 Agricultural Policy	4
AGB 313 Agricultural Economic Analysis.....	4
AGB 323 Agribusiness Managerial Accounting	4
AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (USCP)	4
AGB 460 Research Methodology in Agribusiness	2
AGB 461 Senior Project	2
¹ Agribusiness general electives	12
<i>Select 12 units of AGB courses at the 300-500 level</i>	
Agribusiness quantitative electives	8
<i>Select 8 units from the following:</i>	
AGB 405, 421, 422, 433, 435	
Agribusiness advanced applied elective	4
<i>Select one of the following:</i>	
AGB 406, 410, 450, 452, 456	
	72

SUPPORT COURSES

BUS 207 Business Law	4
CHEM 110 World of Chem/Essentials (B3 & B4)*	4
Life science elective with lab (B2 & B4*).....	4
ECON 222 Macroeconomics (D2)*	4
² MATH 221 Calculus for Business & Econ. (B1)*	4
STAT 221 Probability/Statistical Inference (B1)*	5
Agricultural science and technology electives	16
<i>Animals Area (select one):</i>	
ASCI 112, 211, 220, 225, 229, 321;	
DSCI 101, 134, 230, 231 and 232, 233;	

¹ 500-level courses used for a baccalaureate degree may not be applied toward a master's degree or credential program. Consultation with advisor is recommended.

² Prerequisite: Passing score on appropriate Mathematics Placement Examination, or MATH 118 or equivalent.

Agronomic Area (select one):

- CRSC 123;
- EHS 230;
- FRSC 132, 133, 230, 311;
- HCS 120;
- SS 121, 131, 221;
- VGSC 230

Other Science Area (select one):

- BRAE 439;
- FSN 125, 204, 210, 230, 244, 250, 270, 275, 285, 341;
- WVIT 365

Area F (select one):

- AG 315, 360;
- BRAE 340, 348;
- FSN 319;
- NR 312, 321

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GENERAL EDUCATION (GE)

72 units required, 24 of which are specified in Support.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

- A1 Expository Writing 4
- A2 Oral Communication 4
- A3 Reasoning, Argumentation, and Writing..... 4

Area B Science and Mathematics (no additional units required)

- B1 Mathematics/Statistics * 8 units in Support.... 0
- B2 Life Science * 4 units in Support..... 0
- B3 Physical Science * 4 units in Support..... 0
- B4 One lab taken with either a B2 or B3 course * in Support

Area C Arts and Humanities (20 units)

- C1 Literature 4
- C2 Philosophy 4
- C3 Fine/Performing Arts 4
- C4 Upper-division elective 4
- Area C elective (Choose one course from C1-C4) 4

Area D/E Society and the Individual (16 units)

- D1 The American Experience (40404) 4
- D2 Political Economy * 4 units in Support..... 0
- D3 Comparative Social Institutions 4
- D4 Self Development (CSU Area E) 4
- D5 Upper-division elective 4

Area F Technology Elective (upper division)

- * 4 units in Support 0

48

FREE ELECTIVES..... 19

180

AGRIBUSINESS MINOR

In today's ever more complex, technology-driven world, it is a necessity for any graduate in agriculture to have some exposure to marketing, personnel management, financial management, budgeting, and economics if they are to succeed. The minor is designed to give students in the College of Agriculture, Food and Environmental Sciences this opportunity. Interested students must apply for acceptance into the minor through the Agribusiness Department.

Note: One course in the minor may be graded credit/no credit.

Required courses

AGB 212 Agricultural Economics	4
AGB 214 Agribusiness Financial Accounting or BUS 212 Financial Accounting for Non- Business Majors	4
AGB 301 Food and Fiber Marketing	4
AGB 310 Agribusiness Credit and Finance	4
AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (USCP).....	4
¹ Approved electives	8
Select 8 units of AGB courses from the following:	
AGB 202, 260, 312, 313, 315, 318, 322, 323, 324, 326, 331, 404, 405, 406, 410, 412, 421, 422, 433, 435, 450, 452, 456, 457, 458	28

MS AGRIBUSINESS

The Master of Science in Agribusiness is designed to enhance the agribusiness management, commodity marketing, and technical skills of graduate students with interests in international and domestic agribusiness:

Additional Prerequisites: A bachelor's degree and one course in each of the following areas: Intermediate microeconomics, macroeconomics, statistics, calculus or business calculus. Submit Graduate Record Exam (GRE) General Test scores (50 percentile required) electronically to Institution Code: R4038.

Program of Study: Graduate students must file a formal study plan with their major professor, graduate committee, college and university graduate studies office no later than the end of the quarter in which the 12th unit of approved courses is completed.

Core courses	<i>Units</i> 40/42
AGB 433/435/422 (4)	
AGB 450 Agricultural Strategy Formulation (4)	
AGB 460 Research Methodology in Agribusiness (2) or SS 501 Research Methodology in Research Planning (4)	

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

AGB 514 Agribusiness Managerial Leadership
and Communication (4)

¹ NR 532 Applications in Biometrics and
Econometrics (4)

AGB 543 Agricultural Policy and Program
Analysis (4)

AGB 554 Food Systems Marketing (4)

AGB 555 Technological and Economic Change in
Agriculture (4)

AGB 563 International Agribusiness Trade:
Cases and Development (4)

AGB 599 Thesis or Scholarly Project in
Agribusiness (6)

² **Committee approved elective (400-500 level) 7-8**

At least half of all units required by the committee
as reflected on the formal study plan must be at
the 500 level.

47-50

¹ This course has particular statistical applications for economics and
business forecasting that are appropriate to this program.

² Similar courses or course equivalents already completed at the
undergraduate level require that the student complete additional
“committee approved” elective units, but not reduce the degree unit
requirement. Those electives are to be selected from the College of
Agriculture, Food and Environmental Sciences or the Orfalea
College of Business at the 400 or 500 level.

Agricultural Education & Communication

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

Department Head, William C. Kellogg

Glen R. Casey Benjamin G. Swan
Ann M. De Lay J. Scott Vernon
Robert A. Flores

Affiliate Faculty: Daniel E. Lassanske

ACADEMIC PROGRAMS

Agricultural Education – Master of
Agricultural Science – BS

The Agricultural Education and Communication Department offers a Bachelor of Science degree in Agricultural Science and a Master of Agricultural Education.

The BS Agricultural Science program offers a choice of one of six concentrations plus approved electives that may be selected from one of two career pathways: preparation of future agriculture teachers for the public secondary schools of California, or professional preparation in agricultural communication.

The teaching credential program provides for early field experience and professional education coursework in the undergraduate curriculum. Specialized preprofessional and professional courses are offered for undergraduate and graduate students.

Postbaccalaureate work is required of students seeking the Single Subject in Agriculture, and Agricultural Specialist credentials. Students interested in teaching agriculture may receive a B.S. degree in any of the agricultural science, production or management fields. Coursework toward the teaching credential should be started early in order to complete the total curriculum most effectively.

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

In association with the Brock Center for Agricultural Communication, selected interdisciplinary courses in Journalism, Graphic Communications, English, Communication Studies and Agriculture make up the Agricultural Communication minor. Career preparation includes a breadth and depth in agriculture along with a foundation in journalism, and an industry internship. For

more information about the minor, see College of Agriculture, Food and Environmental Sciences. The Brock Center for Agricultural Communication provides students the opportunity for industry linkages and professional preparation in this rapidly growing career area.

CONCENTRATIONS

Agricultural Engineering Technology. Designed to develop knowledge and ability necessary to perform agricultural engineering/mechanical operations and processes.

Agricultural Supplies and Services. Study of the consumable supplies and services needed in the production and post harvest phases of agriculture.

Animal Science. Principles and practices related to the economic use of resources in the production of livestock and poultry.

Crop and Soil Science. Principles and practices related to the economic use of resources in the culture and production of agricultural plants.

Forestry and Natural Resources. Principles and practices involved in the conservation, multiple use or improvement of natural resources.

Ornamental Horticulture. Principles and practices involved with the culture of plants used for ornamental or aesthetic purposes.

CONTINUING EDUCATION IN AGRICULTURE

Cal Poly and the Agricultural Education and Communication Department play an active role in the professional development and continuing education of high school and community college teachers of agriculture. Instructional staff and facilities are provided for workshops and training programs cooperatively sponsored by the University and the State of California. The campus offers an annual summer skills program. The content varies, depending upon the needs and desires of the teachers, as expressed through the California Agricultural Teachers' Association. Cal Poly faculty provide up-to-date training in the technical phases of agriculture and offer instruction in teaching methods.

BS AGRICULTURAL SCIENCE

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

AGED 102 Intro. to Agricultural Education or	
AGC 102 Orientation to Agricultural	
Communication	2
AGED 404 Agricultural Leadership	3
AGC 426 Presentation Methods in Agricultural	
Communication or EDUC 412 Schooling in a	
Democratic Society	4

AGED 460 Research Methodology in Agricultural Education and Communication	1	<i>Agricultural Communications</i>	
AGED/AGC 461 Senior Project	1	AGC 339 (6), AGC 407 (4),	
AGED/AGC 462 Senior Project	1	JOUR 203 (4), JOUR 205 (4),	
AG 360/ASCI 476/AG 450/AG 452	3	COMS 301 (4),	
AGB 202 Communication, Leadership and Management Skills for Agribusiness.....	4	Plus one of the following:	
AGB 301 Food and Fiber Marketing	4	ENGL 310; GRC 377;	
AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (USCP)	4	JOUR 312, 331; RPTA 320, 420	
ASCI 112 Principles of Animal Science	4	<i>Individualized</i>	
ASCI 225 Introduction to Poultry Management	4	Courses that meet the requirements leading to a minor at Cal Poly. 12 to 20 units must be at the 300-400 level to meet graduate requirements.	42
BRAE 121 Agricultural Mechanics	2	GENERAL EDUCATION (GE)	
BRAE 141 Agricultural Machinery Safety	3	72 units required, 16 of which are specified in Support.	
CRSC 123/FRSC 230/VGSC 230/VGSC 190	4	→See page 39 for complete GE course listing.	
DSCI 230 General Dairy Husbandry	4	→Minimum of 12 units required at the 300 level.	
DSCI 231 General Dairy Manufacturing (3) and DSCI 232 Gen Dairy Mfg Lab (1), or FSN 230 Elements of Food Processing (4).....	4	Area A Communication (12 units)	
EHS 230 Environmental Horticulture	4	A1 Expository Writing	4
HCS 120 Principles of Horticulture and Crop Science.....	4	A2 Oral Communication	4
SS 121 Introductory Soil Science.....	4	A3 Reasoning, Argumentation, and Writing.....	4
Concentration courses (see below).....	22	Area B Science and Mathematics (8 units)	
86		B1 Mathematics/Statistics * 4 units in Support plus	4
SUPPORT COURSES		B2 Life Science.....	4
CHEM 110 World of Chemistry (B3 & B4)*	4	B3 Physical Science * 4 units in Support.....	0
BRAE 340 Irrigation Water Management (Area F)*	4	B4 One lab taken with either a B2 or B3 course	
MATH 118 Pre-Calculus Algebra (B1)*	4	Area C Arts and Humanities (20 units)	
(<i>MATH 116 & MATH 117 substitute</i>)		C1 Literature	4
NR 308 Fire and Safety or NR 323 Human Dimensions in Natural Resources Management (D5)*.....	4	C2 Philosophy	4
¹ Approved electives.....	26	C3 Fine/Performing Arts	4
12-20 units must be 300-400 level depending on concentration. Career area programs may be selected from teaching agriculture, agri-cultural communication, or individualized:		C4 Upper-division elective	4
<i>Teaching Agriculture</i>		Area C elective (Choose one course from C1-C4)	4
BUS 212 or AGB 321 (4),		Area D/E Society and the Individual (16 units)	
AGED 330 (6), AGED 410 (2),		D1 The American Experience (40404)	
EDUC 410 (4), EDUC 414 (4),		Note: POLS 112 is required for teaching credential candidates	4
Plus six units from any of the following (if BUS 212 is taken, then 4 units of 300-400 required):		D2 Political Economy	4
Any course with a prefix in AG, AGB, ASCI, BRAE, CRSC, DSCI, ERSC, FRSC, FSN, HCS, NR, PPSC, RPTA, SS, VGSC, WVIT;		D3 Comparative Social Institutions	4
AGED 220; BUS 207; IME 142,		D4 Self Development (CSU Area E)	
ECON 201, 222; KINE 250, 255, 305;		Note: KINE 250 is required for teaching credential candidates	4
PHYS 121, 131		D5 Upper-division elective *4 units in Support.....	0
		Area F Technology Elective (upper division)	
		* 4 units in Support.....	0
		56	
		FREE ELECTIVES	
		Note: Electives within the College (CAFES), excluding AGED courses, are required for teaching credential candidates.....	8
		192	

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

CONCENTRATIONS (select one)**Agricultural Engineering Technology Concentration**

BRAE 133 Engineering Design Graphics	1
BRAE 237 Intro to Engineering Surveying	2
BRAE 321 Agricultural Safety	3
BRAE 335 Internal Combustion Engines	4
¹ Approved electives (3 units at 300–400 level)	12
<i>Select 12 units from the following:</i>	
BRAE 129, 142, 151, 152, 231, 239, 240, 301, 324, 331, 337, 348, 438, 439, 481	
	22

Agricultural Supplies and Services Concentration

AGB 212 Agricultural Economics	4
AGB 214 Agribusiness Financial Accounting	4
AGB 310 Agribusiness Credit and Finance	4
AGB 312 Agricultural Policy	4
¹ Approved electives	6
<i>Select 6 units from the following:</i>	
AGB 303, 313, 314, 318, 322, 323, 331, 370, 404, 409, 410, 440, 443, 445, 455	
	22

Animal Science Concentration

Select two: ASCI 221, 222, 223	4,4
ASCI 220 Intro Animal Nutrition and Feeding <i>or</i> DSCI 101 Dairy Feeds and Feeding	4
DSCI 330 Artificial Insemination and Embryo Biotechnology	4
¹ Approved electives	6
<i>Select 6 units from the following:</i>	
ASCI 311, 326, 329, 384, 412, 413, 415, 425, 430, 476, 480; ASCI 305, 325, 330, 342; DSCI 301, 333, 435	
	22

Crop and Soil Science Concentration

ERSC 202 Soil Erosion and Water Conservation	4
CRSC 123/FRSC 230/VGSC 230/VGSC 190 (Select course not taken in major column)	4
PPSC 311 Agricultural Entomology	4
SS 221 Fertilizers	4
¹ Approved electives	6
<i>Select 6 units from the following:</i>	
CRSC 333, 445; FRSC 342; HCS 421; VGSC 423, 424	
	22

Forestry and Natural Resources Concentration

BIO 227 Wildlife Conservation Biology	4
NR 142 Environmental Management	3
NR 208 Dendrology	4
NR 306 Natural Resource Ecology and Habitat Management	4
¹ Approved electives	7
<i>Select 7 units from the following:</i>	
NR 312, 320, 321, 402; NR/CRP 404, 408; NR/ES 308 or NR 323; NR/ES 360; NR/GEOG/LA 317; NR/LA 318	
	22

Ornamental Horticulture Concentration

EHS 123 Landscape Installation and Maintenance	4
HCS 124 Plant Propagation	4
EHS 438 Teaching Methods in Environmental Horticulture	4
¹ Approved electives	10
<i>Select 10 units from the following:</i>	
EHS 324, 337, 343, 402, 421, 424, 433, 434; EHS/RPTA 430	
	22

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

MASTER OF AGRICULTURAL EDUCATION

General Characteristics

The Master of Agricultural Education program provides students with the opportunity to focus their graduate study in agricultural education, with an emphasis on preparing candidates for positions as teachers of agricultural education in public schools. The degree is a non-thesis, terminal program that provides practitioners with opportunities for professional development. At least one year of successful high school or community college teaching is required for completion of this degree program. Working with their advisor and graduate committee, students generally complete projects for coursework in the program that enhance their employment settings, or assist them to become compliant with statewide standards in agricultural education.

Prerequisites

For consideration as a graduate student, an applicant will have completed a bachelor's degree from an accredited college or university with a minimum grade point average of 2.75 in the last 90 quarter units. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing. An applicant not meeting these academic standards, but who meets the basic CSU standards of a grade point average of 2.5 in the last 90 quarter units attempted, may be conditionally admitted.

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

Graduate students must file a formal study plan for the degree with the Graduate Coordinator of the College of Agriculture, Food and Environmental Sciences 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 units required by the committee as reflected on the formal study plan must be at the 500 level. Students should refer to the course descriptions in the catalog for credit limitations of individual courses; for example, total credit for AG 500, Individual Study, is limited to six units. All candidates must meet the current Graduation Writing Requirement.

All students are required to pass an oral comprehensive examination which is normally given during the final quarter of the program of study. A written comprehensive exam is required of all students in the Master of Agricultural Education degree program.

Required Courses

AGED 520 Program Develop/Agric Education	3
AGED 522 Instructional Prog/Agric Mechanics	3
AGED 539 Internship	6

Approved electives..... 33

Any 400- and 500-level courses approved by the student's graduate committee. No fewer than 11 units must be at the 500 level. Students are required to complete one year of successful teaching prior to the comprehensive written and oral examinations.

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Animal Science

Agriculture Bldg. (10), Room 141
805 756-2419 FAX: 805 756-5069
<http://animalscience.calpoly.edu>

Department Head, Andrew J. Thulin

Matthew Burd	Jaymie J. Noland
M. Steven Daugherty	Daniel G. Peterson
Robert J. Delmore	William E. Plummer
Mark S. Edwards	Robert T. Rutherford
Michael H. Hall	Dale A. Smith
Marc R. Horney	Robert Spiller

ACADEMIC PROGRAMS

Animal Science – BS
Equine Science – Minor
Meat Science and Processing – Minor
Poultry Management – Minor
Rangeland Resources – Minor

Animal Science offers students the opportunity to apply the principles of animal biology, husbandry and behavior, with molecular biology and other life sciences to a variety of species. Students can apply these principles to farm animals, exotic animals, laboratory animals, and to their own pets. The curriculum is very flexible, which allows students to work with their faculty advisor to plan an individual curriculum in line with their interests and career goals. This is a comprehensive “hands-on, learn-by-doing” program, so students work with animals of several species on a regular basis. Students learn the science and practical applications to be effective problem-solvers and leaders as they move on to professional and graduate schools, animal production and management, food processing, or numerous other career opportunities.

Students may select coursework in one of the following areas: pre-veterinary medicine, food animal production, equine science, poultry management, agribusiness, biotechnology, comparative animal biology studies, rangeland resource management, and meat science.

The department offers a wide assortment of co-curricular activities including five different student clubs, competitive livestock and horse judging teams and intercollegiate dressage and equestrian teams. Students participate in organizing and conducting service meetings, seminars and field days sponsored by the department.

In addition, students are involved with faculty in research and development of new technologies related to animal health and production, using state-of-the-art equipment, facilities and technologies. Through extensive

undergraduate research opportunities, students are prepared for careers in discovery, science and innovation.

Experiential Learning

The Animal Science Department has extensive modern animal facilities for hands-on experience. The department is supported by state-of-the-art biotechnology labs, a new beef center, beef cattle evaluation center, new animal nutrition center for animal food manufacturing, and an extensive equine center with breeding barn, labs, new stalls and training arenas. Additionally, students are able to use nearly 6,000 acres of rangeland, a swine center, sheep center, a state-of-the-art poultry center, an on-campus veterinary clinic for student learning and a new meat processing center.

The department maintains beef cattle, horses, sheep, swine, and poultry. These animal operations are supported by an on-campus veterinary clinic, meat processing facilities, and an animal nutrition center. By actively participating in the management of the herds and flocks, students simulate the larger commercial operations of the industry. The enterprise system is another valuable experience for students, and industry internships are strongly encouraged.

The department has an active role in the management of the Swanton-Pacific Ranch and is developing environmentally sound resource management practices including intensive controlled grazing, multiple species grazing, and using the grazing animal as a tool to enhance the total environment of the ranch. Cal Poly’s Animal Science major provides the knowledge and understanding to apply new technologies for the fast-changing, technology-driven world in which we live. The department’s focus is to help students build a plan for personal and professional growth. Students develop the ability to apply and manage technology, and they also learn how to be team players, with the ability to solve problems utilizing leadership and professional communication skills. Most importantly, students are taught how to learn so they can adapt to the future.

Graduate Programs

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Animal Science. Please refer to the MS Agriculture section of the College of Agriculture, Food and Environmental Sciences.

BS ANIMAL SCIENCE

60 units upper division GWR
 2.0 GPA USCP

* = Required in Support; also satisfies GE

Note: No major or support courses that are graded may be taken as credit/no credit.

MAJOR COURSES

ASCI 101 Introduction to the Animal Sciences.....	2
ASCI 112 Principles of Animal Science.....	4
ASCI 211 Meat Science.....	4
ASCI 220 Intro. Animal Nutrition and Feeding	4
ASCI 229 Anatomy/Phys of Farm Animals.....	4

ASCI 290 Animal Production and Management Enterprise/ASCI 490 Advanced Animal Production and Management Enterprise.....	4
ASCI 304 Animal Genomics.....	3
ASCI 320/CHEM 313/CHEM 371	4-5
ASCI 351 Reproductive Physiology	4
ASCI 477 or ASCI 478 or ASCI 479 Senior Project	3
ASCI 363 Undergraduate Seminar.....	2
<i>Production courses (select one from each of the three categories):</i>	12
<u>Ruminants</u> : ASCI 221 Intro. Beef Prod. (4) or ASCI 223 Syst. Sheep Prod. (4)	
<u>Nonruminants</u> : ASCI 222 Syst. Swine Prod. (4) or ASCI 225 Intro. Poultry Mgmt (4)	
<u>Companion Animals</u> : ASCI 224 Equine Science (4) or ASCI 227 Companion Animal Sci. (4)	
<i>Nutrition (select one)</i>	3-4
ASCI 346, 350, 355, 420; DSCI 301	
<i>Physiology (select one)</i>	3-5
ASCI 333, 347, 366, 405, 406, 438, 440; DSCI 330	
<i>Technology/Management (select two)</i>	6-9
AG 360/AG 450; ASCI 311, 312, 325, 329, 330, 342, 384, 403, 406, 415, 440, 450, 455	
Approved electives.....	27-34
Select courses from a career elective area (CEA); see Approved Electives Guide, below.	
	96

SUPPORT COURSES

BIO 111 General Biology or BIO 161 Intro to Cellular and Molecular Biology (B2 & B4)*	4
BIO 302/BIO 303/BIO 351	4/5
CHEM 111/127 Survey of Chemistry (B3&B4)*	5/4
CHEM 312 Survey of Organic Chemistry or CHEM 316 Organic Chemistry (<i>transfer equivalents CHEM 212, 216</i>)	5
MATH 118 Pre-Calculus Algebra (<i>MATH 116 & 117 substitute</i>) or MATH 161 Calculus Life Sciences I (B1)*	4
STAT 218 Applied Statistics/Life Sciences (B1)*	4
	25-27

GENERAL EDUCATION (GE)

72 units required, 16 of which are specified in Support.
→See page 39 for complete GE course listing.
→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing.....	4

Area B Science and Mathematics (no add'l units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4

C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division)

(4 units)	4
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56

FREE ELECTIVES

1-3

180

Approved Electives Guide

Approved electives have been categorized by career area to guide students in their selections. Advisor approval of electives is not required, but consultation with an advisor is recommended. Bear in mind that selection may impact pursuit of post-baccalaureate studies and/or goals.

Approved Career Elective Areas..... 27-34

Select Career Elective Area (CEA) of choice:

Pre-Veterinary Medicine Career Elective Area

a) Core (26 units):

BIO 162;
CHEM 128, 129, 317;
PHYS 121, 122;

b) Select 1-8 units from:

ASCI 290/490^{††}, 315[†], 320[†], 333[†], 339^{††},
347[†], 366[†], 405[†], 420[†], 438[†], 440[†];
BIO 161[†], 303[†], 351[†];
CHEM 318, 371[†], 372;
DSCI 330[†];
MATH/HNRS 141/MATH 161[†] (B1);
MATH/HNRS 142/MATH 162 (B1);
MCRO 221;
PHYS 123

Biotechnology Career Elective Area

ASCI 290/490^{††}, 339^{††}, 366[†], 403[†], 405[†],
406[†], 440[†];
BIO 161[†], 162, 351[†],
BIO/CHEM 375, 476;
CHEM 128, 129, 316[†], 317, 373, 377,
474, 477, 478;
MCRO 221, 224, 225;
SCM 201

[†] If any of these courses is taken to meet a major/support requirement, it cannot be double-counted as an approved elective.

^{††} A maximum of 6 units of CR/NC courses may be counted toward the degree.

Food Animal Production Career Elective Area

AG 360[†] (GE Area F);
 AGB 321, 322, 401 (USCP);
 ASCI 221[†], 222[†], 223[†], 225[†], 226,
 290/490^{††}, 311[†], 312[†], 329[†], 339^{††}, 450[†];
 BIO 427;
 CRSC 123;
 DSCI 230;
 NR 142; NR/LA 318;
 SPAN 101;
 SS 121

Comparative Animal Biology Studies Career Elective Area

ASCI 203, 290/490^{††}, 321, 339^{††};
 BIO 113, 162, 227, 263, 325, 327;
 PSY 458;
 ZOO 321, 323, 341, 425, 437

Equine Science Career Elective Area

ASCI 214, 224[†], 228, 265, 290/490^{††}, 315[†],
 324, 329[†], 333[†], 339^{††}, 344, 345, 346[†],
 347[†], 455[†]

Poultry Management Career Elective Area

- a) Core (23 units):
 ASCI 225[†], 325[†], 330[†], 342, 350[†], 415[†];
 b) Select 4-11 units from:
 AGB 310, 409;
 ASCI 290/490^{††}, 339^{††}, 440[†];
 BUS 207, 212, 346;
 ENGL 310;
 FSN 270, 275, 334, 335

Rangeland Resource Management Career Elective Area

AG 360[†] (GE Area F);
 ASCI 290/490^{††}, 311[†], 329[†];
 BIO 263, 435;
 NR 306, 320, 335, 418;
 NR/CRP 404; NR/LA 318;
 SS 121, 321

Meat Science Career Elective Area

ASCI 216, 290/490^{††}, 339^{††}, 384[†], 415[†],
 425, 480;
 FSN 125, 270, 275;
 MCRO 221, 421

Agribusiness Career Elective Area

- a) Core (28 units):
 AGB 212, 301, 310, 312, 322, 401 (USCP);
 AGB 214/AGB 321/BUS 212
 b) Select 0-6 units from:
 AGB 313, 315;
 ASCI 290/490^{††}, 311[†], 329[†], 384[†], 415[†]

EQUINE SCIENCE MINOR

The Equine Science minor is designed for students interested in developing a knowledge of, and competency in, the areas of equine training, nutrition and reproduction. This science-based program exposes students to various aspects of the horse industry, including basic equine management, training, and breeding farm management. By

completing this minor, students gain an understanding of the principles and practices used within the equine industry.

Prerequisites. BIO 111 or BIO 161; ASCI 224 and ASCI 229 is required for ASCI 315, ASCI 333, and ASCI 347.

Required courses

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

Select 3 units from the following courses which were *not* taken in the Required courses section

above:	3
ASCI 315, 324, 329, 339/490, 344, 345, 347	

27-28

MEAT SCIENCE AND PROCESSING MINOR

The minor incorporates knowledge of general food science, basic meat science and the principles and practices of adding value to raw materials through livestock harvesting, carcass fabrication and the manufacture of further processed meat and poultry products. Opportunities for business and management training are available. The minor meets the requirements needed to become eligible for jobs with the government or commercial meat processing firms and other businesses associated with the production of food products containing meat or poultry. In addition to the required courses, selected courses address basic principles of microbiology, food science, food sanitation and safety, food chemistry and process control procedures, and other optional courses are offered in agribusiness.

Prerequisite. One quarter of chemistry.

Required courses

ASCI 211 Meat Science.....	4
ASCI 384 Processed Meat Products <i>or</i> ASCI 330 Poultry Meat Production and Processing	4
ASCI 415 HACCP for Meat and Poultry Operations	3
MCRO 221 Microbiology.....	4

Selected courses 12-15

6 units must be at upper-division level:

ASCI 112, 226, 290/490, 339, 450, 476;
 DSCI 444; FSN 125/230, 270, 364; MCRO
 421; AG 360; any upper-division AGB course

27-30

[†] If any of these courses is taken to meet a major/support requirement, it cannot be double-counted as an approved elective.

^{††} A maximum of 6 units of CR/NC courses may be counted toward the degree.

POULTRY MANAGEMENT MINOR

The Poultry Management minor prepares students for a wide variety of positions in the commercial poultry industry and in many allied services related directly to the industry. Career opportunities are many and varied.

Students have an opportunity to conduct enterprise projects in the production of market eggs, hatching eggs, meat birds, replacement pullets, turkey, and game birds, which give them valuable experience in production techniques as well as exposure to a number of business activities related to production. Advanced students may have opportunities to study special topics related to problems in management of commercial poultry flocks.

The program is supported by a state-of-the-art poultry production facility. Cal Poly's Poultry Unit is now considered one of the best in the Western United States; it accommodates commercial laying hen operation, egg processing facility, hatching, meat processing facility and battery and floor pen research facilities. These production facilities allow students to gain hands-on learning which complements their formal class work, and provides real-world experience.

Required courses

ASCI 225 Introduction to Poultry Management	4
ASCI 325 Egg Production, Processing and Distribution	4
ASCI 330 Poultry Meat Production and Processing	4
ASCI 342 Poultry Business Management	4
ASCI 350 Applied Nonruminant Nutrition	4
ASCI 415 HACCP for Meat and Poultry Operations	3
Approved electives	4
Select four units from the following:	
AGB 310; ASCI 290/490, 339; BUS 212, 346;	
ENGL 310; FSN 270, 275, 334, 335	

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Additional Minors

The department also participates in offering a minor in Rangeland Resources. Please see page 67 for additional information.

BioResource & Agricultural Engineering

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

Department Head, Richard A. Cavaletto

Benali B. Burgoa	Daniel J. Howes
Charles M. Burt	Shaun F. Kelly
Samantha J. Gill	Stuart W. Styles
Andrew J. Holtz	Mark A. Zohns

Affiliate Faculty:

William C. Kellogg
Benjamin G. Swan

ACADEMIC PROGRAMS

Agricultural Systems Management – BS
BioResource and Agricultural Engineering – BS

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

The BioResource and Agricultural Engineering Department is an engineering-based educational organization consisting of professionals whose mission is the study, teaching, and practice of engineering and systems management support for agriculture. The department is nationally recognized as a leader in this field, and for balancing theory with application and principle with practice.

Department facilities include well-equipped laboratories for hydraulic systems, evaluation and testing of power units, fabrication of agricultural machinery, agricultural electrical systems, design and construction of agricultural structures, photogrammetry, microcomputers and controllers.

Outdoor facilities include a water resources center with multiple pumping systems and operational canals, a field for evaluation of various irrigation systems including an operating linear move and land for experience in the mechanical production of farm products and safe operation of agricultural machinery.

Students are encouraged to participate in the student clubs of the department. The Agricultural Engineering Society is involved in a broad range of activities and services including Open House displays. The student branch of the American Society of Agricultural Engineers offers professional and co-curricular activities.

BS Agricultural Systems Management

The mission of the Agricultural Systems Management program is to provide a "learn by doing" undergraduate

educational experience that prepares students for systems management practice in support of agriculture and related industries throughout the West.

Students receive broad agricultural training with a business and management emphasis in one of the following areas: plant production, livestock production, food and fiber processing, environmental information management, water/irrigation, and processing and manufacturing. Students have the opportunity to develop management expertise through interdisciplinary experiences in agricultural technology and business oriented coursework.

The objectives of the Agricultural Systems Management program are to produce graduates who:

- ◆ are successful in technical, business, or management positions within agriculture or related industries; and
- ◆ are "industry ready" to undertake technological, business, or management projects and make significant contributions from day one on the job; or
- ◆ are enrolled in an advanced degree program and are successful at graduate studies should they choose to pursue them.

Agricultural Systems Management graduates demonstrate a knowledge and understanding of basic agricultural technologies and agribusiness principles necessary for technical operations and business management careers in agriculture and related industries; an understanding of modern science and practice within a specialized agricultural area of interest; and ability to apply quantitative, analytical processes for developing solutions to technological, business or management problems associated with production, processing, or the distribution of products and support services in agriculture and related industries; an understanding of the interconnected "systems" of agriculture; and ability to safely and properly handle the materials, machines, sensors, tools and techniques of modern agricultural or technical operations; and an ability to communicate and perform as effective agricultural systems management professionals in the solution of problems crossing discipline or cultural boundaries.

Career opportunities are available in the manufacturing, sales, and service of agricultural equipment and machinery; management and production of animals and crops; processing of food and fiber; and management of water/irrigation facilities. The program is recognized by the American Society of Agricultural Engineers.

BS BioResource and Agricultural Engineering

The bioresource/agricultural engineer represents the most general type of engineer, adept at utilizing electrical and mechanical energy sources, water resources, and designing structural units. The curriculum features a unique combination of engineering and applied science coursework, with a focus on preparing graduates for practice in professional engineering.

The mission of the BioResource and Agricultural Engineering program is to provide a "learn by doing" undergraduate educational experience that prepares students for engineering practice in support of agriculture and related industries throughout the West.

The objectives of the BioResource and Agricultural Engineering program are to produce graduates who are:

- ◆ Engineers in positions of professional responsibility and leadership in a modern multidisciplinary system-oriented environment that emphasizes problem solving, or
- ◆ Actively pursuing or have achieved a degree in an advanced degree program, or
- ◆ Applying unique engineering problem-solving skills and principles within a career outside traditional engineering environments, such as management, teaching, research, or other professional fields.

BioResource and Agricultural Engineering graduates demonstrate a knowledge and understanding of the basic mathematics, physical and engineering sciences necessary for modern agricultural engineering practice; the ability to design components, systems or processes to meet specified objectives, including prudent use of resources; an understanding of their professional and ethical responsibilities as agricultural engineers, including the societal impact of engineering solutions and the need to engage in life-long learning; the ability to plan, design, execute and evaluate engineering solutions to problems/projects that are real, practical and of a complexity representative of projects encountered in beginning professional practice; and the ability to communicate and perform as effective engineering professionals in both individual and team-based project environments.

Cal Poly's "learn by doing" philosophy is emphasized by the numerous design-centered laboratories and the senior project. In the senior design project, which is completed in a three-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

Consistent with program accreditation requirements regarding a graduate's ability to function on multidisciplinary teams, the BioResource and Agricultural Engineering program has adopted an explicit graduation requirement in this area. This provides students an opportunity to practice team skills. Such experience is important for practicing engineers given the ever-increasing diversity of engineering science and applications. Methods to fulfill this requirement include items such as:

- Team senior project
- CO-OP or internship employment
- Certain club activities

- Working with faculty on a sponsored project
- Project embedded in curriculum
- Taking certain technical electives
- Service learning project

Career opportunities exist in the design, evaluation and management of systems -- irrigation, drainage, hydrology, soil conservation; agricultural machinery; food processing; and agricultural environments. The program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone: (410) 347-7700.

Minors

The department participates in offering interdisciplinary minors in Water Science and Geographic Information Systems. Please see College of Agriculture, Food and Environmental Sciences section for more information.

Graduate Programs

Cal Poly offers the MS in Agriculture with specializations in Agricultural Engineering Technology and in Irrigation, and the MS in Engineering with a specialization in Water Engineering. Please see College of Agriculture, Food and Environmental Sciences and College of Engineering sections for more information.

BS AGRICULTURAL SYSTEMS MANAGEMENT

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

* = Required in Major/Support; also satisfies GE

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

MAJOR COURSES

BRAE 128 Careers in Bioresource/Agric. Engr	2
BRAE 129 Laboratory Skills and Safety	1
BRAE 133 Engineering Design Graphics	1
BRAE 141 Agricultural Machinery Safety	3
BRAE 142 Agric Power and Machinery Mgt	4
BRAE 151 CAD for Agricultural Engineering	1
BRAE 152 3-D Solids Modeling	1
BRAE 203 Agricultural Systems Analysis	3
BRAE 237 Intro to Engineering Surveying <i>or</i>	
BRAE 239 Engineering Surveying	2/4
BRAE 301 Hydraulic/Mechanical Power Systems	4
BRAE 321 Agricultural Safety	3
BRAE 324 Principles Agricultural Electrification...	4
BRAE 340 Irrigation Water Management	4
BRAE 342 Agricultural Materials	4
BRAE 343 Mechanical Systems Analysis	4
BRAE 348 Energy for a Sustainable Society (Area F)*	4
BRAE 418 Agricultural Systems Management I	4
BRAE 419 Agricultural Systems Management II....	4
BRAE 425 Computer Controls for Agriculture	3
BRAE 432 Agricultural Buildings	4

BRAE 460 Senior Project Organization.....	1
BRAE 461 Senior Project I.....	2
BRAE 462 Senior Project II.....	2
¹ Approved electives	16
<i>Select 16 units from the following, with a minimum of 8 units upper division, and no more than 4 units internship or enterprise: any AGB course eligible for the AGB minor; AGED 102, 330; any ASCI course except ASCI 101, 200, 212, 400, 412, 413, 425; BRAE 236, 302, 331, 335, 344, 345, 405, 435, 438, 439, 440, 447, 448, 532; any DSCI course except DSCI 123; CHEM 212; any course in CM minor; any CRSC course; any FRSC course; FSN 125, 204, 230, 270, 275, 323, 330, 334, 341, 354, 444; any HCS course except HCS 110; IME 141, 142, 143, 144, 157, 319, 320; IT 260, 330, 341; NR 306, 318, 408, 416; any PPSC course except PPSC 110; SS 221; any VGSC course; any WVIT course except WVIT 101</i>	

81/83**SUPPORT COURSES**

AGB 212 Agricultural Economics	4
AGB 301 Food and Fiber Marketing	4
AGB 310 Agribusiness Credit and Finance	4
AGB 401 Managing Cultural Diversity in Agricultural Labor	4
BUS 212 Financial Accounting for Nonbusiness Majors <i>or</i> AGB 214 Agribus Financial Acctg.....	4
CHEM 110 World of Chemistry - Essentials <i>or</i> CHEM 111 Survey of Chemistry (B3 & B4)*	4/5
CSC 110/CSC 113/CSC 232	3
ENGL 148 Reasoning, Argumentation, and Professional Writing <i>or</i> ENGL 145 Reasoning, Argumentation and Writing (A3)*	4
MATH 118 Pre-Calculus Algebra (B1)*	4
MATH 119 Pre-Calculus Trigonometry (B1)*	4
PHYS 121 College Physics I.....	4
SS 121 Introductory Soil Science.....	4
Animal or plant production course.....	3
Any ASCI, CRSC, DSCI, FRSC, HCS, PPSC, VGSC course except for internship or enterprise courses.	

50/51**GENERAL EDUCATION (GE)**

72 units required, 20 of which are specified in Major/Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support	0

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science.....	4
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division)

* 4 units in Major.....	0
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52**FREE ELECTIVES****0****183****BS BIORESOURCE AND AGRICULTURAL ENGINEERING**

- 60 units upper division GWR
 2.0 GPA USCP

* = Required in Support; also satisfies GE

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

MAJOR COURSES

BRAE 128 Careers in Bioresource & Ag Engr.	2
BRAE 129 Laboratory Skills and Safety	1
BRAE 133 Engineering Design Graphics.....	1
BRAE 151 CAD for Agricultural Engineering.....	1
BRAE 152 3-D Solids Modeling	1
BRAE 216 Fundamentals of Electricity.....	4
BRAE 232 Agricultural Structures Planning	4
BRAE 234 Intro Mechanical Systems-Agric	4
BRAE 236 Principles of Irrigation	4
BRAE 239 Engineering Surveying	4
BRAE 312 Hydraulics	4

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

BRAE 320 Principles of Bioresource Engrg	4
BRAE 328 Measurements/Computer Interfacing	4
BRAE 331 Irrigation Theory.....	3
BRAE 403 Agricultural Systems Engineering.....	4
BRAE 414 Irrigation Engineering.....	4
BRAE 421, 422 Equipment Engineering	3,4
BRAE 433 Agricultural Structures Design	4
BRAE 460 Senior Project Organization.....	1
BRAE 461, 462 Senior Project I, II	2,2
¹ Approved electives	10

Select 10 units from the following, with a

minimum of 6 units upper division:

BRAE 302, 335, 345, 348, 405, 427,

435, 447, 448, 532, 533;

any upper division CE course;

CHEM 312;

any upper division ENVE course;

FSN 204;

IME 141, 142, 143, 144, 319;

MATE 210, 215;

MCRO 221, 421;

any upper division ME course

75

SUPPORT COURSES

BIO 213 and ENGR/BRAE 213 or MCRO 221 Microbiology (B2)*	4
CE 201 Mechanics of Materials (6) or CE 204 and CE 207 Mechanics of Materials I, II (3)(3)	6
CHEM 124 General Chemistry for the Engineering Disciplines (B3/B4)*	4
CHEM 125 General Chemistry for the Engineering Disciplines (Add'l Area B)*	4
CSC 231/CSC 232/CSC 234	2/3
ECON 201 Survey of Economics (D2)*	4
EE 321 Electronics and EE 361 Electronics Lab	3,1
ENGL 149 Technical Writing for Engineers (A3)*	4
MATH 141, 142 Calculus I, II (B1)*	4,4
MATH 143 Calculus III (Add'l Area B)*	4
MATH 241 Calculus IV	4
MATH 244 Linear Analysis I	4
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics	3
ME 302 Thermodynamics	3
PHYS 141 General Physics IA.....	4
PHYS 132, 133 General Physics	4,4
SS 121 Introductory Soil Science.....	4
STAT 312 Statistical Methods-Engr. (B6)*	4

81-82

GENERAL EDUCATION (GE)

72 units required, 36 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 in Support.....	0

Area B Science and Mathematics (no additional units are required)

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support.....	0
Additional Area B units* 8 units in Support.....	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (12 units)

D1 The American Experience (40404)	4
D2 Political Economy * 4 units in Support.....	0
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4

36

FREE ELECTIVES **0**

192-193

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Dairy Science

Building 10, Room 121
805 756-2560 FAX: 805 756-6667
dsci.calpoly.edu

Department Head, Bruce L. Golden

Leanne M. Berning Rafael Jimenez-Flores
Nana Y. Farkye Amy Lammert
Stanley L. Henderson Phillip S. Tong

ACADEMIC PROGRAMS

Dairy Science – BS, Minor

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

Experiential Learning

Excellent facilities are provided for students. The dairy herd includes 110 each of milking-age registered Jerseys and Holsteins, located on a well-planned unit where feeding, milking, calf raising, artificial insemination, and management are carried out. Both herds are recognized for their high production and outstanding type.

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

The campus creamery is well-equipped with modern processing equipment. Students are employed on a part-time basis to work in both the production and processing areas.

Dairy Products Technology Center

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

Graduate Program

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Dairy Products Technology. Please

refer to the MS Agriculture section of the College of Agriculture, Food and Environmental Sciences.

BS DAIRY SCIENCE

- 60 units upper division GWR
 2.0 GPA USCP

* = Required in Support; also satisfies GE

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

MAJOR COURSES

DSCI 100 Enterprise Project <i>or</i>	
DSCI 339 Internship in Dairy Science	2
DSCI 101 Dairy Feeds and Feeding	4
DSCI 121 Elements of Dairying <i>or</i>	
DSCI 230 General Dairy Husbandry	4
DSCI 123 Dairy Science Orientation.....	1
DSCI 231 General Dairy Manufacturing (3) <i>and</i>	
DSCI 232 Gen Dairy Manufacturing Lab (1)	4
DSCI 202 Dairy Promotion and Marketing	4
DSCI 223 Frozen Dairy Foods <i>or</i> DSCI 241 Dairy	
Cattle Selection, Breeds, Fitting and Showing.....	4
DSCI 233 Milk Processing and Inspection.....	4
DSCI 234 Dairy Foods Evaluation	2
DSCI 301 Dairy Cattle Nutrition <i>or</i>	
DSCI 401 Physical and Chemical Properties of	
Dairy Products.....	4
DSCI 321 Lactation Physiology <i>or</i>	
DSCI 444 Dairy Microbiology.....	4
DSCI 330 Artificial Insemination and Embryo	
Biotechnology <i>or</i> DSCI 434 Cheese and	
Fermented Dairy Foods	4
DSCI 333 Dairy Cattle Management, Safety and	
Animal Well-Being <i>or</i> DSCI 402 Quality	
Assurance and Control of Dairy Products.....	4
DSCI 422 Breeding and Genetics of Dairy Cattle	
<i>or</i> DSCI 435 Concentration/Fractionation and	
Butter Technology.....	4
DSCI 432 Advanced Dairy Herd Management <i>or</i>	
DSCI 433 Dairy Plant Mgt. & Equipment	4
DSCI 461 Senior Project.....	3
DSCI 463 Undergraduate Seminar	2

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SUPPORT COURSES

* = Satisfies General Education requirement

MCRO 221 Microbiology (B2 & B4)*.....	4
CHEM 111 Survey of Chemistry <i>or</i> CHEM 127	
General Chemistry (B3&B4)*.....	5/4
CHEM 312/BIO 111/BIO 115/BIO 161	5/4
MATH 118 Pre-Calculus Algebra (B1)*	4
(MATH 116 & 117 substitute)	
¹ Approved electives.....	41
Select 41 units from the following. At least 18 units	
must be 300-400 level. Consult with academic	
advisor regarding career tracks:	
AGB 212, 301, 310, 321, 401;	
AGED 102, 330, 404;	

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

ASCI 112, 211, 216, 221, 226, 229, 304, 310,
311, 312, 351, 366, 405, 420, 438, 440;
BIO 162, 303;
BRAE 121, 141;
BUS 212;
CHEM 128, 129, 312, 313, 316, 317, 371;
COMS 301;
CRSC 123;
Any DSCI course;
EHS 230;
FRSC 230;
FSN 125, 230, 270, 275, 330, 335;
JOUR 203, 205;
MCRO 342, 421;
NR 141;
PHYS 121, 122;
STAT 313;
VGSC 230;
Any courses used in the following minors:
Agribusiness
Agricultural Communication
Crop Science
Equine Science
Food Science
Poultry Management
Soil Science

Total units for Support Courses: 57/59

GENERAL EDUCATION (GE)

72 units required, 12 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing 4
A2 Oral Communication 4
A3 Reasoning, Argumentation, and Writing 4

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 4 units in Support plus 4
B2 Life Science * 4 units in Support..... 0
B3 Physical Science * 4 units in Support..... 0
B4 One lab taken with either a B2 or B3 course

Area C Arts and Humanities (20 units)

C1 Literature 4
C2 Philosophy 4
C3 Fine/Performing Arts 4
C4 Upper-division elective 4
Area C elective (Choose one course from C1-C4) 4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404) 4
D2 Political Economy 4
D3 Comparative Social Institutions 4
D4 Self Development (CSU Area E) 4
D5 Upper-division elective 4

Area F Technology Elective (upper division) (4 units)..... 4

FREE ELECTIVES..... 3/5

60

180

DAIRY SCIENCE MINOR

The purpose of this minor is to help students from other disciplines gain a basic understanding of the terminology and practices used within the field of dairy science. The curriculum is flexible enough to accommodate students' interests in animal and/or food-oriented aspects of Dairy Science. After completion of the minor, students should have a basic understanding of cattle, dairy nutrition, milk production and management as well as dairy food processing, quality and regulatory control. Specific programs are designed to reflect the individual student's interests and needs.

The Dairy Science Minor requires two introductory courses. Students must obtain prior program approval from the Dairy Science Minor Coordinator in selecting an additional five courses according to their interests and goals. A minimum of 26 hours is required for the minor, at least half of which must be at the 300 and 400 level.

Required courses

DSCI 121 Elements of Dairying
or DSCI 230 General Dairy Husbandry 4
DSCI 231 General Dairy Manufacturing 3

Approved electives 19

Select units from the following, with approval of minor coordinator:

DSCI 101 Dairy Feeds and Feeding (4)
DSCI 202 Dairy Promotion and Marketing (4)
DSCI 223 Frozen Dairy Foods (4)
DSCI 233 Milk Processing and Inspection (4)
DSCI 234 Dairy Foods Evaluation (2)
DSCI 241 Dairy Cattle Selection, Breeds, Fitting and Showing (4)
DSCI 301 Dairy Cattle Nutrition (4)
DSCI 321 Lactation Physiology (4)
DSCI 330 Artificial Insemination and Embryo Biotechnology (4)
DSCI 333 Dairy Cattle Mgt, Safety and Animal Well-Being (4)
DSCI 340 Dairy Waste Management and Resource Recovery (3)
DSCI 401 Phys/Chem Properties of Dairy Products (4)
DSCI 402 Quality Assurance and Control of Dairy Products (4)
DSCI 412 Dairy Farm Consultation (4)
DSCI 422 Breeding/Genetics of Dairy Cattle (4)
DSCI 432 Advanced Dairy Herd Management (4)
DSCI 433 Dairy Plant Management and Equipment (4)
DSCI 434 Cheese and Fermented Dairy Foods (4)
DSCI 435 Concentration/Fractionation and Butter Technology (4)
DSCI 444 Dairy Microbiology (4)

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Earth & Soil Sciences

Graphic Arts Bldg. (26), Room 100
805 756-2261 FAX 805 756-5412

Department Head, Lynn E. Moody

Christopher S. Appel	Thomas J. Rice, Jr.
Brent G. Hallock	Terry L. Smith
Affiliate Faculty:	Scott Johnston
Gregory S. Bohr	James R. Keese
Antonio F. Garcia	William L. Preston
John J. Jasbinsek	Benjamin Timms

ACADEMIC PROGRAMS

Earth Sciences – BS

Soil Science – BS, Minor

The Earth and Soil Sciences (ERSS) department offers two majors – Earth Sciences and Soil Science. Students have access to several thousand acres of agricultural, forest, and range land managed by the college. Students gain hands-on experience with equipment and techniques in common use by agricultural and environmental scientists. The department is equipped for analysis of soil, plant, and water samples as well as optical analysis of minerals, rocks, and soils. Analytical methods available to students include flame and graphite furnace atomic absorption spectrometry, high temperature combustion analysis of carbon, nitrogen, and sulfur, and petrographic microscopy with digital image analysis.

The department maintains greenhouse research space with an outdoor erosion research facility, providing opportunities for students to assess erosion control practices used to protect and improve water quality. Additionally, the department operates state-of-the-art weather and environmental monitoring equipment on Cal Poly rangelands, providing data for a wide variety of interdisciplinary research projects.

Students are encouraged to reinforce their education, develop professional contacts, and strengthen their career potential by participating in any of the following activities: the Earth, Soil, and Water Conservation Club, which is nationally affiliated; the Soil Judging Team, which commonly qualifies for national competition; attending international and national conferences; and internships and cooperative education programs with government and industry. Each of these opportunities, combined with a friendly, helpful atmosphere, provide students a college experience that is highly personal as well as rewarding. Students also are encouraged to investigate opportunities for international education. Please see the Study Abroad program section of this catalog.

BS Earth Sciences

The BS in Earth Sciences provides a strong foundation for understanding and improving the utilization of land, water, and atmospheric resources. The program emphasizes a wide

range of disciplines in natural resources and in the cultures that use and modify them. The core of the earth sciences curriculum is composed of geography, geology, and soil science, and is strengthened by a diverse array of related topical and technical specialties.

The Earth Sciences major provides detailed and thorough training in the natural and cultural processes that govern the relationship between humans and their habitats. The program also furnishes students the marketable expertise to assess, manage, repair, and improve this fragile relationship while acquiring a well-rounded education in both the natural and social sciences. In addition, majors can meet the educational requirements for professional certification in a number of areas and find their training ideal for graduate school preparation in a number of related disciplines.

Due to the multidisciplinary nature of the Earth Sciences major, students have access to diverse faculty and laboratories in several colleges on campus. California's Central Coast offers a diverse environmental and cultural setting for real-world training and experiences in the earth sciences.

Undergraduate students majoring in Earth Sciences earn the credentials for useful careers in resource assessment and administration. They graduate with a substantial and well rounded education in the natural and social sciences. Moreover, Earth Sciences graduates possess the understanding, flexibility, and tools to appreciate and adapt to a changing world and its employment opportunities.

Concentrations

In addition to the required major courses, students select one of the following concentrations or individualized course of study based upon their interests and career goals.

Climate Change Studies. Students gain knowledge and understanding of the applied sciences of meteorology and climatology. This foundational knowledge is coupled with an understanding of how a rapidly changing climate affects humans economically, socially, and politically, and affects global environments. Students are equipped to pursue careers in environmental science and policy and contribute to the understanding of climate change and how to mitigate the impacts of humans.

Environmental Interpretation and Assessment. Prepares students for careers in environmental assessment, impact analysis, planning, and government administration. Students gain skill in the analysis of environmental utilization and modification and the current legal and regulatory environment. This concentration also provides a strong foundation for graduate school in geography and environmental studies.

Geology. Students learn the fundamentals of a broad variety of geologic subdisciplines, including mineralogy, petrology, seismology, stratigraphy, geochemistry, geomorphology and structural geology. Each of these fundamental subdisciplines are supported by curriculum that emphasizes methods of data collection, interpretation and professional communication of results. Upon completion of this concentration, students are

able to critically evaluate geologic reports within the context of our evolving societal needs, and are prepared to pursue post graduate degrees in the geosciences and/or careers in the geotechnical industry.

Geosciences Teaching. Prepares students to meet California State Board of Education Earth Sciences Content Standards. Prepares students to seek a teaching credential for teaching earth sciences in elementary or secondary schools.

Land and Water Resources. Prepares students for professional opportunities in the mitigation and conservation of land and water resources. Emphasis is on the processes that endanger these ecosystems and the knowledge necessary to protect and maintain them. Additional training in soils and hydrological studies along with enhanced technological skills is provided. This concentration also prepares students for graduate study in disciplines that specialize in land and water.

Individualized Course of Study. Students may pursue an academic minor or create a program, with faculty approval, based upon their interests and career goals. The coursework may be specifically tailored for a career in industry, education, government, or as preparation for graduate school.

BS Soil Science

Three-fourths of the world's food and nearly all of its fiber come from the fragile, thin skin of the land's surface—the soil. Also, soil absorbs and transmits rain and snow, which replenish our groundwater; and it captures great quantities of environmental wastes. Soil scientists are responsible for the management of soil, one of our most precious natural resources.

The Bachelor of Science degree in Soil Science provides fundamental knowledge and skills needed for field, laboratory, management, and teaching positions, as well as for graduate studies. Concentrations are offered in Land Resources, Environmental Management, and Environmental Science and Technology. These high quality programs help ensure that our graduates are well prepared for the diverse opportunities awaiting them. Also, graduates can meet educational requirements for professional certification by the American Registry of Certified Professionals in Agronomy, Crops and Soils, and as Certified Professional Erosion and Sediment Control Specialists.

The undergraduate soil science program ranks among the largest and strongest in the nation. Graduates are employed from Alaska to Mexico, Maine to Hawaii, and on every continent. Their Cal Poly experience has provided them with the strong scientific foundation, practical skills and balanced general education needed to be flexible and competitive in today's diverse, and often unpredictable, job market.

Undergraduate and graduate students majoring in soil science earn a solid, useful education; likewise, students from other fields who select soil science courses as electives, or who select the soil science minor, can augment their skills and knowledge, making them more adaptable to changing professional opportunities. All students can

discover soil's vital role in their lives, and the human dependence on the quality of soil for quality of life.

Cal Poly offers a Master of Science in Agriculture degree with a specialization in Soil Science. For information regarding this degree program, please refer to the MS Agriculture section.

Concentrations

Environmental Management. Offers a solid scientific background melded with environmental policy and administration, site analysis, and resource planning. The program helps prepare students for managerial positions dealing with today's complicated environmental problems and opportunities.

Environmental Science and Technology. Provides the strongest foundation for evaluating and solving complex environmental problems, including land and water degradation and contamination by hazardous wastes. Additionally, the concentration includes courses needed for admission to rigorous graduate programs.

Land Resources. Prepares students for professional opportunities in soil and water conservation, farm advisement, fertilizer and agricultural chemicals industries, forest and range soils, urban land enhancement, laboratory analysis, soil surveying, environmental issues, and international agriculture. The flexibility of this concentration allows students to select (with departmental approval) from nearly any minor offered by the University. Students are encouraged to consider the minors in Land Rehabilitation, Water Science, and Geographic Information Systems, offered through the College of Agriculture, Food and Environmental Sciences. In addition, students may design their programs to prepare for graduate studies.

Graduate Program

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Soil Science. Please refer to the MS Agriculture section of the College of Agriculture, Food and Environmental Sciences.

SOIL SCIENCE MINOR

Students from major fields other than Soil Science may broaden their education, and enhance their career opportunities, by selecting the minor in Soil Science.

Required courses

SS 121 Introductory Soil Science (B5).....	4
ERSC 202 Soil Erosion and Water Conservation....	4
SS 221 Fertilizers and Plant Nutrition <i>or</i>	
ERSC 223 Rocks and Minerals.....	4
SS 321 Soil Morphology.....	4
Approved Electives	11/14
ERSC 323; BIO/NR/SS 421; SS 322, 422, 423, 431, 432, 433, 440, 442, 453	

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Additional Minors

The department also participates in offering a minor in Rangeland Resources, Anthropology-Geography, Geology,

and Land Rehabilitation. Please see page 66, 67, 250 or 279 for additional information.

BS EARTH SCIENCES

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

* = Required in Major; also satisfies GE

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

MAJOR COURSES

ERSC/SS 110 Orientation in Earth & Soil Sciences	1
ERSC 144 Introduction to Earth Systems	4
ERSC 223 Rocks and Minerals	4
ERSC/GEOG 250 Physical Geography	4
ERSC 323 Geomorphology	4
ERSC/GEOG 333 Human Impact on the Earth	4
ERSC/GEOG 414 Global & Regional Climatology	4
ERSC or SS 461, 462 Senior Project I, II	1,3
ASTR 101 Introduction to the Solar System	4
BOT 121 General Botany (B2 & B4)*	4
BOT 326 Plant Ecology	4
BRAE 237 Intro to Engineering Surveying	2
CHEM 127, 128 General Chemistry (B3 & B4)*	4,4
GEOG 318 Applications in GIS	4
GEOG 328 Applications in Remote Sensing	4
GEOL 201 Physical Geology	3
GEOL 241 Physical Geology Lab	1
GEOL 415 Structural Geology	4
PSC 201 Introduction to Physical Oceanography	4
SS 121 Introductory Soil Science	4
SS 321 Soil Morphology	4
STAT 218 Applied Statistics/Life Sciences (B1)*	4
Concentration (see below; 4 units B1)*	41-42
	124-125

GENERAL EDUCATION (GE)

72 units required, 16 of which are specified in Major.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (no add'l units req'd)

B1 Math/Statistics * 8 units in Major & Conc	0
B2 Life Science * 4 units in Major	0
B3 Physical Science * 4 units in Major	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4

D4 Self Development (CSU Area E)	4
(KINE 250 recommended for Geosciences Teaching Concentration)	
D5 Upper-division elective	4
(PSY 352 recommended for Environmental Interpretation and Assessment Concentration)	
Area F Technology Elective (upper division)	4
(BRAE 340 recommended for Geosciences Teaching Concentration)	
	56
FREE ELECTIVES	0
	180

CONCENTRATIONS (select one):

Climate Change Studies Concentration

ERSC or SS 463 Undergraduate Seminar	2
GEOG 325 Climate and Humanity	4
GEOG 415 Applied Meteorology/Climatology	4
MATH 118 Pre-Calculus Algebra (B1)*	4
MATH 119 Pre-Calculus Trigonometry	4
PHYS 121 College Physics I	4
SOC 218 International Political Economy	4
UNIV 350 The Global Environment	4
Energy/Sustainability: BRAE 348 or PSC 320	4
¹ Approved electives	7-8
Choose from: CRP 375, 438, CRP/FNR 404; EDES 406; ENVE 324; GEOG 301, 440; PHIL 340.	

Note: CRP 438 or ENVE 324 recommended

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Environmental Interpretation and Assessment Concentration

ERSC 202 Soil Erosion and Water Conservation	4
ERSC/GEOG 325 Climate and Humanity	4
ERSC or SS 463 Undergraduate Seminar	2
CRP 420 Land Use Law	4
GEOG 301 Geography of Resource Utilization	4
MATH 118 Pre-Calculus Algebra (B1)*	4
MATH 119 Pre-Calculus Trigonometry	4
PHYS 121 College Physics I	4
¹ Approved electives	11

Select 11 units from the following:

CRP 212, 336;
CRP/NR 404, 408;
GEOG 440;
NR 306, 320, 416, 418, 425;
SS 339[†]

41

Geology Concentration

GEOL 206 Geologic Excursions	1
GEOL 305 Fundamentals of Seismology	4
GEOL 310 Igneous and Metamorphic Petrology	4

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

[†] No more than 4 units of SS 339 may be used.

GEOL 330 Principles of Stratigraphy	4
GEOL/ERSC 401 Field-Geology Methods	4
GEOL/ERSC 402 Geologic Mapping	4
GEOL 420 Applied Geophysics	3
ERSC or SS 463 Undergraduate Seminar	2
MATH 141, 142 Calculus I, II (B1)*	4,4
PHYS 141 General Physics IA	4
PHYS 132 General Physics II	4
	<hr/>
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Geosciences Teaching Concentration

ASTR 102 Introduction to the Stars and Galaxies	4
BIO 113 Animal Diversity and Ecology	4
EDUC 300 Intro to the Teaching Profession	3
GEOG 301 Geography of Resource Utilization	4
GEOG 325 Climate and Humanity	4
GEOL 203 Fossils and the History of Life	4
GEOL 204 Geologic History of California	3
MATH 118 Pre-Calculus Algebra (B1)*	4
MATH 119 Pre-Calculus Trigonometry	4
PHYS 121 College Physics I	4
PSC 424 Organizing/Teaching of Phys Sciences or EDUC 480 Computer Based Curriculum	4/3
	<hr/>
	41-42

Land and Water Resources Concentration

ERSC 202 Soil Erosion and Water Conservation	4
ERSC or SS 463 Undergraduate Seminar	2
CHEM 129 General Chemistry	4
MATH 141, MATH 142 Calculus I, II (B1)*	4,4
PHYS 141, 132 General Physics IA, II	4,4
SS 432 Soil Physics	5
¹ Approved electives (min 6 units 300-400 level)	11
<i>Select 11 units from the following:</i>	
ANT 202, 309, 310;	
CRP/NR 408;	
ERSC/GEOG 415;	
ERSC/GEOL 401, 402;	
GEOG 440;	
NR 306, 320, 418;	
SS 339 [†] , 432	
	<hr/>
	42

Individualized Course of Study

ERSC or SS 463 Undergraduate Seminar	2
MATH 118 Pre-Calculus Algebra (B1)*	4
MATH 119 Pre-Calculus Trigonometry	4
PHYS 121 College Physics I	4
Approved electives (min 10 units 300-400 level)	27
	<hr/>
	41

BS SOIL SCIENCE

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

SS 110 Orientation in Earth and Soil Sciences	1
SS 121 Introductory Soil Science	4
ERSC 202 Soil Erosion and Water Conservation	4
SS 221 Fertilizers and Plant Nutrition	4
ERSC 223 Rocks and Minerals	4
SS 321 Soil Morphology	4
SS 322 Soil Plant Relationships	4
ERSC 323 Geomorphology	4
SS 422 Soil Microbiology and Biochemistry	4
SS 423 Soil and Water Chemistry	5
SS 431 Soil Resource Inventory	4
SS 432 Soil Physics	5
SS or ERSC 461 Senior Project I	1
SS or ERSC 462 Senior Project II	3
SS or ERSC 463 Undergraduate Seminar	2
Concentration courses (see below)	28
	<hr/>
	81

SUPPORT COURSES

BOT 121 General Botany (B2 & B4)*	4
BRAE 340 Irrigation Water Management (Area F)*	4
CHEM 127 General Chemistry (B3&B4)*	4
CHEM 128 General Chemistry	4
CHEM 129 General Chemistry	4
CHEM 313 Survey of Biochemistry	5
GEOL 201 Physical Geology	3
NR/LA 318 Applications of GIS	3
² MATH 118 Pre-Calculus Algebra or MATH 141 Calculus I (B1)*	4
² MATH 119 Pre-Calculus Trigonometry or MATH 142 Calculus II (B1)*	4
³ PHYS 121/PHYS 141	4
STAT 218 Appl Statistics-Life Sciences	4
	<hr/>
	47

GENERAL EDUCATION (GE)

72 units required, 20 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² Students in the Environmental Science and Technology concentration take MATH 141 and MATH 142.

³ Students in the Environmental Science and Technology concentration take PHYS 141.

[†] No more than 4 units of SS 339 may be used.

Area B Science and Mathematics (no add'l units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division)

* 4 units in Support	0
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FREE ELECTIVES.....

0

180**CONCENTRATIONS (select one):****Environmental Management Concentration**

CHEM 312 Survey of Organic Chemistry (<i>transfer equivalent CHEM 212</i>).....	5
CRSC 411 Experimental Techniques & Analysis or STAT 313 Applied Experimental Design & Regression Models	4
ERSC 323 Geomorphology.....	4
GEOG 440 Advanced Applications in GIS.....	4
¹ Approved electives.....	11
<i>Select 8 units from the following:</i>	
CHEM 341;	
CRP 212, 336;	
CRP/NR 404, 408;	
GEOG 440;	
NR 142, 306, 320, 335, 416, 418, 425;	
NR 311;	
PHIL 340;	
RPTA 302;	
SS 339 [†] , 440, 444, 453	

28

Environmental Science and Technology Concentration

CHEM 316 (<i>transfer equivalent CHEM 216</i>), 317 (<i>transfer equivalent CHEM 217</i>) Organic Chemistry I, II	5,5
<i>Select from:</i> CHEM 218/318, 231/331, 319, 341, 481	8
<i>Select from:</i> ENVE 325, 330, 434, 439; SS 442	6
STAT 313 Applied Experimental Design & Regression Models or CRSC 411 Experimental Techniques & Analysis.....	4

28

Land Resources Concentration

CHEM 312 Survey of Organic Chemistry (<i>transfer equivalent CHEM 212</i>).....	5
CRSC 411 Experimental Techniques & Analysis ...	4
¹ Approved electives.....	19
<i>Select 19 units from any one minor, or select 19 units from the following courses.</i>	
<i>Note: The prerequisite courses are not listed - check the catalog.</i>	
AG 450;	
AGB 321, 370;	
AGED 404;	
ANT 310;	
ARCH 202;	
ASCI 220, 221, 222, 223, 329, 420;	
BIO 112, 114, 161, 162, 325, 415, 427, 435;	
BOT 238, 323, 324, 433;	
BRAE 340, 348, 405, 435, 440, 448;	
CHEM 316, 317, 318, 319, 341, 481;	
COMS 212;	
CRP 212, 214;	
CRSC 203, 333, 445;	
DSCI 101, 121, 230;	
EHS 343;	
ENVE 325, 330, 434, 436, 439;	
ERSC/GEOG 250, 325, 333;	
FRSC 132, 133, 230, 231, 342;	
FSN 121, 125, 341;	
GEOG 150, 300, 301, 308, 340; GEOL 204;	
HUM 302;	
JOUR 205;	
LA 551;	
MCRO 221;	
NR 141, 142, 208, 306, 420;	
NR/GEOG/LA 318;	
NR 311;	
PHIL 321, 331, 337, 340;	
PPSC 311, 321, 327, 431, 441;	
PSY 301, 302;	
RPTA 302;	
SOC 309;	
SS 301, 310, 339 [†] , 433, 440, 442, 444, 453;	
VGSC 230, 260;	

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¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

[†] No more than 4 units of SS 339 may be used.

Food Science & Nutrition

Agricultural Sciences Bldg. (11), Room 244
805 756-2660
<http://foods.calpoly.edu>

Department Head, Gour Choudhury

Louise A. Berner	Aydin Nazmi
	Tom Neuhaus
Doris Derelian	Lisa M. Nicholson
Laura Hall	Peggy C. Papathakis
Brian C. Hampson	Scott K. Reaves
Hany M. Khalil	Gerry Ritchie
Amanda Lathrop	Madoka Watabe-Belzel
Joseph Montecalvo, Jr.	

ACADEMIC PROGRAMS

Food Science – BS, Minor

Nutrition – BS, Minor

The department offers two degree programs designed to prepare graduates for employment in the general areas of human nutrition and commercial food processing. Graduates in Nutrition find rewarding careers in public health, business, food industry, clinical nutrition, food systems management and education. Food Science graduates take responsible positions in commercial food processing and product development, sales, quality assurance and government regulation. Opportunities for private consulting and business are available to graduates in both majors, depending on personal interests and initiative. The department also offers minors in Food Science and Nutrition.

Students are involved in a number of clubs, including the 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.

Experiential Learning

The department is equipped with a food processing pilot plant, culinary laboratory, and chemistry-style teaching and research laboratories. These and additional laboratories are designed for teaching courses in nutrition, foodservice management, sensory evaluation of foods, food chemistry, food product development, food processing and quality control. Students get hands-on experience with pilot scale commercial processing equipment.

Through the student enterprise program, students can manufacture and market various food products, which are marketed throughout the campus community. Enterprise projects are designed to simulate industry and business practices. Students are encouraged to gain valuable

experience by working during the summer or by participating in one of the university co-op or internship programs.

BS Food Science

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

Concentrations

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

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

Culinary is designed for students wanting to apply a strong science background in ingredient development, food product development, or in entrepreneurial pursuits. This concentration serves the growing need for food scientists who are positioned to make decisions that require a blend of management training, culinary expertise, and a fundamental science background. Graduates are prepared to pursue advanced degrees in food science or may choose to attend a professional culinary program.

BS Nutrition

The program offers a broad preparation in the science of nutrition. Coursework includes foods and nutrition, general chemistry, organic chemistry, biochemistry, microbiology, general biology, and a variety of general education courses.

Concentrations

Applied Nutrition prepares students for careers in various areas of nutrition, including dietetics, food systems management, nutrition communications, and community nutrition. This concentration is a Didactic Program in Dietetics (DPD), accredited by the Commission on Accreditation for Dietetics Education, of the American Dietetic Association, 120 Riverside Plaza, Suite 2000, Chicago, IL 60606-6995, (312) 899-4876. Students in this concentration who graduate with a minimum higher education overall GPA of 2.75 and receive a Verification Statement are eligible to apply for admission to an accredited dietetic internship, upon completion of which the graduate must pass a national examination administered by the Commission on Dietetic Registration to

qualify as a registered dietitian (RD). Graduates also are prepared to pursue advanced degrees in foods and nutrition, public health, and food systems management.

Nutrition and Food Industries is designed for students who want to apply knowledge of nutrition to careers in the food industry and related organizations (such as commodity and other non-profit organizations, pharmaceutical companies, or government). A Food Science or Agricultural Communications minor can be earned with proper course selection within this concentration and within the 186 unit degree requirement. Students are prepared for positions in food product research and development, quality and regulatory operations, food and health communications, public relations, extension, and technical sales. In addition, students are prepared for graduate study in food science, nutrition, or related fields.

Nutrition Science emphasizes a strong background in basic sciences and human nutrition for students planning further study in graduate school or a health-related profession such as medicine, dentistry, nursing, or physical therapy. Students need to check with their advisors for specific requirements for various health-related professions.

BS Wine and Viticulture

In addition to those majors listed above, the department is involved with this multidisciplinary major and the Enology concentration is administratively housed in the Food Science and Nutrition Department. Please see pages 100, 104 for information on the BS Wine and Viticulture major.

Food Science Minor and Nutrition Minor

The department offers minors in either food science or nutrition to qualified students from across campus. Specific criteria apply to entering into the minor program and interested students should see either of the minor advisors.

Interdisciplinary Minors

The department participates in offering interdisciplinary minors in Packaging (see Orfalea College of Business section), and Wine and Viticulture (see College of Agriculture, Food and Environmental Sciences section).

Graduate Program

Cal Poly offers an MS in Agriculture with a specialization in Food Science and Nutrition. Please refer to the MS Agriculture section in the College of Agriculture, Food and Environmental Sciences.

Dietetic Internship

Cal Poly's dietetic internship is accredited by the Commission on Accreditation for Dietetics Education (CADE) of the American Dietetic Association. The program consists of at least 1,120 hours of supervised practice and at least 108 hours of class, seminars, and professional meetings. Upon completion, interns must pass a national examination administered by the Commission on Dietetic Registration to qualify as a Registered Dietitian (R.D.). Applications for fall quarter are due mid-February.

BS FOOD SCIENCE

☐ 60 units upper division

☐ GWR

☐ 2.0 GPA

☐ USCP

* = Required in Major/Support; also satisfies GE

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

MAJOR COURSES

FSN 101 Orientation/Food Science & Nutrition	1
FSN 125 Introduction to Food Science.....	4
FSN 204 Food Processing Operations	4
FSN 210 Nutrition	4
FSN 250 Food/Nutrition: Customs/Culture (D4)*	4
FSN 270 Food and Wine Plant Sanitation	4
FSN 275 Principles of Food Safety & Hazard Anly	4
FSN 311 Sensory Evaluation of Food	4
FSN 330 Intro to Principles of Food Engineering ...	4
FSN 334 Food Packaging	3
FSN 335 Food Quality Assurance	4
FSN 364 Food Chemistry	4
FSN 368 Food Analysis.....	4
FSN 374 Food Laws and Regulations	4
FSN 408 Food Comp Science and Product Dev.....	4
FSN 461 Senior Project I.....	3
FSN 462 Senior Project II.....	3
Concentration courses (see below)	28
	90

SUPPORT COURSES

AGB 214 Agribusiness Financial Accounting <i>or</i>	
BUS 212 Fin Acctg for Nonbusiness Majors.....	4
BIO 111 General Biology (B2 & B4)*	4
CHEM 127, 128 General Chemistry I, II (B3/B4)*	4,4
CHEM 312 Survey of Organic Chemistry	5
CHEM 313 Survey of Biochemistry and Biotech...	5
ECON 201 Survey of Economics (D2)*	4
MATH 118 Pre-Calculus Algebra (B1)*	4
MCRO 221 Microbiology	4
MCRO 421 Food Microbiology.....	4
PHYS 121 College Physics I	4
STAT 218 Applied Statistics/Life Sciences (B1)*	4
	50

GENERAL EDUCATION (GE)

72 units required, 24 of which are specified in Major/Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing.....	4

Area B Science and Mathematics (no add'l units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support	0
B3 Physical Science * 4 units in Support	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (12 units)

D1 The American Experience (40404)	4
D2 Political Economy *4 units in Support	0
D3 Comparative Social Institutions	4
D4 Self Dev (CSU Area E) * 4 units in Major.....	0
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

Area F Technology Elective (upper division) (4 units)	4
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FREE ELECTIVES**0****188****CONCENTRATIONS (select one)****Advanced Food Science Concentration**

ENVE 330 Environmental Quality Control	4
FSN 444 Engrg Concepts in Food Processing	4
FSN 474 Advanced Food Processing.....	4
MATH 161 Calculus for Life Sciences I.....	4
MATH 162 Calculus for Life Sciences II	4
Approved electives. Select from:	8
AGB 212, 301, 401;	
ASCI 211, 384, 415;	
BUS 207, 384;	
CHEM 129, 317, 318, 319;	
DSCI 223, 230, 231, 232, 401, 434, 435, 444;	
FRSC 210, 230, 311;	
FSN 121, 201, 244, 285, 304, 322, 341;	
401, 410, 426;	
HCS 421;	
IT 330, 341;	
MCRO 320, 342;	
POLS 333;	
PSY 201/202;	
one quarter of foreign language	

28**Applied Food Technology Concentration**

FSN 410 Nutrit. Implications/Food Ind. Practices...	4
FSN 444 Engrg Concepts in Food Processing	4
FSN 474 Advanced Food Processing.....	4
Approved electives. Select from:	16
AGB 212, 301, 401;	
ASCI 211, 384, 415;	
BUS 207, 384;	
CHEM 129, 317, 318, 319;	
DSCI 223, 230, 231, 232, 401, 434, 435, 444;	
FRSC 210, 230, 311;	
FSN 121, 201, 244, 285, 304, 322, 342, 401,	
426;	
HCS 421;	
IT 330, 341;	
MCRO 320, 342;	
POLS 333;	
PSY 201/202;	
one quarter of foreign language	

28**Culinary Concentration**

AGB 301 Food/Fiber Marketing.....	4
FSN 121 Fundamentals of Food	4
FSN 304 Adv. Culinary Principles and Practice.....	4
FSN 321 Culinary Mgt: Principles and Practice.....	4
FSN 343 Institutional Foodservice I.....	3
FSN 344 Institutional Foodservice II.....	4
Approved electives. Select from:	5
AGB 212, 401;	
ASCI 211, 384, 415;	
BUS 207, 384;	
CHEM 129, 317, 318, 319;	
DSCI 223, 230, 231, 232, 401, 434, 435, 444;	
FRSC 210, 230, 311;	
FSN 201, 244, 285, 322, 341, 401, 410,	
426, 444, 474;	
HCS 421;	
IT 330, 341;	
MCRO 320, 342;	
POLS 333;	
PSY 201/202;	
one quarter of foreign language	

28**BS NUTRITION**

- 60 units upper division GWR
 2.0 GPA USCP

* = Required in Major; also satisfies GE

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

MAJOR COURSES

FSN 101 Orientation/Food Science/Nutrition Majors	1
FSN 121 Fundamentals of Food	4
FSN 210 Nutrition	4
FSN 230 Elements of Food Processing.....	4
FSN 250 Food and Nutrition: Customs and Culture (D4)* (USCP)	4
FSN 310 Maternal and Child Nutrition.....	4
FSN 315 Nutrition in Aging	4
FSN 328, 329 Nutrient Metabolism I, II.....	4,4
FSN 415 Nutrition Education and Communications	4
FSN 420 Critical Evaluation of Nutrition Research	4
FSN 461 Senior Project I.....	3
MCRO 221 Microbiology <i>or</i> MCRO 224 General Microbiology I (B2 & B4)*	4
CHEM 127 General Chemistry I (B3&B4)*	4
CHEM 128 General Chemistry II	4
¹ CHEM 312 Survey of Organic Chemistry <i>or</i> CHEM 316 Organic Chemistry I (<i>transfer equivalents</i> CHEM 212, 216).....	5
¹ CHEM 313 Surv Biochemistry & Biotechnology <i>or</i> CHEM 371 Biochemical Principles.....	5
ECON 201 Survey of Economics (D2)*	4

¹ Most Nutrition majors should take the lower numbered courses. Students choosing the Nutrition Science concentration may need to take higher numbered courses, depending on their career goals and approved electives. Students selecting CHEM 316 must also take CHEM 317 and CHEM 318. See advisor.

MATH 118 Pre-Calculus Algebra (B1)*	4
<i>(MATH 116 & 117 substitute)</i>	
STAT 218 Applied Statistics Life Sciences (B1)*	4
BIO 161 Intro to Cell and Molecular Biology	4
Concentration courses (see below).....	56
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GENERAL EDUCATION (GE)

72 units required, 24 of which are specified in Major.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (no additional units req'd)

B1 Mathematics/Statistics * 8 units in Major	0
B2 Life Science * 4 units in Major.....	0
B3 Physical Science * 4 units in Major.....	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (12 units)

D1 The American Experience (40404)	4
D2 Political Economy * 4 units in Major.....	0
D3 Comp. Social Institutions	4
D4 Self Dev. (CSU Area E) * 4 units in Major	0
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

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FREE ELECTIVES.....

0

186

CONCENTRATIONS (select one)

Applied Nutrition Concentration

FSN 321 Culinary Mgt: Principles and Practice	4
FSN 343, 344 Institutional Foodservice I, II.....	3,4
FSN 416 Community Nutrition.....	4
FSN 417 Nutrition Counseling.....	4
FSN 426 Food Systems Management	4
FSN 429, 430 Clinical Nutrition I, II	4,4
BIO 302 Human Genetics <i>or</i> BIO 303 Survey of Genetics	4
PSY 201/202 General Psychology	4
ZOO 331, 332 Human Anatomy/Physiology I, II	5,5
¹ Approved electives. Select from:	7
ASCI 211;	
BIO 162;	
BUS 207, 212;	
CHEM 129, 377;	
COMS 301;	
DSCI 231, 232;	
ECON 303;	

ENGL 310;
 FSN 244, 275, 304, 341, 374;
 JOUR 203, 205, 312, 342;
 KINE 301, 303;
 MCRO 225, 320, 342, 421, 423;
 PHIL 339; PSY 256, 317, 318, 340, 405;
 SCM 451;
 one quarter of foreign language

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Nutrition and Food Industries Concentration

FSN 275 Principles of Food Safety and Hazard Analysis.....	4
FSN 311 Sensory Evaluation of Food	4
FSN 364 Food Chemistry	4
FSN 368 Food Analysis.....	4
FSN 374 Food Laws and Regulations	4
FSN 408 Food Comp. Science and Product Dev.	4
FSN 410 Nutr Implications of Food Ind Practices	4
AGB 301 Agricultural Marketing	4
Select one from: ASCI 211; FSN 204, 244, 341; or DSCI 231 (3) <i>and</i> DSCI 232 (1).....	4
Select one from: DSCI 230, FRSC 230, VGSC 230	4
¹ Approved electives. Select from:	16
AGC 407;	
AGED 404;	
ASCI 211, 384, 415;	
COMS 301;	
DSCI 231, 232;	
ENGL 210, 310;	
FSN 204, 244, 270, 304, 321, 330, 334, 335, 341, 343, 344, 426, 444, 474;	
JOUR 203, 205, 312, 331, 342, 407;	
MCRO 421;	
PHYS 121;	
PSY 201/202	

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Nutrition Science Concentration

FSN 416 Community Nutrition.....	4
FSN 429 Clinical Nutrition I.....	4
FSN 430 Clinical Nutrition II	4
BIO 302/BIO 351/BIO 303.....	4
PHYS 121 College Physics I	4
ZOO 331, 332 Human Anatomy/Physiology I, II....	5,5
¹ Approved electives. Select from:	26
ASCI 403, 503;	
BIO 160, 162, 253, 305, 405, 426, 452, 476;	
BUS 207, 212;	
CHEM 129, 231, 317, 318, 319, 331, 372, 373, 375, 377, 458, 474, 477;	
COMS 418;	
ECON 303;	
FSN 417;	
KINE 181, 301, 302, 303, 304, 305, 308, 402, 406, 445, 446;	
MATH 161/141, 162/142, 143;	

¹ Please consult the FSN advising materials and catalog for prerequisites.

MCRO 225, 320, 342, 402, 421, 423, 433;
 PHIL 339;
 PHYS 122, 123;
 PSY 201/202, 256, 310, 317, 318, 330, 340, 405,
 460, 472;
 SCM 101, 363, 451;
 SOC 326;
 ZOO 422, 425, 428;
 one quarter of foreign language

Culinary Science and Food Service Management
 FSN 121, 321, 343
 Plus select FSN 304 or FSN 344
Sports Nutrition (CHEM 313 or equivalent as prerequisite)
 FSN 328, 329, KINE 303, and 451

27-28

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FOOD SCIENCE MINOR

The minor is principally designed for students majoring in related academic disciplines who desire employment in the food industry. Students acquire the fundamental technical skills necessary to understand basic issues and concepts in food science such as food processing, food safety, and quality assurance.

Required core

FSN 125 Introduction to Food Science
 or FSN 230 Elements of Food Processing 4
 FSN 204 Food Processing Operations 4
 FSN 335 Food Quality Assurance..... 4

Emphasis area courses: 16

Select from the following courses (3 of which must be 300-400 level):

ASCI 211, 384, 415;
 FSN 244, 270, 285, 311, 330, 341, 354, 364, 368,
 374, 408, 410, 444, 474;
 DSCI 231, 232; MCRO 421

28

NUTRITION MINOR

The minor is designed for students majoring in science disciplines (Chemistry, Biological Sciences, Kinesiology), Agribusiness or Agricultural Communications, and other interested majors such as Business or Psychology. Students can enhance career opportunities or qualification for admission into graduate programs or allied health fields. See the department Nutrition minor coordinator for criteria for admission into the Nutrition minor.

Required core

FSN 210 Nutrition (B5) 4
 FSN 310 Maternal and Child Nutrition..... 4
 FSN 315 Nutrition in Aging..... 4

Emphasis area courses (Select one area) 15-16

Clinical (CHEM 313 and ZOO 331, 332 or equivalents as prerequisites)

FSN 328, 329, 429, and 430

Community (CHEM 313 or equivalent as prerequisite)

FSN 328, 329, and 416

Plus select one of the following:

FSN 250, 415; ANT 401; COMS 418;
 POLS/UNIV 333; RPTA 450; SOC 323.

Horticulture & Crop Science

Agricultural Sciences Bldg. (11), Room 230
805 756-2279/1237 FAX 805 756-6504
<http://aepe.calpoly.edu>

Department Head, John C. Peterson

J. Wyatt Brown	W. Keith Patterson
Michael J. Costello	John C. Phillips
Lauren C. Garner	Mark D. Shelton
David W. Hannings	Robert R. Shortell
David H. Headrick	Virginia R. Walter
Daniel E. Lassanske	David J. Wehner
Jason D. Lewis	Jeffrey C. Wong

ACADEMIC PROGRAMS

Agricultural and Environmental Plant Sciences – BS
Crop Science – Minor
Fruit Science – Minor
Landscape Horticulture – Minor
Ornamental Plant Production – Minor
Plant Protection – Minor
Wine and Viticulture – BS, Minor

The department offers the Agricultural and Environmental Plant Sciences major leading to the Bachelor of Science degree. Within this major are seven concentrations: Crop Science, Fruit Science, Greenhouse and Nursery Plant Production, Plant Protection Science, Public Horticulture, Sustainable Landscape Management and Design, and Turfgrass and Sports Field Management. Each concentration is well-grounded in the sciences and designed to prepare students for many attractive career opportunities. In addition, the department offers the interdisciplinary program, Wine and Viticulture, leading to the Bachelor of Science degree.

Experiential Learning Opportunities and Facilities

The Horticulture and Crop Science Department has well-equipped laboratories for instruction in plant biotechnology, insect and weed pest management, postharvest technology, plant production, winemaking, and landscape horticulture, including CAD capabilities and plant materials.

Students have hands-on experiences in production and marketing of landscape and ornamental plants using comprehensive facilities at the 16-acre Environmental Horticulture Unit. This unit includes 35,000 square feet of greenhouses, a 5,000 square-foot retractable roof greenhouse, 7,500 square feet of shade houses, a 10,000-square foot U.S. Golf Association specification experimental green, an extensive field container growing area, and a five-acre arboretum. Additionally there are six horticulture laboratories, four of which are fitted with “smart-room”

technologies for state-of-the-art teaching capabilities. The Leaning Pine Arboretum and Gardens is an outdoor laboratory. In addition, the 200 acres of landscaped campus are planted with many interesting and unusual trees and shrubs from all over the world, as well as native plant materials. The plant specimens are frequently used for laboratory instruction.

The Crops Unit has 70 acres of productive citrus, avocados, grapes, deciduous orchard, and berries, with additional nonbearing acreage for instructional use. There are also approximately 35 acres of annual vegetable and forage crops, of which eleven acres are certified organic. There is a modern building containing two teaching labs with prep rooms, six greenhouses, cooler, hydroponic vegetable production facility and a state-of-the-art fruit and vegetable processing line.

The technological aspects of instruction are enhanced by an array of equipment required in crop and fruit production systems, postharvest handling, postharvest research lab, biotechnology lab, seed processing, pesticide application, controlled environment rooms, nursery and greenhouse operations, parks and sport grounds maintenance, landscape construction and maintenance, and a florist shop. Field trips supplement instruction and are strongly encouraged for most classes.

Students are encouraged to gain experience and earn income by participating in the enterprise project program or by working on the campus farm. Enterprise projects are run under faculty supervision but are student-operated. These projects provide students with a “no risk” glimpse of a commercial enterprise. The department offers enterprise project experiences in commercial-scale production of vegetable crops, wine grapes, citrus, avocados, deciduous fruit and nut crops, floriculture, nursery plants, and forage crops. Available marketing outlets range from contract sales of vegetable seeds, wholesaling to area supermarkets, to direct marketing at local farmers’ markets, garden centers, florist shops, and other campus outlets. Certified organic produce is marketed through a biweekly Farmers Market, farmed and sold to local restaurants and markets.

The department supports co-curricular activities for its students, including three student clubs. Student teams in horticulture science, flower judging, floral design and landscape industry areas continue to win national championships.

BS Agricultural and Environmental Plant Sciences

Students in this major begin with core courses that provide a thorough introduction to the various concentrations. Each concentration, in turn, has required courses, which may be shared by other concentrations. In their first year, students explore curriculum and professional opportunities to enable them to choose a concentration. In consultation with their advisor, students have the flexibility to select electives

within the concentrations according to their career goals and interests.

Internships are readily available to students and are highly recommended. Interns are typically placed with private industry and public facilities all across the United States and in several foreign countries. Over \$100,000 of scholarships are also available to students as are several undergraduate student assistantships which are sponsored by industry. Program alumni are employed nationally and internationally and are often leaders in their industries. Graduates of the department are in great demand. Typically there are more internship and job opportunities than there are students to fill them.

An extensive list of periodicals covering all of the related disciplines in the department is available to students through the Robert E. Kennedy Library on campus.

Concentrations

Each concentration offers introductory, intermediate and advanced classes. The concentrations offer their own course of study (including required courses and electives) as well as opportunities for cross-training and multi-disciplinary learning.

Crop Science. A crop scientist develops cropping systems that are both profitable and ecologically sustainable. Students learn about the management of irrigation and equipment, the timing of planting and harvesting, plant and insect pest management, fertilization, postharvest handling and marketing techniques and a variety of other ways to efficiently and sustainably produce food and fiber. The concentration focuses on areas of innovation and development such as postharvest technology, plant biotechnology, integrated pest management and precision farming.

Fruit Science. This concentration prepares students for the current and future challenges of the multi-billion dollar fruit and nut crop industry. The curriculum focuses on the fundamentals of crop growth and production. Students experience innovative production and propagation methods, including sustainable irrigation, fertilization and pest-management techniques, and learn about high-density orchard design and postharvest technology. The concentration is also flexible enough to allow students to pursue minors in Agricultural Business or Plant Protection Science.

Greenhouse and Nursery Plant Production. This concentration focuses on the production, utilization and maintenance of trees, flowers, shrubs and house plants. It provides unique opportunities to study a wide range of plant life in the micro-climates that exist close to campus. Students acquire a solid understanding of the science behind the practical techniques used to grow, propagate and maintain plants. Students also learn which plants are best adapted to specific environments, precision growing techniques, the use of controlled environments, and hydroponics. This concentration offers a technical education which prepares students to meet the present and

future demands of the greenhouse and nursery plant industries.

Plant Protection Science. Approximately one-third of the world's food crops are destroyed each year by insects, rodents, diseases and other pests. Finding ways to reduce these losses is the challenge of the plant protection specialist. In this concentration, students learn a broad range of pest management subjects including entomology, plant pathology and weed control. Students develop an understanding of crop production principles, ecology, biotechnology, pesticide toxicology and environmental science. As environmental regulations continue to increase, employment opportunities will grow for those holding professional licenses, and this concentration prepares students to take the California Pest Control Advisor (PCA) license exam.

Public Horticulture. This concentration is for students interested in a professional career promoting horticulture, horticultural education, native plant restoration, green roofs and walls, and the public displays of plants. Possible careers include positions in city or urban horticulture, urban forestry, the directorship of a botanical garden or park, professional garden writing and editing, and horticultural therapy. Students also have the opportunity to prepare for a career managing corporate horticultural environments, including corporate grounds and building interiors.

Sustainable Landscape Management and Design. This concentration provides students with real-world experience in the landscape industry while teaching the skills to design, install and maintain landscapes and gardens. Students develop knowledge of landscape plants and plant care, and learn the basics of landscape contracting, including the construction processes and materials used in the landscape industry. Opportunities are also provided to acquire more advanced skills in design and plant care, both for interior and exterior landscapes.

Turfgrass and Sports Field Management. This concentration gives students a well-rounded education in turfgrass species selection and their uses in sports field management. Students study turfgrass physiology – especially as affected by various environmental conditions – and design technology. Students also gain a solid understanding of the cultural procedures and equipment needed for turfgrass propagation, mowing, irrigation, fertilization and cultivation, and the pest control programs required to maintain turf. This concentration offers students a science-based education that prepares them to manage sports complexes, golf courses and commercial landscape turf operations.

BS Wine and Viticulture

The major provides a unique interdisciplinary learning experience for students, combining an understanding of vineyards, winemaking, and wine business. With the campus located in the heart of San Luis Obispo wine country, Cal Poly students have the added benefit of gaining hands-on

experience at more than 300 local vineyards and wineries. Professional positions within the grape and wine industry are now multi-dimensional, with winemakers and grape-growers working together. To develop successful strategies, management teams must understand all aspects of wine.

The major is based on fundamental and applied sciences, modern agribusiness principles, and appropriate social sciences, plus it encompasses grape cultivation, enology, and wine business. The curriculum fosters an academic alliance among production agriculture, food science, and agricultural business interests and provides an academic understanding of the “vine to glass” opportunity.

Cal Poly has its own 14-acre vineyard and pilot winery which provide students an excellent opportunity to practice the “learn-by-doing” method of education.

Concentrations

Enology. The science of winemaking and its creative and practical application. Students monitor and assess wines and winemaking choices using sensory, chemical and microbiological analyses. Graduates are able to make creative winemaking decisions, manage a winery and provide successful solutions to winemaking challenges.

Viticulture. Intensive training in all aspects of quality wine grape production. Students learn site evaluation and vineyard development, disease and pest management, sustainability, and state-of-the-art cultural practices. Graduates typically become vineyard managers, pest control advisors, or vineyard owners.

Wine Business. Students learn financial management, principles of vineyard and winery operations, strategic planning, branded wine marketing, packaging, wine consumer behavior, and government compliance. Graduates are prepared for a variety of wine industry careers, with many planning to operate vineyards or wineries of their own.

Graduate Programs

Cal Poly offers a Master of Science degree in Agriculture with specializations in Crop Science, Environmental Horticultural Science, and Plant Protection Science, among others. Please refer to the MS Agriculture section of the College of Agriculture, Food and Environmental Sciences.

CROP SCIENCE MINOR

Designed for students majoring in related academic disciplines who desire careers in crop production or the associated industries. The minor offers a broad-based knowledge of the science and technology of agronomy and vegetable production, especially as practiced in California.

Required courses

HCS 120 Principles of Horticulture/Crop Science	4
CRSC 244 Precision Farming	4
VGSC 190 California Vegetable Production	4
CRSC 203/VGSC 202 Enterprise Project	2
BRAE 340 Irrigation Water Management.....	4

Approved elective courses	12
<i>Select from the following:</i>	
CRSC 333, 445; HCS 304, 421;	
PPSC 311, 321	

30

FRUIT SCIENCE MINOR

The minor is designed for students majoring in related academic disciplines who desire to seek careers in fruit production or the associated industries. The minor offers a broad-based knowledge of the science and technology of fruit and nut production.

Required courses

HCS 120 Principles of Horticulture/Crop Science...	4
FRSC 132 Pomology I.....	4
FRSC 133 Pomology II.....	4
FRSC 342 Citrus and Avocado Fruit Production....	4
FRSC 202 Enterprise Project	2

Approved elective courses	10
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Select from the following: BRAE 340; BOT 323; CRSC 445; FRSC 402; HCS 329, 421; PPSC 311, 321, 327

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LANDSCAPE HORTICULTURE MINOR

The minor provides students with an understanding of the landscape horticultural industry and provides them with basic skills to understand design, installation and maintenance of landscapes. Students develop knowledge of landscape plants and plant care as well as the basics of landscape contracting, including construction processes and materials used in the landscape industry. Students learn of the wide range of career opportunities in the industry. Depending on which electives are chosen, students also learn more advanced skills and concepts in the areas of design, plant care (both interior and exterior), and computer applications for design and presentation techniques.

Required courses

EHS 123 Landscape Installation and Maintenance	4
EHS 126 Landscape Construction	3
EHS 127 Horticulture and Landscape Design	4
EHS 230/EHS 231/EHS 232.....	4
EHS 331 Landscape Contracting	4

Approved Electives	11
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Select from:
EHS 301, 315, 324, 343, 381, 421, 434, 437

30

ORNAMENTAL PLANT PRODUCTION MINOR

The minor gives a student an understanding of the important ornamental crops grown in California, how they are propagated and grown, how we manipulate the environment to control the crop, and how they are harvested and handled after harvest. Ornamental plants are a multibillion dollar part of the agriculture industry in California, and students

majoring in Agricultural Business, Crop Science, or Fruit Science may well deal with ornamental plants as crops during their careers.

Required courses

HCS 120 Principles of Horticulture/Crop Science...	4
HCS 124 Plant Propagation	4
EHS 245 Horticultural Production Techniques.....	3
Approved Electives <i>Select from:</i>	19
<i>At least 15 units must be at 300-400 level</i>	
EHS 210/231/232, 310, 315, 324, 341, 342, 424;	
HCS 327, 340	

30

PLANT PROTECTION MINOR

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

Required courses

Advanced versions of the following courses may be substituted by production majors.

BOT 323 Plant Pathology <i>or</i>	
BOT 324 Ornamental and Forest Pathology	4
PPSC 311 Agricultural Entomology	4
PPSC 321 Weed Biology and Management.....	4

Courses in area of emphasis..... 16

Students elect one Emphasis based on their major.

Emphasis I: for Plant Production Majors (16 units)

For majors in: Agricultural and Environmental Plant Sciences, Forestry and Natural Resources (Forestry Concentration), and Wine and Viticulture.

Select 16 units from: PPSC 327, 405, 414, 421, 427, 431, 441

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

¹ Select 12 units of specified agriculture production courses from the following:

- AG 360, 450;
- ASCI 112, 231, 311, 329;
- CRSC 123, 203, 244, 333, 402, 445;
- DSCI 121, 230, 333;
- EHS 123, 210, 230, 231, 232, 245, 310, 324, 341, 342, 343, 381, 382, 421, 424, 433;
- FRSC 123, 132, 133, 202, 210, 230, 231, 331, 342, 402;
- HCS 110, 120, 124, 231, 340;
- NR 141, 260, 350, 365, 414, 503, 504;
- VGSC 190, 202, 230, 402, 423

¹ Select one course (4 units) from:

- PPSC 327, 405, 414, 421, 427, 431, 441

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WINE AND VITICULTURE MINOR

The goals of the minor are to educate students in the various aspects of wine and viticulture management, addressing knowledge of viticulture, enology, and marketing with skill areas of growing practices, winemaking and wine marketing.

Contact the minor advisor for requirements for being admitted into the Wine and Viticulture minor.

Required core courses

WVIT 102 Global Wine and Viticulture	4
WVIT 202 Fundamentals of Enology	4
WVIT 339 Internship in Wine and Viticulture	4
WVIT 433 Wine Selling <i>or</i> AGB 443 Branded Wine Marketing	4
WVIT 463 Issues/Trends/Careers in Wine Ind.....	2
FRSC 210 Viticultural Practices	2
FRSC 311 Survey of Viticulture.....	4
	<hr/> 24

Interdisciplinary Minors

The department participates in offering interdisciplinary minors in Geographic Information Systems for Agriculture, Land Rehabilitation, and Sustainable Agriculture. Please see College of Agriculture, Food and Environmental Sciences section for more information.

BS AGRICULTURAL AND ENVIRONMENTAL PLANT SCIENCES

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

HCS 110 Orientation to Horticulture/Crop Science	2
HCS 120 Principles of Horticulture/Crop Science...	4
HCS 124 Plant Propagation	4
HCS 304 Plant Breeding.....	4
HCS 327 Abiotic Plant Problems.....	3
HCS 410 Crop Physiology.....	4
HCS 461 Senior Project I.....	2
HCS 462 Senior Project II	2
HCS 463 Senior Seminar	1
PPSC 311 Agricultural Entomology	4
PPSC 321 Weed Biology and Management	4
BOT 121 General Botany (B2 & B4)*	4
BOT 323 Plant Pathology	4
SS 121 Introductory Soil Science	4
Concentration courses (see below)	42

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¹ Approval of minor advisor required.

SUPPORT COURSES

BRAE 340 Irrigation Water Mgmt (Area F)*	4
BUS 212 Financial Acctg/Nonbusiness Majors	4
CHEM 111 Survey of Chemistry (B3&B4)*	5
CHEM 312 Survey of Organic Chemistry	5
ECON 201 Survey of Economics (D2)*	4
MATH 118 Pre-Calculus Algebra (B1)*	4
SPAN 111 Elem Hispanic Lang/Culture (USCP)	4
SS 221 Fertilizers and Plant Nutrition.....	4
STAT 218 Applied Statistics/Life Sciences (B1)*	4
38	

GENERAL EDUCATION (GE)

72 units required, 24 of which are specified in Support.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (no additional units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts.....	4
C4 Upper-division elective.....	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy * 4 units in Support.....	0
D3 Comparative Social Institutions.....	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division)

* 4 units in Support	0
48	

FREE ELECTIVES.....

6
180

CONCENTRATIONS (select one)

Crop Science Concentration

VGSC 190 California Vegetable Production	4
VGSC 202 or CRSC 203 Enterprise Project.....	2
HCS 231 Commercial Seed Production	4
CRSC 411 Experimental Techniques/Analysis.....	4
HCS 421 Postharvest Technology/Hort Crops.....	4
CRSC 445 Cropping Systems	4
¹ Approved electives.....	20

Select 20 units from the following:

- AG 315, 360;
- AGB 301, 310, 312, 321, 336, 401;
- CRSC 123, 244, 333;
- CRSC 402 or VGSC 402;

- FRSC 132, 231, 331, 342;
- HCS 200[†], 339[†], 340, 400[†], 450;
- PPSC 327, 405, 421, 427, 431, 441;
- SS 321, 322;
- VGSC 423

42

Fruit Science Concentration

FRSC 123 Beekeeping	3
FRSC 132, 133 Pomology I, II	4,4
FRSC 202 Enterprise Project	2
FRSC 231, 331 Viticulture I, II	4,4
FRSC 342 Citrus and Avocado Fruit Production....	4
CRSC 411 Experimental Techniques and Analysis	4
HCS 421 Postharvest Technology/Hort Crops	4
¹ Approved electives.....	9

Select 9 units from the following:

- AGB 260, 301, 310, 315, 321, 401;
- CRSC 333, 445;
- CRSC 402 or FRSC 402 or VGSC 402;
- FRSC 415;
- HCS 200[†], 339[†], 400[†], 450;
- PPSC 327, 405, 414, 421, 431, 441;
- SS 321, 322;
- VGSC 190 or 230, 423;
- WVIT 433

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Greenhouse and Nursery Plant Production Concentration

EHS 127 Horticulture and Landscape Design	4
² EHS 210 or EHS 310 Enterprise Project (I or II)	2
EHS 231, 232 Plant Materials I, II.....	4,4
EHS 245 Horticultural Production Techniques	3
EHS 315 Herbaceous & Specialty Plant Production	4
EHS 342 Potted Plant Production	4
HCS 340 Principles of Greenhouse Environment	4
PPSC 427 Disease and Pest Control Systems for Ornamental Plants	4
¹ Approved electives.....	9

Select 9 units from the following:

- AGB 401;
- BUS 310, 346, 409;
- CRSC 333;
- EHS 210 or 310, 324, 341, 381, 382, 402, 424;
- HCS 200[†], 339[†], 400[†], 421;
- PPSC 327, 405, 421, 431, 441

42

Plant Protection Science Concentration

CRSC 411 Experimental Techniques and Analysis	4
FRSC/VGSC 202 or CRSC/FRSC/VGSC 402 or EHS 210/310/402	2

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² The course selected to satisfy this requirement may not be taken again for credit as an approved elective.

[†] HCS 200 and 400 up to 2 units each; HCS 339 up to 4 units.

PPSC 327 Vertebrate Pest Management	4
PPSC 405 Advanced Weed Management	4
PPSC 421 Plant-Pest Interactions	4
PPSC 431 Insect Pest Management.....	4
PPSC 441 Biological Control for Pest Management	4
¹ Approved electives.....	16
<i>Select 16 units from the following:</i>	
AG 315;	
BIO 114;	
BOT 326;	
BRAE 331;	
CHEM 313;	
CRSC 123, 244, 333, 445;	
EHS 245, 315, 341, 342, 343;	
FRSC 132, 133, 231, 331, 342;	
HCS 200 [†] , 231, 339 [†] , 340, 400 [†] , 421, 450;	
MCRO 221, 436;	
PPSC 427;	
SS 322, 422;	
VGSC 190	

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Public Horticulture Concentration

EHS 123 Landscape Installation and Maintenance	4
EHS 127 Horticulture and Landscape Design.....	4
EHS 231, 232 Plant Materials I, II.....	4,4
EHS 343 Turfgrass Management	4
EHS 437 Park and Public Space Management.....	4
PPSC 427 Disease and Pest Control Systems for Ornamental Plants	4
¹ Approved electives.....	14
<i>Select 14 units from the following:</i>	
BRAE 331, 337;	
EHS 215, 225, 301, 324, 381, 382, 402, 421, 427, 434;	
HCS 200 [†] , 339 [†] , 340, 400 [†] ;	
PPSC 405, 431, 441	
May take up to two (2) courses from the following:	
BOT 313, 326, 335;	
RPTA 330;	
SS 310, 433	

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Sustainable Landscape Management and Design Concentration

EHS 123 Landscape Installation and Maintenance	4
EHS 126 Landscape Construction.....	3
EHS 127 Horticulture and Landscape Design.....	4
EHS 231, 232 Plant Materials I, II.....	4,4
EHS 331 Landscape Contracting	4
EHS 343 Turfgrass Management	4
¹ Approved electives.....	15
<i>Select 16 units from the following:</i>	
AGB 401;	
BRAE 331, 337;	
EHS 301, 324, 381, 382, 421, 433, 434, 427, 437;	
HCS 200 [†] , 339 [†] , 400 [†] ;	
PPSC 327, 405, 421, 431, 441	

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Turfgrass and Sports Field Management Concentration

EHS 231, 232 Plant Materials I, II.....	4,4
EHS 343 Turfgrass Management.....	4
EHS 430 Sports Field Construction/Management ...	4
EHS 433 Golf Course Management Operations	4
EHS 434 Landscape Management	4
HCS 339 Internship in Horticulture/Crop Science	4
PPSC 427 Disease and Pest Control Systems for Ornamental Plants	4
¹ Approved electives.....	10
<i>Select 10 units from the following:</i>	
BOT 326;	
BRAE 331, 337;	
CRSC 411;	
EHS 301, 324, 381, 421, 437;	
HCS 200 [†] , 400 [†] ;	
PPSC 327, 405, 431;	
SS 310, 322	

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BS WINE and VITICULTURE

- 60 units upper division GWR
- 2.0 GPA USCP

* = Required in Major; also satisfies GE

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

MAJOR COURSES

WVIT 101 Orientation to Wine and Viticulture	1
WVIT 102 Global Wine and Viticulture	4
WVIT 202 Fundamentals of Enology	4
WVIT 339 Internship in Wine and Viticulture	4
WVIT 442 Sensory Evaluation of Wine.....	4
WVIT 463 Issues, Trends and Careers in the Wine Industry	2
AGB 214 Financial Accounting.....	4
AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (USCP).....	4
BRAE 340 Irrigation Water Management (F)*	4
CHEM 111 Survey of Chemistry (B3)*	5
FRSC 231 Viticulture	4
FRSC 331 Advanced Viticulture.....	4
SS 121 Introductory Soil Science.....	4
Concentration courses (see below).....	73

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¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

[†] HCS 200 and 400 up to 2 units each; HCS 339 up to 4 units.

GENERAL EDUCATION (GE)

72 units required; 24 of which are specified in Major/Concentrations.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science & Mathematics (no additional units req'd)

B1 Math/Statistics * 8 units in Concentrations	0
B2 Life Science * 4 units in Concentrations	0
B3 Physical Science * 4 units in Major	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one from C1-C4)	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy * 4 units in Concentration	0
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division)

4 units in Major	0
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FREE ELECTIVES	11
	180

CONCENTRATIONS (select one)**Enology Concentration**

WVIT 203 The Anatomy of a Wine	2
WVIT 301 Wine Microbiology	4
WVIT 365 Wine Analysis and Amelioration	4
WVIT 404 Winemaking I	4
WVIT 405 Winemaking II	4
WVIT 406 Winemaking III	4
WVIT 433 Professional Wine Selling	4
CHEM 312 Survey of Organic Chemistry	5
ECON 201 Survey of Economics (D2)*	4
FSN 461 Senior Project	3
MATH 118 Pre-Calculus Algebra <i>or</i>	
MATH 161 Calculus for Life Sciences I (B1)* ...	4
MCRO 221 Microbiology (B2)*	4
STAT 218 Appld Stats for the Life Sciences (B1)*	4

¹ Approved electives	23
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Select 23 units from the following:

AGB 212, 301, 310, 312, 318, 322, 323, 444, 450;
 BIO 111, 303, 161;
 BOT 121, 323;
 BRAE 348, 439;
 CHEM 127, 128, 129, 313, 316, 317, 401;
 ECON 222[†];
 FRSC 202, 210, 402, 415;
 FSN 230, 270, 285, 354, 374, 462;
 HCS 421;
 IT 330, 411, 435;
 MCRO 342, 421;
 PPSC 311, 321, 414, 421;
 RPTA 214, 314, 320, 321, 412, 420;
 WVIT 339^{††};
 SPAN/ITAL/FR/GER 101, 102, 103 (limited to 8 units)

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Viticulture Concentration

BOT 121 General Botany (B2)*	4
BOT 323 Plant Pathology	4
CHEM 312 Survey of Organic Chemistry	5
ECON 201 Survey of Economics (D2)*	4
FRSC 202 Enterprise Project	2
FRSC 210 Viticultural Practices	2
FRSC 402 Enterprise Project Management	2
FRSC 415 Vine Physiology	4
HCS 461, 462 Senior Project I, II	2,2
MATH 118 Pre-Calculus Algebra <i>or</i>	
MATH 161 Calculus for Life Sciences I (B1)* ...	4
PPSC 311 Agricultural Entomology	4
PPSC 321 Weed Biology and Management	4
PPSC 414 Grape Pest Management	4
SS 221 Fertilizers and Plant Nutrition	4
STAT 218 Appld Stats for the Life Sciences (B1)*	4
WVIT 433 Professional Wine Selling	4

¹ Approved electives	14
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Select 14 units from the following:

AG 315, 360, 450, 452;
 AGB 212, 301, 310, 321, 409
 BIO 435;
 BOT 326, 335, 431;
 BRAE 438, 439;
 CRSC 244;
 GEOG 318, 328;
 FRSC 342;

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

[†] ECON 201 must be taken first, as it is not open to students with ECON 222 credit.

^{††} Limited to 2 units.

HCS 470;
 MCRO 221;
 PPSC 327, 405, 421, 431, 441;
 SS 321, 322;
 WVIT 203, 301, 365, 404, 405, 406

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Wine Business Concentration

AGB 202 Sales, Communication and Leadership in Agribusiness	4
AGB 212 Agricultural Economics	4
AGB 301 Food and Fiber Marketing	4
AGB 310 Agribusiness Credit and Finance	4
AGB 323 Agribusiness Managerial Accounting.....	4
AGB 422 Logistics in Global Agribusiness	4
AGB 443 Branded Wine Marketing.....	4
AGB 444 Wine Compliance and Market Analysis	4
AGB 450 Agribusiness Strategy Formulation.....	4
AGB 460 Research Methodology in Agribusiness	2
AGB 461 Senior Project	2
BIO 111 General Biology (B2)*	4
ECON 222 Macroeconomics (D2)*	4
MATH 118 Pre-Calculus Algebra <i>or</i>	
MATH 221 Calculus Business/Economics (B1)*	4
STAT 221 Intro Probability and Statistics (B1)*	5
¹ Approved electives	16

Select 16 units from the following:

AGB 312, 315, 318, 322, 324, 326, 404,
 405, 406, 410, 452;
 BRAE 348, 439;
 FRSC 202, 210, 402, 415, 421;
 FSN 230, 270, 285, 354, 374;
 HCS 421;
 IT 330, 411, 435;
 JOUR 203, 285, 312, 331, 342;
 PPSC 311, 321, 414, 421;
 RPTA 214, 314, 320, 321, 412, 420;
 WVIT 203, 301, 365,404, 405, 406;
 SPAN/ITAL/FR/GER 101, 102, 103

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¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Military Science

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

Department Head, Lieutenant Colonel Erik Krivda

Captain Jennifer Hill
Captain Christine Mediano
Sergeant First Class Jose Cruz

PROGRAMS

ROTC Four-Year Program
Military Science Minor

Four-Year Program

The Military Science Department conducts a dynamic four-year program of instruction which develops the mental and physical qualifications of graduates in preparation for positions of leadership within the military and civilian communities. Students may enroll at any time for full academic elective credit without incurring any military service obligation. However, the last two years of the program are oriented toward preparing the student for a military career.

The innovative and well-taught courses complement all major areas of study by broadening the student's basic education. The complete curriculum includes both military leadership and management courses; courses which provide an awareness of the heritage of the U.S. military; the Armed Forces' role in national defense strategy; professional military subjects; and military ethics.

Students desiring to attain a highly sought-after commission as a Second Lieutenant in the U.S. Army must meet eligibility requirements and complete the entire Military Science/ROTC (Reserve Officers' Training Corps) Advanced Course (25 units). To be eligible for participation in the Cal Poly ROTC Program, a student must be enrolled full time (12 units) at Cal Poly, have at least two years remaining as a university student to permit completion of the advanced course prior to reaching the 30th birthday, and be physically qualified.

Financial Assistance

Many opportunities for financial assistance are available to students. Three areas of opportunities are: ROTC cadets who sign a contract for Advanced Phase, students who earn an ROTC scholarship, and cadets who train with Reserve or National Guard units. All ROTC cadets sign a contract to participate in the Advanced Phase of ROTC and receive a \$300 - \$500 a month allowance. Criteria to participate in the Advanced Phase are stated later. Highly competitive

two-, two and a half, three-, and four-year ROTC scholarships are available. The scholarship provides payment of either full tuition or room and board (student's choice), books, supplies, and the \$300 - 500 a month allowance for the duration of the scholarship. Students interested in ROTC scholarship should contact the Military Science Department. Reserve or National Guard training provides an additional two sources of financial assistance: approximately \$165 a month for one weekend drill and approximately \$190 a month tuition assistance from the National Guard/Army Reserve "New GI Bill" benefits.

Equipment and Uniforms

All necessary equipment, uniforms and textbooks for participation in the Military Science/ROTC program are furnished to the student by the United States Government free of charge. Title to this property, other than expendable items, remains with the government.

Phases of Four-Year Program

The four-year program elective military science curriculum is divided into two diverse phases. The basic phase is primarily for freshmen and sophomores, and the advanced phase is for junior and senior level students.

Basic Phase

The Basic Phase is a two-year challenging opportunity where students may, without obligation, investigate the ROTC Program and the military as a full- or part-time career. Students may enter and leave this phase during any quarter. The curriculum for the basic phase is listed below and offers many exciting opportunities for all students. To become an ROTC cadet during this phase requires the student be registered for a Military Science class, completion of an ROTC enrollment form (obtained at the Military Science Department, Dexter Building, Room 115), and an interview with the ROTC Enrollment Officer. Because this phase is for students to examine the ROTC Program without obligation, participation in ROTC activities is encouraged but not mandatory.

Entry to the challenging Advanced Phase is accomplished either by successfully completing the Basic Phase classes, completing ROTC Leader's Training Course or completing any military basic training program. Students have the option of contracting any time during their second year of the Basic Phase of study.

ROTC Leader's Training Course (Summer Session only)

One method to qualify for the Advanced Phase is to successfully complete the six-week challenging ROTC Leader's Training Course (LTC). Students normally attend LTC during the summer between their second and third academic years. Transfer students may complete the camp during the summer immediately prior to their matriculation

at Cal Poly. It is important that potential transfer students who plan to participate in the two-year ROTC program make their intentions known directly to the Military Science Department no later than June 1 of the year they plan to register at the university even though this date may precede the date of their final acceptance by the university.

The government provides a transportation allowance to and from LTC 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 LTC. No military obligation is incurred for attending this camp.

Basic Training

Outstanding students who have successfully served on active duty, regardless of the branch of service, are qualified to enter the Advanced Phase because they have completed basic training for their particular branch of service. Also, students who have been or are members of Reserve or National Guard units and have completed basic training are qualified for the Advanced Phase.

Advanced Phase

The Advanced Phase is a two-year period where ROTC cadets receive advanced leadership and management training. The cadets receive many hours of hands-on, practical leadership experiences to prepare them for a military career or a management position in the civilian sector. To become a cadet in the Advanced Phase a student must complete the Basic Phase, ROTC Summer Leader's Training Course (LTC) or Basic Training. The student must also make a commitment to attend all required training activities and sign a contract to accept a prestigious commission in the United States Army. In return for the student's commitment, the Military Science Department provides \$450-500 a month (which is based on program year), classroom instruction, real leadership opportunities, and continuous professional development of their leadership skills.

After their first year of the Advanced Phase, cadets usually attend a five-week camp where their leadership skills are further developed and assessed. All equipment, uniforms, room, board, and medical care are furnished free while at this camp. The cadets also receive approximately \$800 during the five weeks. Upon successful completion of the Advanced Phase and graduation from the university, the cadet is commissioned as a Second Lieutenant in the United States Army.

Simultaneous Membership Program

Students can serve simultaneously in either the California National Guard or Army Reserve while they are cadets in ROTC and receive pay from both their unit and ROTC. 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 as much as \$4,000 each year, this program provides both substantial financial benefits and leadership experience.

BASIC PHASE

Freshman

- MSL 101 Foundations of Officership I (1)
- MSL 102 Foundations of Officership II (1)
- MSL 103 Basic Leadership (1)
- MSL 110 Exercises in Military Leadership (1)
- MSL 111 Orienteering (2)
- MSL 112 The Army Physical Fitness Program (1)

Sophomore

- MSL 201 Foundations of Leadership I (2)
- MSL 202 Foundations of Leadership II (2)
- MSL 203 Foundations of Leadership III (2)
- ¹ MSL 212 Leader's Training Course (1-7)
- MSL 229 Ranger Challenge (2)
- ² MSL 240 American Military History and the Evolution of Western Warfare (4)

ADVANCED PHASE

Junior

- MSL 301 Tactical Leadership I (3)
- MSL 302 Tactical Leadership II (3)
- MSL 303 Applied Leadership (3)
- MSL 310 Advanced Leadership of Military Exercises (1)
- MSL 312 Leadership of the Army Physical Fitness Program (1)
- ³ MSL 314 Leadership Development and Assessment Course (6)

Senior

- MSL 400 Special Problems for Advanced Undergraduates (1-2)
- MSL 401 Developmental Leadership I (3)
- MSL 402 Developmental Leadership II (3)
- MSL 403 Adaptive Leadership (3)
- MSL 410 Administration and Evaluation of Exercises in Military Leadership (1)
- MSL 412 Administration and Evaluation of the Army Physical Fitness Program (1)
- MSL 470 Selected Advanced Topics (1-4)

¹ LTC is an optional 5-week summer training course (1-7 units) at Fort Knox, Kentucky.

² MSL 240 or equivalent is required for commissioning of all cadets; approved substitutions are HIST 320, HIST 321 and HIST 322.

³ LDAC is a required 5-week summer training experience at Fort Lewis, Washington (6 credits).

Military Science Minor

The minor emphasizes the following personal and technical skills: time, personnel, and resource management under duress; knowledge of U.S. military heritage, customs, and courtesies; planning and briefing under time constraints; current national defense issues; equal opportunity, sexual harassment, and military ethics; military justice; physical fitness; map reading and orienteering; leadership, management, and counseling skills under duress; oral, visual, and written communication skills in accordance with Army norms; small unit tactics. It provides marketable skills to students interested in government service, personnel management, and law enforcement. The Military Science Minor is limited to contracted ROTC cadets only. A minimum GPA of 2.5 is required in all units counted for completion of the minor.

Required core

MSL 240/HIST 320/HIST 321/HIST 322.....	4
MSL 301 Tactical Leadership I.....	3
MSL 302 Tactical Leadership II	3
MSL 303 Applied Leadership.....	3
MSL 401 Developmental Leadership I	3
MSL 402 Developmental Leadership II.....	3
MSL 403 Adaptive Leadership	3
Approved electives	6
Select 6 units from the following:	
MSL 101, 102, 103, 110, 111, 112, 201, 202, 212, 229, 310, 312, 314 (ROTC only), 410, 412	28

Natural Resources Management

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

Department Head, Douglas D. Piirto

Christopher A. Dicus	Norman H. Pillsbury
Brian C. Dietterick	Scott E. Sink
Samantha J. Gill	Richard P. Thompson
John H. Harris	James R. Vilkitis
Walter R. Mark	

ACADEMIC PROGRAMS

Environmental Management and Protection – BS
Forestry and Natural Resources – BS
Disaster Management and Homeland
Security – Minor
Forestry Sciences – MS

Field Facilities for Experiential Learning

The Natural Resources Management Department has a number of outdoor field sites where faculty and student learn-by-doing projects and research are conducted. Facilities sited at the Cal Poly campus include a Forestry Skills Center, computer labs, GIS laboratories, Coastal Resources Institute Research field lab and several well-equipped greenhouses. Most importantly, the department plays a lead role in administering the Swanton Pacific Ranch and School Forest near Santa Cruz, California. This 3800-acre field laboratory includes redwood forests, salmonid-bearing streams, agricultural land and many other ecological environments. The Swanton site provides hands-on learning of active forest, ranch, and watershed management activities. The management of these forest resources is internationally certified by the Forest Stewardship Council. Students make extensive use of these facilities.

BS ENVIRONMENTAL MANAGEMENT AND PROTECTION

This major is an undergraduate, interdisciplinary course of study integrating the biophysical and social/economical/political sciences in natural resource management. The curriculum emphasizes management and protection of ecosystem structures and processes that sustain uses of environmental resources. The major provides students with the science and management background that, when properly integrated, can guide consumptive uses of resources in a sustainable manner for current and future generations.

Since environmental problems arise from human demands and stresses on the environment, solutions must focus on the human dimension of ecosystems. Thus, environmental

management is the management of both people and resources to attain human goals while protecting environmental values in order to sustain natural systems.

Graduates are prepared for a broad range of professional careers in environmental assessment, impact analysis, project management and impact mitigation monitoring.

Knowledge of the legal and regulatory environment is balanced with study of ecological and economic theories and practices to solving social conflicts over environmental uses and impacts.

The Environmental Management and Protection major is endorsed and supported by the California Association of Environmental Professionals (AEP), a professional association representing the full range of environmental professions in both private and public sectors.

Concentrations

In addition to the required major courses, students select one of the following.

Environmental Impact Mitigation Strategies. Provides students with a knowledge base to utilize multiple strategies to mitigate environmental impacts from development activity or in ecological restoration.

Environmental Policy and Management. Through further study in land use analysis and planning, economics, regulation, administration, and law, students are prepared for careers in environmental planning and policy analysis or graduate school. Typical careers include analysts or lobbyists for non-governmental organizations (NGOs), trade associations, and government regulatory agencies.

Watershed Management and Hydrology. Provides students a focused and encompassing program including a proficiency in watershed hydrology in forest ecosystems and Mediterranean ecosystems, rangeland hydrology, post-fire watershed evaluation, watershed and stream restoration and urban/wildland hydrologic implications.

Individualized Course of Study. This option for the student is planned, designed and developed through guidance from the student's advisor, and allows development of a program to meet the student's interests and career goals. It allows students to pursue existing minors/concentrations in areas such as water science, land rehabilitation, geographic information systems, soil science, rangeland resources, public administration, sustainable environments, or wildlife biology.

Other Concentrations Available. The Field and Wildlife Biology concentration, offered by the Biological Sciences Department, is available to Environmental Management and Protection majors and prepares students for employment in the fish and wildlife areas of law enforcement, management, and production.

BS FORESTRY AND NATURAL RESOURCES

The Bachelor of Science degree program in Forestry and Natural Resources prepares students for careers in the protection and management of our forest and natural resources. Students may specialize in recreation management; urban forestry; environmental assessment and planning; watershed management and hydrology, fire and fuels management, forest and environmental practices, wildlife biology, or an individualized course of study.

Graduates qualify for such positions as: forester, environmental planner and assessor, natural resource manager, urban forester, park administrator, watershed manager, hydrologist, fire and fuels manager, and many other related environmental career areas. Cal Poly graduates are employed throughout the world: establishing, managing and sustaining forests and urban wildland areas; providing opportunities for a full range of uses; teaching; extension; research; and protecting and managing the environment.

Most students are required to complete an internship equivalent to half-time work. Paid internships are available at Swanton Pacific Ranch, or the student may choose to pursue a seasonal job, volunteer work, or a cooperative education program. Work experience for academic credit must be documented by work supervisor and approved by student's academic advisor.

Students are required to purchase 8-inch+ high field boots, hard-hats (OSHA approved), hand calculator capable of linear regression, 10X hand lens, and an engineers scale ruler prior to taking 200- or 300-level major courses. Students are strongly encouraged to purchase a laptop before beginning 300-level major courses.

The Society of American Foresters accredits the Forestry and Natural Resources program. Also, the U.S. Office of Personnel Management (OPM) recognizes employment as a forester with the Federal Government upon graduation.

Concentrations

Concentrations prepare students for entry into the profession of forestry and natural resources. Extensive field training occurs concurrently with classroom instruction.

Environmental Planning and Assessment. Prepares students for employment as professionals in the environmental management and protection subdisciplines of environmental planning, impact assessment, analysis and monitoring. Graduates from this concentration are academically qualified for Cal EPA's Registered Environmental Assessor I and II.

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

Urban Forestry. Management problems resulting from the continued trend of urbanization into the urban-wildland interface are studied. Urban Forestry focuses on the urban ecosystem including lesser vegetation, wildlife, and open space, as well as the trees. The curriculum emphasizes the application of forestry skills for management of urban forest ecosystems. Students taking this concentration are eligible to compete for two scholarships of \$2000 and \$1000.

Watershed Management and Hydrology. Provides students a focused and encompassing program in watershed management including a proficiency in watershed hydrology in forest ecosystems and Mediterranean ecosystems, rangeland hydrology, post-fire watershed evaluation, watershed and stream restoration and urban/wildland hydrologic implications. Students pursuing specific coursework can qualify as hydrologists under U.S. Government OPM guidelines.

Wildland Fire and Fuels Management. Focused study on the management of fire and fuels on landscapes ranging from the wildlands to the urban interface. Emphasis on the technologies, issues and policies in managing fire, using fire as an ecosystem management tool and social and economic impacts of fire.

Other Concentrations Available. The Field and Wildlife Biology concentration, offered by the Biological Sciences Department, is available to Forestry and Natural Resources majors and prepares students for employment in the fish and wildlife areas of law enforcement, management, and protection. Also, the Outdoor, Adventure, and Resource Recreation concentration, offered by the Recreation, Parks, and Tourism Administration Department, is available to Forestry and Natural Resources majors, preparing them for careers in the planning, development, leadership, and management of outdoor recreation opportunities on public and private lands.

Individualized Course of Study. Students have the option of developing an individualized course of study. The intent of this option is to give students the opportunity to pursue a minor in related areas, such as geographic information systems, land rehabilitation, soil science, and others.

Minors

Geographic Information Systems for Agriculture. An interdisciplinary minor sponsored by the departments of BioResource and Agricultural Engineering, Natural Resources Management, and Horticulture and Crop Science. For more information, see the College of Agriculture, Food and Environmental Sciences section.

Water Science. An interdisciplinary minor sponsored by the departments of BioResource and Agricultural Engineering, and Natural Resources Management, that emphasizes one of three areas of study: irrigation, water policy, or watershed management. For more information, see the College of Agriculture, Food and Environmental Sciences section.

DISASTER MANAGEMENT AND HOMELAND SECURITY MINOR

The program is a multidisciplinary cooperative effort between the Natural Resources Management Department, Continuing Education, California Emergency Management Agency, and the California State Fire Marshal’s Office. It includes a broad understanding of the nature, impact and recovery methods of natural and human caused disasters on the wildland and built environments.

The program includes courses in policy, planning and operational components of disaster management and homeland security, including opportunities to gain practical experience and work with current incident management technologies. The minor prepares students from various majors whose careers will be related to disaster management and homeland security.

Required courses

CRP 458 Local Hazard Mitigation Plng/Design	4
NR 455 Wildland-Urban Interface Fire Protection	3
DMHS/NR/CRP 351 Intro to Emergency Management in California	3
DMHS/NR 353 Intro to Crisis Communications and the Media	3
DMHS/NR/CRP 401 Disaster Recovery	3
UNIV 339 Disaster-Resistant Sustainable Communities (Area F)	4

Approved electives 10

Select from the following courses:

- CRP 212; NR 312 (Area F), 418;
- DMHS/NR 352, 405, DMHS/NR/CRP 466

30

BS Environmental Management and Protection

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

* = Required in Major; also satisfies GE

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

MAJOR COURSES

NR 140 Careers in Forestry & Env. Mgmt.	1
NR 142 Environmental Management	3
NR 215 Land and Resource Measurements	2
NR 311 Environmental Measurements and Interpretation	4
NR/LA 318 Applications in GIS	3
NR 326 Natural Resources Econ. & Valuation	4
NR 335 Conflict Mgmt. in Natural Resources	4
¹ NR 402 Forest Health <i>or</i> NR 320 Watershed Mgmt & Restoration	4
NR/CRP 404 Environmental Law <i>or</i> NR/CRP 408 Water Law	3
NR 412 Forest and Natural Resources Senior Assessment Project <i>or</i> NR 461 Senior Project I	3
NR 416 Env. Impact Analysis and Mgmt	4
NR 425 Applied Resource Analysis and Assessmt	4
NR 465 Ecosystem Management	4

² ASCI 329/BIO 263/BIO 427	3-4
BOT 121/BIO 111/BIO 161 (B2&B4)*	4
BIO 115/BIO 162/NR 208	4-5
BIO 325 General Ecology <i>or</i> NR 306 Ecology of Natural Resources & Habitat Mgmt	4
BRAE/NR 247/BRAE 237/BRAE 239	2-4
BRAE 348 Energy for a Sustainable Society <i>or</i> ENVE 324 Intro to Air Pollution (Area F)*	4
CHEM 111 Survey of Chemistry <i>or</i> CHEM 127 General Chemistry (B3)*	4-5
CHEM 312 Survey of Organic Chemistry	5
GEOL 201 Physical Geology	3
³ MATH 161/221 (B1)*	4
PHYS 121 College Physics I (B3)*	4
PSY 201/202 Introduction to Psychology (D4)*	4
SS 121 Introductory Soil Science	4
STAT 217/218 Applied Statistics (B1)*	4
Concentration courses (see below)	36

132

GENERAL EDUCATION (GE)

72 units required, 24 of which are specified in Major.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (no additional units req'd)

B1 Mathematics/Statistics * 8 units in Major	0
B2 Life Science * 4 units in Major	0
B3 Physical Science * 4 units in Major	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E) * 4 units in Major	0
D5 Upper-division elective	4

Area F Technology Elective (upper division)

(no additional units req'd) * 4 units in Major 0

48

FREE ELECTIVES 0

180

¹ Students following Track 1 of Watershed Management and Hydrology Concentration must take NR 320.

² Students following Track 1 of Watershed Management and Hydrology Concentration must take PHYS 122 as a substitute.

³ Students following Track 1 of Watershed Management and Hydrology Concentration must take MATH 161.

CONCENTRATIONS (Select one)

Environmental Impact Mitigation Strategies Concentration

BIO 427 Wildlife Management.....	4
CRP/NR 404 Environmental Law or CRP/NR 408 Water Resource Law and Policy	3
NR 421 Wetlands	4
ZOO 329 Vertebrate Field Zoology	4
¹ Approved electives.....	21
<i>Select 21 units from the following:</i>	
Any upper division BIO, CRP, LA, NR, SS or ZOO course	36

Environmental Policy and Management Concentration

CRP 212 Introduction to Urban Planning	4
CRP 420 Land Use Law <i>or</i> POLS 341 American Constitutional Law	4
ECON 431 Environmental Economics <i>or</i> POLS 230 Basic Concepts of Political Thought	4
NR 435 Natural Resources Policy Analysis.....	4
NR/CRP 404 Env. Law <i>or</i> NR/CRP 408 Water Law (4)	3
¹ Approved electives.....	17
<i>Select 17 units from the following:</i>	
<i>Pre-Environmental Law:</i> POLS 245, 334, 343, 344, NR 339, 400;	
<i>Other:</i>	
ECON 311, 432; ENVE 330; NR 339, 400, 420; SS 433; UNIV 330; Any CRP or POLS course	36

Watershed Management and Hydrology Concentration

NR 420 Advanced Watershed Hydrology	4
SS 321 Soil Morphology	4
² SS 440 Forest and Range Soils <i>or</i> ERSC 323 Geomorphology	4
¹ Approved electives (<i>select one track</i>).....	24
³ <i>Track 1:</i>	
(a) Select 4 units from: BRAE 435, NR/BIO/SS 421 [†] , <i>or</i> NR/HNRS 475	
(b) GEOL 241 Physical Geology Laboratory (1)	
(c) Select 4 units from: ENVE 434, ERSC 323, NR/BIO/SS 421 [†] , NR/HNRS 475, PHYS 107, <i>or</i> SS 440	
(d) MATH 162 Calculus for Life Sciences II (4)	
(e) Select 11 units from: BRAE 345, NR 315, NR/HNRS 475 (1 unit max), NR 418, <i>or</i> STAT 313	
<i>Track 2 – Select 24 units from:</i>	
BRAE 435, ENVE 434, GEOL 241, MATH 162, NR 260, 339, 418, NR/BIO/SS 421, NR/CRP 408, NR/HNRS 475 (9 units max), PHYS 107, 122, <i>or</i> STAT 313	36

Individualized Course of Study

Select from the following:.....	36
NR 339 Internship/Forest and Natural Resources (1-12)	
Any course used in minor(s)	36

BS FORESTRY AND NATURAL RESOURCES

- 60 units upper division GWR
- 2.0 GPA USCP
- * = Required in Support; also satisfies GE
- Note: No major, support or concentration courses
may be taken as credit/no credit.

MAJOR COURSES

NR 140 Careers in Forestry and Environ. Mgmt.	1
NR 141 Introduction to Forest Ecosystem Mgmt.	3
NR 208 Dendrology.....	4
NR 215 Land and Resource Measurements	2
NR 260 Forest Practices and Environ. Protection	4
NR 306 Natural Resource Ecology & Habitat Mgt	4
NR 307 Fire Ecology	3
NR 315 Measurements & Sampling in Forested Env.	4
NR/LA 318 Applications in GIS.....	3
NR 320 Watershed Management	4
NR 326 Natural Resources Econ. & Valuation.....	4
NR 335 Conflict Mgmt. in Natural Resources.....	4
NR 365 Silviculture and Vegetation Management	4
NR 402 Forest Health	4
NR 412 Forest and Natural Resources Senior Assessment Project <i>or</i> NR 461 Sr. Project I	3
⁴ NR 414 Sustainable Forest Management	4
NR 416 Environmental Impact Analysis & Mgmt.	4
NR 435 Natural Resources Policy Analysis.....	4
NR 465 Ecosystem Management	4
Concentration courses	32
	99

SUPPORT

AGB 212 Agricultural Economics	4
⁵ ASCI 329 Principles of Range Mgmt. <i>or</i> BIO 427 Wildlife Management	3-4
BOT 121 General Botany (B2&B4)*	4
BRAE/NR 247 Forest Surveying <i>or</i> BRAE 239 Engineering Surveying	2-4

- ¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ² If a course is taken to meet a requirement, it cannot be double-counted as an approved elective for the concentration.
- ³ This track is designed to prepare students to become eligible for hydrology positions and meets the criteria for employment eligibility in the federal government (GS 1315).
- ⁴ Students following Track 1 of Watershed Management and Hydrology Concentration must take CHEM 312 as a substitute.
- ⁵ Students following Track 1 of Watershed Management and Hydrology Concentration must take PHYS 122 as a substitute.
- [†] Course cannot be double-counted as an elective.

BRAE 345 Aerial Photogram. & Remote Sensing	3
CHEM 111 Survey of Chemistry (B3)*	5
¹ MATH 161 Calculus for the Life Sciences I <i>or</i>	
MATH 221 Calculus for Bus & Econ (B1)*	4
SS 121 Introductory Soil Science	4
STAT 217 or STAT 218 Statistics (B1)*	4
² Approved science course	
BOT 313, CHEM 312, <i>or</i> PHYS 121	4-5
	37

GENERAL EDUCATION (GE)

72 units required, 16 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (no additional units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support	0
B3 Physical Science * 4 units in Support	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

4

FREE ELECTIVES

0

192

CONCENTRATIONS (Select one)

Environmental Planning and Assessment

Concentration

CRP 212 Introduction to Urban Planning	4
NR 311 Environmental Measurements and Interpretation	4
NR 339 Internship	6
NR/CRP 404 Environmental Law or NR/CRP 408 Water Resource Law and Policy	3
NR 425 Applied Resource Analysis and Assessment	4
³ Approved electives	11

Select 11 units from the following:

- CRP 334, 420;
- ENVE 434;
- GEOG 301, 414, 415;
- NR 400, 418, 420;
- SS 321, 440, 433

32

Forest and Environmental Practices Concentration

NR 339 Internship	6
NR 475 Sustainable Forest and Env. Practices	15
³ Approved electives	11
<i>Select 11 units from the following:</i>	
AG 360; AGB 315;	
BIO 435; BOT 238, 324;	
BRAE 133, 151, 340;	
CRP 212, 336, 420;	
EHS 382, 421,	
JOUR 203, 205;	
MCRO 436;	
NR 204, NR/ES 308, NR 312, 340, 350,	
NR/ES 360, NR 400, NR/CRP 404, 408,	
NR 418, 420, NR/BIO/SS 421, NR 434, 450,	
455;	
SS 221, 321, 433, 440;	
PPSC 321, 327;	
any upper division BIO, BOT, ZOO, MCRO,	
CHEM, COMS, or JOUR course;	
any DMHS course	

32

Urban Forestry Concentration

CRP 212 Introduction to Urban Planning	4
EHS 421 Arboriculture	4
NR 311 Environmental Interpretation	4
NR 339 Internship	6
NR 350 Urban Forestry	3
NR 450 Community Forestry	3
³ Approved electives	8
<i>Select 8-10 units from the following:</i>	
EHS 230, 337, 381;	
HCS 327;	
NR 204, 340, 400, 418, 455; NR/CRP 404;	
SS 433	

32

Watershed Management and Hydrology Concentration

NR 420 Advanced Watershed Hydrology	4
SS 321 Soil Morphology	4
¹ SS 440 Forest and Range Soils <i>or</i> ERSC 323 Geomorphology	4

¹ Students following Track 1 of Watershed Management and Hydrology Concentration must take MATH 161.

² Students following Track 1 of Watershed Management and Hydrology Concentration must take PHYS 121.

³ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

^{1,2} Approved electives. (<i>select one track</i>)	20
³ <i>Track 1:</i>	
(a) Select 4 units from: BRAE 435, NR/BIO/SS 421, or NR/HNRS 475	
(b) Select 8 units from: ENVE 434, ERSC 323, GEOL 201 and GEOL 241, NR/HNRS 475 (4 units max), PHYS 107; or SS 440	
(c) MATH 162 Calculus for Life Sciences II (4)	
(d) Select 4 units from: STAT 313 (4) <i>or</i> NR/HNRS 475 (max 1 unit) and NR 418 (3)	
<i>Track 2 – Select 20 units from:</i>	
BRAE 435, CHEM 312, ENVE 434, GEOL 201, 241, NR 339, NR/BIO/SS 421, NR/HNRS 475 (9 units max), PHYS 107, 121, or STAT 313	
	32

Wildland Fire and Fuels Management Concentration	
NR 204 Wildland Fire Control.....	3
NR 339 Internship	6
NR 340 Wildland Fire Management	3
NR 455 Wildland-Urban Interface Fire Protection	3
² Approved electives.....	17
<i>Select 17 units from the following:</i>	
BOT 326, 433;	
CRP 212, 336, 342, 458;	
CRP/NR 404, 408;	
EHS 230, 381, 421;	
ERSC 415;	
KINE 280;	
LA 221;	
NR 203, NR/ES 308, NR 312, 350, 418, 420, 425, 450, NR/HNRS 475;	
PHYS 107;	
SS 321, 440;	
UNIV 339;	
any upper division COMS course;	
any DMHS course;	
any CSU-transferable course recognized by Cal Regional Fire Academy;	
any CSU-transferable fire technology course;	
any CSU-transferable emergency medical technician course	
	32

Individualized Course of Study	
NR 339 Internship in Forest and Natural Resources	6
4 units of NR coursework	4
Select any course used in minor(s).....	22
	32

MS FORESTRY SCIENCES

The Master of Science degree program in Forestry Sciences offers advanced study in a range of forest science sub-disciplines or in preparation for study leading to the Ph.D. degree.

Areas of Emphasis

Students may select one of the following emphasis areas that incorporate specific scientific and professional disciplines:

Forest Resource Sciences. Offers advanced preparation in the forestry disciplines of watershed management and hydrology, biometrics, forest health, forest management, fire science, and urban and community forestry.

Environmental Management. Offers advanced preparation in the disciplines that comprise the field of environmental management, including environmental assessment, planning, mitigation and policy formation relating to a wide range of landscapes and ecosystems.

Prerequisites

For consideration as a graduate student, an applicant will have completed a bachelor’s degree in forestry at an accredited forestry four-year college or a related B.S. degree area such as environmental sciences with a minimum grade point average of 2.75 in the last 90-quarter units. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Program of Study

Graduate students must file a formal study plan with their major professor, graduate committee, department, college and university graduate studies office no later than the end of the quarter in which the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 23 of which must be at the 500 level). The broad curriculum for the Master of Science degree in Forestry Sciences is:

- a) 20 units in the required core;
- b) 25 units in area of emphasis approved by the student’s major professor and department head;

¹ If a course is taken to meet a requirement, it cannot be double-counted as an approved elective for the concentration.

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

³ This track is designed to prepare students to become eligible for hydrology positions and meets the criteria for employment eligibility in the federal government (GS 1315).

- c) completion of a thesis or scholarly project, and an oral and written examination. At the discretion of the graduate committee, the written examination may consist of submitting an article for publication to a referred journal.

	<i>Units</i>
Required courses	20
SS 501 Research Planning (4) or equivalent	
NR 532 Apps in Biometrics & Econometrics (4)	
NR 581 Graduate Sem. in Forestry & Env. Sci. (3)	
NR 599 Thesis (9)	
Area of Emphasis	25
Determined by the student's graduate committee from forestry subdisciplines (400–500 level). At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.	
	45

Recreation, Parks, & Tourism Administration

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

Department Head, William W. Hendricks

Marni Goldenberg P. Brian Greenwood
Jerusha B. Greenwood Jeffrey A. Jacobs

ACADEMIC PROGRAMS

Recreation, Parks, and Tourism Administration – BS

The BS in Recreation, Parks, and Tourism Administration program is dedicated to excellence in teaching, developing professionals, and fostering dynamic and effective leaders. The major is accredited by the National Recreation and Park Association Council on Accreditation.

Recreation, parks, and tourism are mainstays of the American culture and a foundation of the United States economy, with over \$750 billion spent annually on leisure pursuits. U.S. households spend seven to eight percent of their income on recreation. The United States has been ranked as the top tourism earner in the world and generates over \$85 billion from international tourism. Tourists visit the 200 million acres of federal land, which the government has set aside for recreation. Although recreation, parks, and tourism provide activities for people from all walks of life, these industries also provide numerous jobs, both in this country and abroad.

Students are prepared for professional employment in public, non-profit, private, and commercial recreation, parks, and tourism organizations. Majors select a concentration in tourism planning and management; outdoor, adventure, and resource recreation; event planning and management; sport management. In addition, students may select a course of study in community services management.

To prepare students for their professional careers, the major includes a 400-hour required internship (one quarter) in a recreation, parks, or tourism organization. Graduates qualify for diverse positions as recreation supervisors, park and recreation administrators, travel and tourism specialists, environmental educators, park rangers, park naturalists, outdoor recreation managers, recreation-related business owners, outdoor and adventure leaders, private recreation club managers, employee services and recreation specialists, adventure program planners, camp directors, chamber of commerce specialists, convention and visitor bureau program directors, meeting planners, special event planners,

youth sports coordinators, professional and intercollegiate event managers and campus recreation directors.

Graduates employed in settings located in and out of the United States are planning, organizing, implementing and evaluating recreation, parks, and tourism services. Sound management skills developed in the program, and through practical and research applications, allow for career progress into executive management positions within the recreation, parks, and tourism industries.

Students have access to the program's field laboratories and also develop competencies in a myriad of sites, including leadership laboratories, environmental education centers, leisure businesses, and parks and recreation departments. Students plan and implement major special events and programs, as well as conduct applied research in required and elective coursework.

In addition to major requirements, the curriculum provides a full range of general education and support courses. These courses are designed to fully educate and prepare students for cultural diversity, community engagement, and international understanding in a global society.

Concentrations

Event Planning and Management. Prepares students for employment for a variety of organizations and settings designing, planning and managing festivals and events. Areas of study include event development and management, marketing and promotion, contract negotiation and sponsorship solicitation.

Outdoor, Adventure, and Resource Recreation.

Prepares students for employment in the planning, development, leadership, and management of outdoor recreation opportunities on public and private lands. Areas of study include adventure/eco-tourism and outdoor recreation management.

Sport Management. Prepares students for management positions with sport entities ranging from high school interscholastics to professional sports. Areas of study include sport marketing and promotion, sport ethics, sport structure and governance, sport for social change, and sport sponsorship.

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

Graduate Program

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Recreation, Parks, and Tourism Management. Please refer to the MS Agriculture section of the College of Agriculture, Food and Environmental Sciences.

BS Recreation, Parks, and Tourism Administration

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

RPTA 101 Intro. to Recreation, Parks and Tourism	4
RPTA 110 Career Planning/Rec, Parks & Tourism	1
RPTA 205 Leadership and Facilitation	4
RPTA 210 Introduction to Program Design <i>or</i> RPTA 260 Recreational Sport Programming	4
RPTA 252 Therapeutic Rec. & Special Populations	4
RPTA 342 Legal Aspects of Rec, Parks/Tourism	4
RPTA 350 Recreation Areas and Facilities Mgt	4
RPTA 360 Assessment/Eval of Rec Parks/Tourism	4
RPTA 405 Recreation, Parks, and Tourism Mgt	4
RPTA 413/EHS 437/LA 363	4
RPTA 424 Financing Rec., Parks, & Tourism Svcs	4
RPTA 460 Research in Recreation, Parks/Tourism	4
RPTA 461 Senior Project	3
RPTA 463 Pre-Internship Seminar	1
RPTA 465 Internship	6
Concentration courses (see below)	28
	83

SUPPORT COURSES

BUS 212 Financial Actg for Nonbusiness Majors	4
BUS 346 Principles of Marketing	4
ENGL 310 Corporate Communications	4
JOUR 312 Introduction to Public Relations	4
MATH 118 Pre-Calculus Algebra (B1)* (MATH 116 & 117 substitute)	4
STAT 217 Intro to Stat Concepts/Methods (B1)*	4
	24

GENERAL EDUCATION (GE)

72 units required, 8 of which are specified in Support.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (8 units)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division)

(4 units)	4
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	64
FREE ELECTIVES	9
	180

CONCENTRATIONS (Select one)

Event Planning and Management Concentration

RPTA 214 Introduction to Travel and Tourism	4
RPTA 317 Convention and Meeting Management	4
RPTA 320 Special Event Planning	4
RPTA 420 Festival and Event Management	4
¹ Approved electives	12

Select 12 units from the following, with a minimum of 6 units upper division:

- AGB 314, 455;
- BUS 207, 215, 387, 418;
- COMS 212, 301, 419;
- EHS 215, 225;
- FSN 250 (D4/USCP);
- GRC 377 (Area F);
- JOUR 331, 342;
- KINE 280;
- PSY 319;
- RPTA 313, 316, 321, 330, 400, 412, 414, 450;
- TH 230/330

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Outdoor, Adventure, and Resource Recreation Concentration

RPTA/NR 112 Parks and Outdoor Recreation	4
RPTA 302 Environmental/Wilderness Education	4
RPTA 325 Outdoor and Adventure Leadership	4
¹ Approved electives	16

Select 16 units from the following, with a minimum of 6 units upper division:

- BIO 227, 263, 306, 307, 325, 401, 427;
- BUS 207, 310, 382, 387, 418, 446;
- COMS 322;
- EHS 437[†];
- ES/NR 360 (C4/USCP);
- GEOG 308 (D5);
- JOUR 331, 342;
- KINE 280;

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

[†] Can be utilized as a major or concentration course, but not both.

LA 363[†];
 MSL 111;
 NR 141, 142, 204, 208, 306, 318, 350,
 360 (C4/USCP), 416;
 PSY 311 (D5);
 RPTA 203, 214, 275, 314, 321, 330, 400,
 410, 412, 414, 450

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Sport Management Concentration

RPTA 160 Introduction to Sport Management 4
 RPTA 320 Special Event Planning 4
¹ Approved electives 20
*Select 20 units from the following, with a minimum
 of 6 units upper division:*
 BUS 207, 387, 407, 418;
 COMS 213, 301;
 ECON 221;
 GRC 377 (Area F);
 JOUR 331, 342;
 KINE 266, 323 (D5/USCP), 324 (D5/USCP);
 PSY 256;
 RPTA 214, 321, 330, 400, 420, 450

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Tourism Planning and Management Concentration

RPTA 214 Introduction to Travel and Tourism 4
 RPTA 314 Sustainable Travel and Tourism
 Planning 4
 RPTA 317 Convention and Meeting Management 4
¹ Approved electives 16
*Select 16 units from the following, with a minimum
 of 6 units upper division:*
 BUS 207, 302, 310, 387, 418, 446;
 COMS 201;
 CRP 212, 214, 215, 310, 334, 427;
 ECON 221, 222;
 GEOG 301 (D5), 308 (D5);
 JOUR 331, 342;
 PSY 252, 319, 351;
 RPTA 316, 320, 321, 330, 400, 412, 414, 415,
 420, 450

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Individualized Course of Study 28

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

[†] Can be utilized as a major or concentration course, but not both.

College of *Architecture & Environmental Design*

Architecture and Environmental Design Bldg. (05)
Room 212
805 756-1321
R. Thomas Jones, Dean
K. Richard Zweifel, Associate Dean

ACADEMIC PROGRAMS

Architectural Engineering	<i>BS, Minor</i>
Architecture	<i>BArch, MS</i>
City and Regional Planning	<i>BS, MCRP, Minor</i>
Construction Management	<i>BS, Minor</i>
Integrated Project Delivery	<i>Minor</i>
Landscape Architecture	<i>BLA</i>
Real Property Development	<i>Minor</i>
Sustainable Environments	<i>Minor</i>
Transportation Planning	<i>MCRP/MS Engineering</i>

The five undergraduate programs share the common objective of betterment of the human physical environment through the effective application of natural and cultural systems knowledge in planning, design and construction. They are all nationally accredited by their respective external review organizations.

The masters degree programs are designed for students interested in advanced professional studies. Included under the MS Architecture are specializations in structural engineering, environmental design and professional practice. The college also offers the Master of City and Regional Planning (MCRP). The joint MCRP/MS Engineering with a specialization in Transportation Planning is an interdisciplinary program. It is a cooperative effort between the colleges of Engineering and Architecture and Environmental Design.

The well-equipped college facilities include design laboratories, grading galleries, soils laboratory, stress laboratory, construction shop, project yard, instructional resource center, computer laboratories, and photo presentation laboratory. An outlying area of 12 acres known as the "Canyon" is available for experimental construction.

The location of the campus between the great population centers of San Francisco and Los Angeles is ideal for community and environmental studies in a variety of

contexts and scales. An active visiting lecturer program joins with faculty in all departments in providing excellent student instruction. Field trips are arranged to various parts of the state as required coursework. Students have the opportunity to participate in national and international exchange programs. The college offers several opportunities through departmentally sponsored programs for directed foreign study. Students also regularly participate in the California State University's International Programs in Denmark and Italy.

In addition to individual faculty representation in a wide range of professional associations, departments are members of their respective educators associations: the Association of Collegiate Schools of Architecture (ACSA); the Council of Educators in Landscape Architecture (CELA); the Association of Collegiate Schools of Planning (ACSP); and the Associated Schools of Construction Management (ASCM).

Likewise, students maintain active chapters of the professional organizations of the American Institute of Architects (AIA), the American Society of Landscape Architects (ASLA), the Associated General Contractors (AGC), the Structural Engineers Association of California (SEAOC), the American Planning Association (APA), and the National Society of Architectural Engineers (NSAE).

Opportunities for interdisciplinary interaction within the college are made available through coursework, annual forums, participation in district and national student competitions, student council activities and community service projects. Students are exposed to viable economic and ecological alternatives to conventional planning, design and construction through faculty applied research in such areas as passive solar building, post-disaster community rebuilding, sustainable design and construction technologies, earthquake-resistant building systems, project delivery methodologies, and daylighting and electrical lighting integration.

The college has various enhanced computing capabilities including Geographic Information System Technology, Computer-Aided Design and Immersive Visualization (virtual reality).

Students interested in pursuing one of the five undergraduate program offerings within the college should familiarize themselves with the appropriate curriculum flow chart, available through the College Advising Center, Architecture and Environmental Design Bldg. (05), Room 221, and departments. Special attention is directed to the sequencing of courses and prerequisite requirements. Students who plan to transfer from a California community college should schedule classes to maximize transfer units. Current admission requirements may be found at the Cal Poly website (www.calpoly.edu).

As a consequence of the periodic review and accreditation requirements of its programs, the college reserves the right

to keep selected student projects for its archives. These projects are returned to students at the discretion of their respective department faculty.

Additional information about the college and its programs may be found at its website, www.caed.calpoly.edu.

CAED ADVISING CENTER

Ellen Notermann, Director
Bldg. (05), Room 210
805 756-1325

www.calpoly.edu/~caed/the_CAED/Advising_Center/

The College of Architecture and Environmental Design (CAED) Advising Center provides academic advising services to all students within the CAED, in conjunction with each student's departmental faculty advisor. These services include providing information relative to curriculum requirements for all majors within the college, General Education requirements, transfer and evaluation credit and articulation, academic probation advising, University, College and department policies and procedures, change of major policies and procedures, tutoring, special academic programs, and referral of students to other campus resources.

The Advising Center processes most student-related forms including those for curriculum substitution, course withdrawal, change of major and other forms. Curriculum sheets, flowcharts, information on CAED minors, jobs, scholarships and competitions are located in the Advising Center.

INTEGRATED PROJECT DELIVERY MINOR

Barbara J. Jackson, Minor Advisor
bjackson@calpoly.edu

Construction Management Department (186), Room A100
805 756-1323

This minor is offered by the Construction Management Department, and is specific and intentional in its design. It is intended to provide an "interdisciplinary" understanding of the design and construction process. It is designed to serve students who will be engaged in the Architecture/Engineering/Construction (A/E/C) industry and be involved in integrated services project delivery.

Prerequisite. Upper division standing; and thus students are presumed to have completed the majority of their General Education courses, support, and/or major courses.

Required courses

COMS 301 Business and Professional Communication	4
CM 415 Interdisciplinary Project Management	5
CM/EDES 430 Collaborative Process	3
CM 432 Design-Build Project Management	3
CM 433 Integrated Project Delivery	2
Approved electives	7

Construction Management students must complete
7 units of advisor approved design courses
(ARCE, ARCH, CRP or LA prefix)

Other CAED students must complete 7 units of
Construction Management courses

Non-CAED students must complete:

7 units of advisor approved design and/or CM courses

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REAL PROPERTY DEVELOPMENT MINOR

Scott Kelting, Minor Advisor
skelting@calpoly.edu

Construction Management Department (186), Room A100
805 756-1323

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

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

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

Required courses	Units
CM 475 Real Property Development Principles	4
CRP 315 Fiscal and Project Feasibility <i>or</i> CM 332 Evaluation of Cost Alternatives	4/3
CRP 446 Development Review and Entitlement	4
Planning/Design	3
Select one course from the following:	
ARCH 445 Urban Design in Architecture (3)	
ARCH 472 Housing Design Concepts (3-4)	
ARCH 446 The Small Scale Master Builder (4)	
CRP 430 Public Sector Planning Practice (3)	
Any advisor approved planning or design courses at the 400 or 500 level	
Approved Electives	9/10
Select two or more courses from the following to complete a minimum of 24 units.	
BUS 434;	
CM 364;	
CRP 336, 420, 442, 447, 458, 470;	
ECON 434, 435;	
LA 470	

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SUSTAINABLE ENVIRONMENTS MINOR

Margot McDonald, Minor Advisor
mcdonal@calpoly.edu, 805 756-1298
Architecture Department (05), Room 212

This minor educates students within the University in the principles and various aspects of sustainable environmental design with global, regional and local perspectives and concepts. It provides students with the knowledge and abilities needed to integrate concerns for ecology, social equity and economics within the context of human and natural resource systems and the built environment.

Required courses	<i>Units</i>
EDES 406 Sustainable Environments	4
EDES 408 Implementing Sustainable Principles	4
Approved Electives	16

Select 16 units from the following courses:

AG 450;
 ANT 201¹, 360²;
 ARCH 413, 445, 472;
 BIO 112, 227, 325³;
 BOT 238;
 BRAE 348;
 CRP 211⁴, 212⁴, 214, 334, 336, 342, 436, 438;
 CRP/ES 215;
 ECON/HNRS 303;
 EDES 410, 420;
 ENGL 380 (Eco-Lit);
 ES/ARCH 326;
 ES 360;
 GEOG 150¹,
 GEOG/ERSC 325, 333;
 HUM 303/HNRS 304;
 LA 482;
 NR 306³, 320, 321, 323, 414, 434;
 NR/CRP 404;
 NR/ES 360;
 NR/HNRS 475;
 NR/LA 318³;
 PHIL 340;
 PHYS 310;
 PSC 320;
 PSY 311;
 SOC 313;
 UNIV/AG/HUM 330;
 UNIV 333, 339, 350, 391, 392, 492

ENVIRONMENTAL STUDIES MINOR

Students who complete the Environmental Studies Minor, coordinated through the College of Science and Mathematics (see that College's catalog section for additional information), are able to:

- Analyze, explain, and evaluate environmental issues from both scientific/technical and social/political/economic perspectives.
- Integrate and synthesize knowledge from multiple disciplines.
- Explain and apply the methodologies and approaches that different disciplines bring to bear on complex problems.
- Work productively and effectively with students from other disciplines and with other points of view.
- Confront real issues of contemporary significance; issues that affect them and their future.
- Gain employment or pursue further study that emphasizes interdisciplinary knowledge and skills.

The College of Architecture and Environmental Design offers the following course options as a part of this minor:

- LA 321 Concepts in Environmental Design
- EDES 406 Sustainable Environments
- CRP 336 Introduction to Environmental Decision Making
- CRP 404 Environmental Law

¹ ANT 201 and GEOG 150 do not count for Sociology, Social Sciences, and Anthropology and Geography majors.

² ANT 360 does not count for Anthropology and Geography majors.

³ BIO 325, LA/NR 318, and NR 306 do not count for Environmental Management and Protection majors.

⁴ CRP 211 and CRP 212 do not count for City and Regional Planning majors.

Architectural Engineering

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

Department Head, Allen C. Estes

Graham Archer	Abraham C. Lynn
Craig Baltimore	Cole McDaniel
Pamalee Brady	James Mwangi
Kevin Dong	Jill Nelson
James Guthrie	Ansgar Neuenhofer
Peter T. Laursen	Brent Nuttall
John Lawson	Edmond Saliklis

ACADEMIC PROGRAMS

Architectural Engineering – BS, Minor

The Architectural Engineering Department is an integral part of the College of Architecture and Environmental Design, and it shares and supports the mission of the College. The department has several overall program objectives, which are: to prepare students for career paths in architectural engineering and the building construction field, to give students the opportunity to pursue graduate degrees, to inspire students to seek out learning opportunities throughout their lives and to ensure that graduates are effective communicators.

To meet these overall departmental objectives, the following learning outcomes must be satisfied. The program ensures that students can apply mathematics, science and other engineering disciplines to the design of building structures. The program provides a balance of theoretical (analytical) and experimental courses. In the experimental courses students design their own experiments, interpret gathered data and think critically to reach rational conclusions. Students learn to design building components and building systems and to understand building behavior.

The Architectural Engineering program carefully addresses architectural design, constructability issues, life safety and economy of construction. In addition, course projects address realistic design criteria, such as economic implications and environmental, social, ethical and sustainability issues. Using integrated design projects, modern technological tools, and the latest design codes to address these goals, the department emphasizes the advantages of a close, interdisciplinary team-based approach to design and construction.

The use of interdisciplinary projects allows students to hone their communication, critical thinking, and project

management skills by working in multi-disciplinary teams. As students learn more about building design, they become cognizant of the ethical implications of design, specifically of how political and societal issues affect the engineering of the built environment, both on a local scale and on a broader international scale. These larger societal issues motivate students to engage in life-long learning, allowing them to use their skills in professional structural engineering practice.

The department's learn-by-doing philosophy is part of a pedagogy which emphasizes design-centered laboratories, integrating theory and design, culminating in a senior project capstone design experience.

The Architectural Engineering Program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone: (410) 347-7700.

Graduate Program

Cal Poly offers the MS in Architecture with a specialization in Architectural Engineering. Please see the Architecture Department's catalog section for more information.

Architectural Engineering Minor

The minor is designed for students wishing to pursue a more in-depth education in structures. The coursework exposes students to analytical, design, and construction issues relevant to the structural design process. Students select a sequence of courses that focus on either structural design or structural analysis. The program is tailored for students majoring in architecture, construction management, and civil engineering. Enrollment is limited and acceptance into the program is dependent upon the student's performance in structures-related courses. Contact the department for additional information.

Required courses	Units
ARCE 211, 212 Structures I, II.....	3,3
ARCE 223 Mechanics of Structural Members.....	3
ARCE 226 Structural Systems for Architects.....	3
ARCE 315 Small Scale Structures.....	4
ARCE 316 Large Scale Structures.....	4
Select either Analysis <i>or</i> Design Option.....	8-9
<i>Analysis Option</i>	
ARCE 227 Structures III (2)	
ARCE 302 Structural Analysis (4)	
Select one from: ARCE 303, 304 or 305 (2-3)	
<i>Design Option</i>	
ARCE 303 Steel Design I (3)	
ARCE 304 Timber Design (3)	
ARCE 305 Masonry Design (2)	

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Integrated Project Delivery Minor

The department also participates in offering an interdisciplinary minor in Integrated Project Delivery. Please see the College of Architecture and Environmental Design for more information.

BS ARCHITECTURAL ENGINEERING

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

* = Required in Support; also satisfies GE

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

Note: All ARCE majors must obtain a grade of C- or better in ARCE courses that are prerequisites for other ARCE courses.

MAJOR COURSES

ARCE 211 Structures I	3
ARCE 212 Structures II	3
ARCE 223 Mechanics of Structural Members	3
ARCE 224 Mechanics of Structural Members Lab	1
ARCE 225 Dynamics or ME 212 Engrg Dynamics	3
ARCE 227 Structures III	2
ARCE 257 Structural CAD for Building Design	2
ARCE 302 Structural Analysis	4
ARCE 303 Steel Design I	3
ARCE 304 Timber Design	3
ARCE 305 Masonry Design	2
ARCE 306 Matrix Analysis of Structures	3
ARCE 351, 352, 353 Structural Computing Analysis I, II, III	1,1,1
ARCE 354 Numerical Analysis Laboratory	1
ARCE 371 Structural Systems Laboratory	3
ARCE 372 Steel Structures Design Laboratory	3
ARCE 412 Dynamics of Framed Structures	3
ARCE 421 Soil Mechanics	3
ARCE 422 Foundation Design	3
ARCE 444 Reinforced Concrete Lab	3
ARCE 451 Timber/Masonry Structures Design and Constructability Laboratory	3
ARCE 452 Concrete Structures Design and Constructability Laboratory	3
ARCE 483 Seismic Analysis and Design	4
Advanced structural electives	6
<i>Select 6 units from:</i>	
ARCE 403, 410, 414, 423, 445, 446, 447, 448, 449, 471	
Interdisciplinary senior project	5
<i>Select 5 units from:</i>	
ARCE 415 (5) or 453 (3) and 460 (2)	

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SUPPORT COURSES

ARCH 106 Materials of Construction	2
ARCH 131, 132, 133 Design and Visual Communication 1.1, 1.2, 1.3	4,4,4
ARCH 217/ARCH 218/ARCH 219 (C3)*	4
BRAE 237 Intro to Engineering Surveying	2

CHEM 124 General Chem/Engr Discipline (B3/B4)*	4
CM 115 Fundamentals of Construction Mgmt	6
CM 332 Evaluation of Cost Alternatives or IME 314 Engineering Economics	3
CSC 231 Programming for Engineering Students or CSC 234 C and UNIX (3)	2
EDES 101 Intro to Architecture and Env Design	2
EE 201 Electrical Circuit Theory	3
GEOL 201 Physical Geology	3
MATH 141, 142 Calculus I, II (B1)*	4,4
MATH 143 Calculus III (Add'l Area B)*	4
MATH 241 Calculus IV	4
MATH 244 Linear Analysis I	4
ME 302 Thermodynamics	3
ME 341 Fluid Mechanics	3
PHYS 141 General Physics IA (Add'l Area B)*	4
PHYS 132, 133 General Physics	4,4
STAT 312 Statistical Methods for Engineers or STAT 321 Probability and Statistics for Engineers and Scientists (B6)*	4

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GENERAL EDUCATION (GE)

72 units required, 28 of which are specified in Support.
 →See page 39 for complete GE course listing.
 →Minimum of 8 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing *	4

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science	4
B3 Physical Science * 4 units in Support	0
B4 One lab taken with either a B2 or B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support	0
Additional Area B units* 8 units in Support	0

Area C Arts and Humanities (12 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts * 4 units in Support	0
C4 Upper-division elective	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4

44

FREE ELECTIVES

0

204

Architecture

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

Department Head, Henri T. de Hahn

Robert M. Arens	Karen F. Lange
Mark N. Cabrinha	Michael A. Lucas
Arthur J. Chapman	Sandra D. Miller
Don H. Choi	Margot K. McDonald
Thomas L. Disanto	Marc J. Neveu
James A. Doerfler	Troy Peters
Donna P. Duerk	Stephen J. Phillips
Thomas Fowler, IV	Jens G. Pohl
Bruno Giberti	Jonathan Reich
Terry C. Hargrave	Sandra Stannard
Douglas Jackson	Don E. Swearingen
Laura E. Joines	Howard Weisenthal
John H. Lange	Christopher L. Yip

ACADEMIC PROGRAMS

Architecture – BArch, MS

The objective of the five-year Bachelor of Architecture degree program is to develop design and related skills necessary for entry into the professional field of architecture. Preparation for architecture spans several disciplines and requires a range of aptitudes. As the architect has a responsibility for solving problems of the built environment involving people, an understanding and sensitivity to human needs is required. Therefore, programs in architecture are broad in nature. With careful selection of elective work, areas of specialization can be included.

The Bachelor of Architecture degree is accredited by the National Architectural Accrediting Board.

"In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit US professional degree programs in architecture, recognizes three types of degrees: the Bachelor of Architecture, the Master of Architecture, and the Doctor of Architecture. A program may be granted a 6-year, 3-year, or 2-year term of accreditation, depending on the extent of its conformance with established educational standards.

Doctor of Architecture and Master of Architecture degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree that, when earned sequentially, constitute an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree."

California Polytechnic State University, San Luis Obispo, CA, College of Architecture and Environmental Design,

Department of Architecture offers the following NAAB-accredited degree program:

B.Arch. (225 undergraduate credits)

Next accreditation visit for program: 2011"

LAPTOP REQUIREMENT

The department has a requirement that all freshmen or transfer students have a notebook computer when they enter the program. In the profession of architecture, computing is an integral component, and developing the ability to critically integrate hand and digital tools is a fundamental aspect of architectural education. A notebook computer is the key to having computing capabilities available at all times and all locations. Financial aid may be available to cover the cost of the notebook computer (contact the Financial Aid Office for more information).

OFF-CAMPUS ARCHITECTURE PROGRAMS

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

CSU International Programs. There are two CSU-sponsored organized studio programs for Architecture majors, one in Copenhagen, Denmark, and one in Florence, Italy. The concept of the studio organization is similar to Cal Poly. Credit for major design courses, some professional electives, some general education courses and free electives are handled through approved overseas study centers.

San Francisco Urban Design Internship Program offers fourth year students the opportunity to live and study in San Francisco for one quarter (fall and spring). Each class utilizes real projects with the participation of talented, award-winning architectural offices and urban designers to introduce students to urban design and architectural practice.

Washington Alexandria Architecture Consortium. The Consortium, comprised of several universities including Cal Poly, is organized to offer a challenging and stimulating one-year option. The Center functions as an extension of the College of Architecture of Virginia Polytechnic Institute and State University (VPI) in the Washington DC Metropolitan Area. The Consortium seeks to explore and expand design pedagogues and processes and establish collaboration with national and international institutions.

Other Programs. The Architecture Department offers a changing variety of off-campus programs throughout the world. Contact the Architecture Department for current information.

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

BACHELOR OF ARCHITECTURE

- ☐ 60 units upper division ☐ GWR
 - ☐ 2.0 GPA ☐ USCP
- * = Required in Major/Support; also satisfies GE

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

MAJOR COURSES

ARCH 101 Survey of Arch. Education and Practice	1,1,1
ARCH 131, 132, 133 (4)(4)(4).....	12
ARCH 207 Environmental Control Systems 1.....	4
ARCH 217 History of Architecture (C3)*	4
ARCH 218 History of Architecture (Area C)*	4
ARCH 219 History of Architecture	4
ARCH 241, 242 Architectural Practice 2.1, 2.2.....	4,4
ARCH 251, 252, 253 Arch. Design 2.1, 2.2, 2.3	5,5,5
ARCH 307 Environmental Control Systems 2.....	4
ARCH 341, 342 Architectural Practice 3.1, 3.2.....	4,4
ARCH 351, 352, 353 Arch. Design 3.1, 3.2, 3.3	5,5,5
ARCH 420 Seminar in Architectural History, Theory and Criticism <i>or</i> ARCH 320 Topics in Architectural History	4
ARCH 443 Professional Practice	4
ARCH 451, 452, 453 Arch. Design 4.1, 4.2, 4.3	5,5,5
ARCH 481 Senior Arch Design Project.....	5,5,5
ARCH 492 Senior Design Thesis.....	3
	122

SUPPORT COURSES

ARCE 211 Structures I.....	3
ARCE 212 Structures II	3
ARCE 226 Structural Systems for Architects	3
ARCE 315 Small Scale Buildings.....	4
ARCE 316 Large Scale Buildings.....	4
EDES 101 Intro to Architecture and Env Design	2
MATH 141 Calculus I (B1)*	4
MATH 182 Calculus for Architecture and Construction Management (MATH 142 Calculus II substitutes) (B1)*	4
¹ PHYS 121/PHYS 141 (B3)*	4
PHYS 122 College Physics II <i>or</i> PHYS 132 General Physics II.....	4
Professional Electives	16

May include:
 Any EDES, ARCH, ARCE, CM, CRP, LA or ART course.
 Any course included in any College of Architecture and Environmental Design minor, or the ART minor.

GENERAL EDUCATION (GE)

72 units required, 20 of which are specified in Major/Support.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing.....	4

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Support	0
¹ B2 Life Science.....	4
B3 Physical Science * 4 units in Support.....	0
¹ B4 One lab taken in either PHYS 121 (see Support) or a B2 course with lab component	

Area C Arts and Humanities (12 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts * 4 units in Major	0
C4 Upper-division elective	4
Area C elective * 4 units in Major	0

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

.....	4
	52

FREE ELECTIVES

.....	0
	225

¹ PHYS 121 has a lab (B4). If PHYS 141 is taken, then take a B2 Life Science course with a lab (B4).

MBA – Architectural Management Track

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

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

MBA Common Required Courses (36)

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

MCRP, ARCHITECTURE PLANNING TRACK

This track is available only to students who are enrolled in Cal Poly's Bachelor of Architecture (BArch) program. Students may request permission to enroll in Master of City and Regional Planning (MCRP) graduate level courses during their fourth and fifth years of study. Upon completion of the BArch degree, students are eligible to formally apply for graduate student status in the MCRP program. Students who fulfill all the requirements first receive the BArch and then the MCRP. Contact the Graduate Coordinator, City and Regional Planning Department for additional information.

MASTER OF SCIENCE IN ARCHITECTURE

The Master of Science in Architecture is a post-professional degree in the broad field of architecture with an emphasis on environmental planning and design in an information society. Common core studies aim to establish a framework for advanced study and research, while specialization areas and directed electives provide for the development of in-depth study chosen by candidates.

Professional Practice Specialization. Designed for applicants holding an accredited architecture degree wishing to pursue advanced studies with a strong professional practice orientation.

Environmental Design Specialization. Designed for applicants holding a degree in one of the several cognate environmental design disciplines, engineering, or computer science, wishing to pursue advanced studies with a strong inter-professional orientation. This is a post-professional specialized degree in the inter-professional field of environmental design, with special reference to its three primary contributory disciplines of Architecture, City and Regional Planning, and Landscape Architecture. The common core curriculum aims to establish a central focus for advanced study and research, while sub-core studies and directed electives provide for in-depth study in one of the contributory disciplines of Architecture, City and Regional Planning, Architectural Engineering, Landscape Architecture and Construction Management.

Graduate Study Areas. The graduate study topics are challenging. Each is of critical importance to the architecture, engineering, and construction industry. The knowledge and experience students bring to the program are fully employed. At the same time new practices and new knowledge are acquired. These study areas are:

- * *Computer-Aided Design.* Focusing on the development and utilization of computer systems in the architectural process, with particular emphasis on design information representation and management, the development and utilization of knowledge bases, and expert design assistants. Students are encouraged to participate in the research projects undertaken by the CAD Research Center of the College of Architecture and Environmental Design.
- * *Architectural Science.* Focusing on the increasingly complex performance and technical aspects of architectural design and the knowledge and skills needed when designers deal with the challenges associated with such topics as energy responsive architecture, acoustics, lighting, and wind-effects phenomena.
- * *Facilities Management.* Stresses the practice of coordinating the physical workplace with the people and work of an organization. It integrates the principles of business administration, architecture, and behavioral and engineering sciences. Facilities management is concerned with the design, construction, maintenance, and management of physical environments. Facility managers usually work as generalists managing teams of specialists such as architects, interior architects, interior designers, engineers, construction personnel, communication technicians, etc.
- * *Structural Engineering.* For students holding an accredited degree in architectural engineering or civil

engineering. To prepare students in meeting the demands for practice in the structural engineering profession.

CURRICULUM FOR MS ARCHITECTURE

Core Curriculum	36
ARCH 519 Theory of Architecture (3)	
ARCH 551 Architectural Design (5,5,5)	
ARCH 561 Advanced Design (9)	
ARCH 598 Master's Design Project (9)	
Directed Electives	9
Advisor approved elective courses are included in a student's formal program of study.	
	45

For further information contact the Graduate Program Coordinator, Architecture Department, College of Architecture and Environmental Design, Cal Poly, San Luis Obispo, CA 93407.

MS Architecture, Specialization in ARCHITECTURAL ENGINEERING

The Architectural Engineering specialization is designed for students holding an accredited degree in architectural engineering or civil engineering who wish to pursue advanced studies in structural engineering. For students within the Cal Poly Architectural Engineering undergraduate program, a blended BS + MS option is available. The program is developed to better prepare students in meeting the demands for practice in the structural engineering profession. Core curriculum courses expose students to emerging topics in structures, advanced methodologies to predict and analyze structural behavior, and cutting edge design procedures. Additionally, related topics in architecture and construction management are integrated into the curriculum to create a unique masters level education. Elective courses allow individuals to concentrate in an area of interest related to environmental design or technology. Individuals conclude their educational experience through a series of project oriented laboratories designed to increase the student’s awareness of building design issues using projects, reports, or experimentation, and culminating in a report and oral presentation. Additionally, candidates should refer to the “General Policies Governing Graduate Studies” section for supplemental University requirements.

Core Curriculum	28
ARCE 502 Nonlinear Structural Behavior I (3)	
ARCE 503 Nonlinear Structural Behavior II (3)	
ARCE 511 Structural System Behavior (3)	
ARCH 551 Architectural Design (5, 5)	
ARCH 598 Master’s Design Project (9)	
Directed Electives	18
Advisor approved elective courses shall be included in a student’s Formal Study Plan.	
	46

For additional information contact the Architectural Engineering Department or the Architecture Department Graduate Program Coordinator.

Blended BS Architectural Engineering + MS Architecture

For motivated students a blended program, also referred to as a 4+1 program, is available. The blended program allows students to simultaneously complete both a bachelor in Architectural Engineering and a Masters in Architecture with a specialization in architectural engineering. The blended program offers promising individuals an opportunity to continue their studies in architectural engineering in a collaborative learning environment.

Eligibility for the Blended Program

Architectural Engineering (ARCE) students wishing to pursue a Masters of Science in Architecture with a Specialization in Architectural Engineering may apply after completing all 300-level Architectural Engineering courses and 180 units. The ARCE Graduate Committee reviews all applications and selects individuals with records that demonstrate success at the undergraduate level as well as potential to succeed at the graduate level. Candidates shall meet the University requirements, as a minimum, stated in “Blended BS+MS Programs” in the Graduate Programs section. Contact the Architectural Engineering Department for additional information.

City & Regional Planning

Engineering West Bldg. (21), Room 128
805 756-1315

Department Head, Hemalata Dandekar

Michael R. Boswell	Kelly D. Main
W. David Conn	Cornelius K. Nuworsoo
Vicente del Rio	William J. Siembieda
Adrienne I. Greve	Umut Toker
	Paul Wack

ACADEMIC PROGRAMS

City and Regional Planning – BS, MCRP, Minor
Transportation Planning – MCRP/MS Engineering

The profession of city and regional planning involves helping people and communities manage growth and change in their physical, social, and economic environments. The focus is on understanding how cities and towns (human settlements) function and how to make them better places for people to live, work and play. City planning has its roots in engineering, architecture, landscape architecture, law, social welfare and government reform. The practice of city and regional planning is both science and art. It involves technical competence, creativity, hard-headed pragmatism and the ability to develop a vision of the future and to build on that vision. Contemporary planners combine design, quantitative, and people skills to assist communities and society. Both the undergraduate (BSCR) and the graduate (MCRP) programs are accredited by the national Planning Accreditation Board.

The degree programs prepare students for professional careers in the design of human settlements in harmony with the natural environment and the needs of society. Practicing planners work in public agencies, non-profit organizations, and private consulting firms, preparing comprehensive plans for projects, neighborhoods, cities, and entire regions. The plans address 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 an emphasis on urban design and development. The Master of City and Regional Planning degree builds on a general undergraduate preparation in the humanities, architecture, landscape architecture, social sciences or natural sciences, and offers two areas of emphasis: urban development and design and environmental planning.

BS CITY AND REGIONAL PLANNING

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

CRP 101 Intro to Profession of CRP	1
CRP 201 Basic Graphic Skills	4
CRP 202 Urban Design Studio I.....	4
CRP 203 Urban Design Studio II.....	4
CRP 211 Cities: Form, Culture and Evolution.....	4
CRP 212 Introduction to Urban Planning.....	4
CRP 213 Population, Housing and Econ Apps.....	4
CRP 214 Land Use and Transportation Studies.....	4
CRP 215 Planning for and with Multiple Publics....	4
CRP 216 Computer Applications for Planning.....	2
CRP 314 Planning Theory	3
CRP 315 Fiscal and Project Feasibility.....	4
CRP 336 Intro to Environmental Planning	4
CRP 341 Community Design Laboratory	4
CRP 342 Environmental Planning Methods	4
CRP 409 Planning Internship.....	2
CRP 410, 411 Community Planning Lab I, II.....	5,5
CRP 412 Plan Implementation.....	4
CRP 420 Land Use Law	4
CRP 430 Public Sector Planning Practice.....	3
CRP 436 Collaborative Planning	4
CRP 461 and CRP 462 Sr Project I and II (2)(2) or CRP 463 Sr Project Professional Practice (4)	4
¹ Approved electives	12

Note: If any course listed here is taken to meet a curriculum requirement, it cannot be double-counted as an approved elective.

Select 12 units from:

- AG 350 (Area F);
- AGB 312, 315;
- ANT 310, 360 (D5);
- ARCE 311;
- ARCH 316, 339, 401, 420, 445, 446, 447, 460, 461, 513;
- ART 101 (C3), 121, 182, 222, 313, 484, 487;
- BIO 325, 328, 415;
- BRAE 239;
- BUS 207, 350 (Area F), 382, 384, 387, 404, 475, 477;
- CE 421, 424, 523, 525;
- CM 430, 432, 475;
- CRP 211, 310, 334, 338, 375, 400, 402, 404, 408,409, 424, 427, 435, 438, 442, 444, 445, 446, 447, 452, 453, 457, 458, 470, 471, 472, 483, 500, 505,513, 516, 520, 525, 545, 548, 553;

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

CSC 270;
 ECON 201, 222, 303 (D5) (USCP), 304 (D5),
 324, 325, 410, 431, 432, 434, 435;
 EDES 350 (Area F), 406, 408, 410, 420;
 ENGL 310, 317, 319;
 ENGR 350 (Area F);
 ENVE 324 (Area F), 330, 411, 421, 434, 436,
 438, 439, 450;
 ERSC 323, 325, 333;
 GEOG 308 (D5), 317, 318, 325, 328, 333, 340,
 414;
 GEOL 205;
 HIST 438, 468;
 HNRS 212, 303, 319, 475;
 HUM 330 (Area F), 350 (Area F);
 IME 314;
 IT 454;
 JOUR 312, 413;
 KINE 265, 416, 434, 510;
 LA 221, 318, 320, 330, 363, 411, 481, 482,
 551, 552;
 NR 306, 311, 317 (Area F), 318, 323, 326, 335,
 404, 408, 416, 420, 425, 435, 450, 455, 465;
 PHIL 321 (C4), 333 (C4), 334 (C4), 335 (C4)
 (USCP), 336 (C4) (USCP), 337 (C4),
 340 (C4), 350 (C4);
 POLS 310, 316, 325 (D5), 328 (D5), 330, 333,
 338, 351, 375, 419, 451, 456, 459, 471, 515,
 516, 517, 518;
 PSC 320 (Area F);
 PSY 252, 302, 311 (D5), 350, 351, 352, 360;
 RPTA 311, 313, 314, 350, 360, 375, 405, 413,
 417, 424, 450;
 SCM 350 (Area F);
 SOC 301, 309, 313, 315 (D5), 316, 323, 355,
 395, 413, 421, 431;
 SS 310, 321, 345, 421, 431, 433, 440, 442, 508;
 STAT 313, 321;

Total units for Major Courses: **97**

SUPPORT COURSES

EDES 101 Intro to Arch and Env Design 2
 NR 306/NR 319/BIO 112..... 4
 GEOL 102 (B3)*/GEOL 205 (B3*)/CHEM 110
 (B3&B4)* 4
 MATH 118 Pre-Calculus Algebra (B1)* 4
 POLS 375/471/516..... 4
 STAT 221 Intro to Probability & Statistics (B1)* 5

23

GENERAL EDUCATION (GE)

72 units required, 12 of which are specified in Support.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing 4
 A2 Oral Communication 4
 A3 Reasoning, Argumentation, and Writing..... 4

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Support 0
 B2 Life Science..... 4
 B3 Physical Science * 4 units in Support..... 0
 B4 One lab taken with either a B2 or B3 course

Area C Arts and Humanities (20 units)

C1 Literature 4
 C2 Philosophy 4
 C3 Fine/Performing Arts 4
 C4 Upper-division elective 4
 Area C elective (Choose one course from C1-C4) 4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404) 4
 D2 Political Economy 4
 D3 Comparative Social Institutions 4
 D4 Self Development (CSU Area E) 4
 D5 Upper-division elective (Not CRP)..... 4

Area F Technology Elective (upper division)

(4 units) 4
60

FREE ELECTIVES **0**
180

City and Regional Planning Minor

The minor provides students with an interdisciplinary understanding of the science and the art of city planning and its relationship with other environmental design professionals. The student is provided with an understanding of how growth and change affect the physical, social and economic aspects of the city, including the relationships among land use, transportation, housing and the environment. Courses that build skills in the preparation of plan documents, land use studies and environmental studies are combined with laboratory courses providing opportunities for involvement in community building and plan-making projects.

The minor is excellent preparation for creating visions of the future, participation in government and community organizations. It enhances skills in disciplines that have linkages with cities and the built and natural environments. It provides the student with the knowledge, skills and values that help people build better communities and cities.

Required courses

	<i>Units</i>
CRP 212 Introduction to Urban Planning.....	4
CRP 213 Population, Housing and Economic Applications <i>or</i> CRP 214 Land Use and Transportation Studies	4

Select two courses from the following: 8

CRP 203 Urban Design Studio II (4)
or appropriate equivalent
 CRP 336 Intro to Environmental Planning (4)
 CRP 341 Community Design Laboratory (4)
 CRP 342 Environmental Planning Methods (4)

Approved Electives 11/12

Select three courses from the following:

CRP 101, 215, 310, 314, 315, 334, 338, 375, 402,
404, 408, 410, 411, 412, 420, 424, 427, 430, 435,
436, 438, 442, 444, 445, 446, 447, 452, 453, 457,
458, 470, 472, 483, 525, 545; EDES 406, 408, 410

27/28

Additional Minors

The department also participates in offering interdisciplinary minors in Real Property Development, and Sustainable Environments.

MCRP Advising Track (5+1) for BLA & BARCH Students

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

Blended Program-Bachelor of Architecture/Master of City and Regional Planning (BLA/MCRP)

The blended BLA/MCRP Program is an accelerated route to the graduate professional degree in City and Regional Planning. Under this program a student can simultaneously graduate with a BLA and MCRP. Contact the Graduate Coordinator, City and Regional Planning Department, for additional information.

MASTER OF CITY & REGIONAL PLANNING**General Characteristics**

The Master of City and Regional Planning degree (MCRP) is an applied, comprehensive, and professionally-based program. It is open to students with high standards of academic achievement who wish to pursue careers in city and regional planning. It is structured to prepare graduates to function in a general context of city planning, as well as in an area of special emphasis. The core courses cover planning theory, methods, law, community-based studies, and formulation and implementation of plans and policies.

Two principal areas of study are emphasized:

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

In addition, skill building in all aspects of planning communications (visual, verbal, written) is stressed. The City and Regional Planning Department jointly offers the MCRP degree with the Master of Science in Engineering with a specialization in transportation planning.

The MCRP program is structured to meet the needs of those who have earned baccalaureate degrees in a variety of disciplines including, but not limited to, environmental

studies, economics, business, geography, architecture, landscape architecture, civil engineering, political science, environmental or urban studies, natural resources management, and ecology. The program is six quarters (two years) in duration and consists of 72 approved units (not including courses necessary to compensate for deficiencies). Because of the sequencing of courses, students admitted to the program are generally expected to begin their studies in the fall quarter. Students with prerequisite coursework deficiencies and those with backgrounds allowing waivers of first-year core courses may be admitted in other quarters. The degree culminates in a thesis (CRP 599), professional project (CRP 596), or a community planning studio (CRP 556).

Students have an opportunity to develop a close working relationship with the planning faculty. Self-directed study, tailored to the student's interests and needs, is also encouraged.

Prerequisites

Students entering the MCRP program are required to have a background in computer applications equivalent to the Cal Poly course, CSC 110 Computers and Computer Applications: Windows. This includes knowledge of Microsoft Windows, word processing and spreadsheets.

Applicants for admission to the Master of City and Regional Planning program are expected to:

1. Have earned a bachelor's degree from an accredited university or college,
2. Have attained a grade point average of 3.0 in last 90 quarter units of undergraduate work,
3. Provide the CRP Department with the results of the Graduate Record Examination Aptitude Test in cases of borderline grade point average,
4. Give indications of motivation, maturity, and high standards of academic involvement through work and references (three letters required) and submission of a project or paper demonstrating writing ability,
5. Provide a current résumé.

Applicants lacking prerequisites or other background requirements for classified standing requirements may be admitted on a conditionally classified basis, depending on the results of an individual analysis of their applications.

Units

Core Courses..... 52-56

First Year

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

Second Year

CRP 509 Professional Development (1-3)
 CRP 518 Public Policy Analysis (4)
 CRP 530 Planning Agency Management (3)
 CRP 535 Land Use and Planning Law (4)
 CRP 552 Community and Regional Planning Studio I (4)
 CRP 554 Community and Regional Planning Studio II (4)
 CRP 596 Prof Project (2)(2)(2) *or*
 CRP 599 Thesis/Project (2)(2)(2) *or*
 CRP 556 Community and Regional Planning Studio III (4)

Emphasis Area (select one) 11

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

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

Advisor approved electives 5-9
 72

Joint MCRP/MS Engineering with Specialization in TRANSPORTATION PLANNING

The Transportation Planning Specialization is a joint interdisciplinary program between the College of Engineering and the City and Regional Planning Department of the College of Architecture and Environmental Design. Participation in the program requires enrollment in both Colleges. Participants successfully completing the program are awarded both the MCRP and the MS in Engineering, each with a Specialization in Transportation Planning.

The major objectives of this joint program are to:

- (a) Provide an interdisciplinary graduate program which combines elements of transportation planning with city and regional planning to address a need for professionals who understand the technology of transportation planning and the importance of transportation within the urban environment. The required master's project enables students to integrate their work through directed study applied to special areas of their choosing.
- (b) Provide planners with courses essential to understanding the technologies of transportation planning. Provide engineers with a broad background in urban studies and knowledge of contemporary environmental issues.

- (c) Take advantage of the backgrounds of program participants. The graduate students of both sponsoring departments include both mature professionals returning for advanced degrees and recent graduates with diversity of specializations.

Prerequisites. Applicants must have satisfactorily completed courses that cover the following or equivalent subject areas:

- CE 321 Fundamentals of Transportation Engineering *or* CRP 435 Transportation Theory
- COMS 101 Public Speaking
- ECON 201 Survey of Economics *or* ECON 222 Macroeconomics
- ENGL 148 Reasoning, Argumentation and Professional Writing *or* ENGL 149 Technical Writing for Engineers
- MATH 142 Calculus
- PHYS 141 General Physics IA
- STAT 321 Probability and Statistics for Engineers and Scientists *or* STAT 221 Intro to Probability and Statistics *or* STAT 312 Statistical Methods for Engineers

Applicants for admission are expected to:

1. Have earned a bachelor's degree from an accredited university or college,
2. Have attained a grade point average of 3.0 in last 90 units of undergraduate work,
3. Provide results of the Graduate Record Examination (GRE) Aptitude Test to the Admissions Committee (GRE requirement may be waived for Cal Poly bachelor of science graduates and applicants with superior academic records),
4. Give indications of motivation, maturity, and high standards of academic involvement through work and references (three letters required) and submission of a project or paper demonstrating writing ability,
5. Provide a current résumé.

Applicants lacking prerequisites or other background requirements for classified standing may be admitted on a conditionally classified basis, depending on the results of an individual analysis of their applications.

Core Courses..... 64

CE 523 Transportation System Planning (4)
 CE 528 Transportation Analysis *or*
 CE 421 Traffic Engineering (4)
 CE 591 Graduate Seminar I (1)
 CE 599 Design Project (Thesis) (2,2,2) *or*
 CRP 599 Thesis (2)(2)(2) *or*
 CRP 596 Professional Project (2)(2)(2) *or*
 CRP 556 Community and Regional Planning Studio III (4)
 CRP 435 Transportation Theory (3)
 CRP 501 Foundations of Cities and Planning (4)

CRP 509 Professional Development (1-3)
 CRP 510 Planning Theory (4)
 CRP 513 Planning Research Methods (4)
 CRP 516 Methods of Data Analysis (4)
 CRP 518 Policy Analysis for Planners (4)
 CRP 525 Plan Implementation (4)
 CRP 530 Planning Agency Management (3)
 CRP 535 Land Use and Planning Law (4)
 CRP 552 Community and Regional Planning
 Studio I (4)
 CRP 554 Community and Regional Planning
 Studio II (4)
 Advisor approved electives (4-8)

Emphasis Area (select one of the following)..... 11
Urban Development and Design Emphasis
 CRP 520 Feasibility Studies in Planning (4)
 CRP 548 Principles of Urban Dev. and Design (4)
 Urban Development and Design elective (3)
Environmental Planning Emphasis
 CRP 545 Principles of Env. Planning (4)
 Environmental Planning electives (7)

Approved CE/ENVE electives: 15
 Select from: CE 421, 422, 423, 424, 500, 521,
 522, 524, 525, 527, 528, 529, ENVE 411, or
 other advisor approved CE/ENVE courses

Construction Management

Building 186, Room A100
805 756-1323

Department Head, Allan J. Hauck

Philip L. Barlow	Thomas M. Korman
Barbara J. Jackson	Lonny G. Simonian
Barry K. Jones	Gregory F. Starzyk
Hal Johnston	Paul A. Weber
Scott D. Kelting	

ACADEMIC PROGRAMS

Construction Management – BS, Minor

The curriculum in Construction Management leads to the Bachelor of Science degree which is accredited by the American Council for Construction Education. Major emphasis is placed on organizing and managing the construction phase of society's efforts to improve the environment. The constructor is an important member of the building team and requires a professional knowledge of techniques, materials, equipment, job planning and cost control to add to the contributions of the planning and design professions. Graduates of this program can help supply the urgent needs of the construction industry and its related fields.

Laptop Requirement

The department has a requirement that all students have a notebook computer beginning the sophomore year. This is the point the students begin their major coursework and begin preparing themselves for a career in the construction industry. Most Construction Management classes emphasize cooperative projects/assignments, and a notebook computer provides the required mobility to facilitate collaboration. In today's construction environment, computing is an integral component with the computer being the standard tool. A notebook computer is the key to having computing capability available at all times and all locations. Financial aid may be available to cover the cost of the computer laptop (contact the Financial Aid Office for more information).

Minors

The department offers a Construction Management Minor for students in other programs and also participates in offering interdisciplinary minors in Integrated Project Delivery, and Real Property Development. Please see the College of Architecture and Environmental Design for more information.

BS CONSTRUCTION MANAGEMENT

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

CM 102 Introduction to Construction Management	2
CM 115 Fundamentals of Construction Mgmt	6
CM 213 Heavy Civil Construction Management.....	6
CM 221 Concrete and Formwork Technology	3
CM 311 Residential Construction Management	6
CM 313 Commercial Construction Management	6
CM 331 Construction Accounting	3
CM 332 Evaluation of Cost Alternatives	3
CM 411 Specialty Contracting Construction Mgmt	6
CM 413 Jobsite Construction Management	6
CM 415 Interdisciplinary Project Management	5
CM 433 Integrated Project Delivery	2
CM 443 Management of the Construction Firm	4
CM 463 Senior Project: Professional Practice for Constructors	3
Technical electives	6
CM courses; CAED courses; BUS 342, 346, 387, 391; IT 371; other courses may be approved by advisor and department head.	

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SUPPORT COURSES

ARCE 211 and ARCE 212, or ME 211 and CE 204	3,3
ARCE 226 Structural Systems for Architects	3
ARCE 315 Small Scale Buildings	4
ARCE 316 Large Scale Buildings	4
ARCE 421 Soil Mechanics	3
ARCH 106 Materials of Construction	2
BRAE 239 Engineering Surveying	4
BUS 207 Legal Responsibilities of Business	4
BUS 212 Financial Acctg for Nonbusiness Majors	4
BUS 215 Managerial Accounting	4
ECON 303 Economics of Poverty, Discrimination and Immigration (D5)*	4
ECON 221 Microeconomics	4
ECON 222 Macroeconomics (D2)*	4
EDES 101 Intro to Architecture and Env Design	2
ENGL 310 Corporate Communication	4
GEOL 201 Physical Geology	3
MATH 141 Calculus I (B1)*	4
MATH 182 Calculus for Arch. and Construction Mgmt. (MATH 142 Calculus II substitutes)	4
PHYS 141 General Physics IA	4
PHYS 132/CHEM 124/CHEM 127 (B3 & B4)*	4
STAT 251 Statistical Inference for Mgmt I (B1)* ...	4

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GENERAL EDUCATION (GE)

72 units required, 20 of which are specified in Support.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Support....	0
B2 Life Science	4
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (12 units)

D1 The American Experience (40404)	4
D2 Political Economy * 4 units in Support.....	0
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective * 4 units in Support...	0

**Area F Technology Elective (upper division)
(4 units).....**

4

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FREE ELECTIVES.....

0

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CONSTRUCTION MANAGEMENT MINOR

The Construction Management Minor provides students an introduction to the body of knowledge expected of persons pursuing careers in the construction industry. This minor gives a student a competitive edge when applying for certain jobs, by providing concepts, tools and skills which enhance one's progress in a career in one of the professions involved in the built environment.

The Construction Management Minor is recommended for majors in architecture, architectural engineering, civil engineering, mechanical engineering and electrical engineering. Enrollment in the minor is limited, and selection is made based upon the applicant's performance in his or her major courses. Contact the department for more information.

Core courses

CM 102 Introduction to Construction Mgt	2
CM 212 Fundamentals of Construction Mgt	3
CM 433 Integrated Project Delivery	2

Methods courses

12

Select two of the following six courses. One course must be CM 213, CM 311, or CM 313.

CM 213 Heavy Civil Construction Mgt (6)	
CM 311 Residential Construction Mgt (6)	
CM 313 Commercial Construction Mgt (6)	
CM 411 Specialty Contracting Construction Management (6)	
CM 413 Jobsite Construction Mgt (6)	

Project-Based courses

5

Select from the following:

CM 415 Interdisciplinary Project Management (5)	
CM 463 Senior Project: Professional Practice for Constructors (3) <i>plus</i> CM 400 Special Problems for Advanced Undergraduates (2)	

Landscape Architecture

Dexter Bldg.(34), Room 251
805 756-1319

Department Head, Margarita M. Hill

Beverly J. Bass	Christine E. O’Hara
Walter D. Bremer	Joseph J. Ragsdale
Gary R. Clay	Cesar Torres-Bustamante
Omar Faruque	David J. Watts
Jun-Hyun Kim	

Affiliated Faculty:

Thomas J. Rice, Earth and Soil Sciences Department

ACADEMIC PROGRAM

Landscape Architecture – BLA

The profession of landscape architecture is primarily involved with the design, planning, and protection of the natural and developed environments. The five-year program in landscape architecture is accredited by the American Society of Landscape Architects and recognized by the Landscape Architects Technical Committee of the California Board of Architectural Examiners.

An emphasis is placed on a process oriented approach to design and planning while developing an awareness and sensitivity to community and human values as they relate to environmental conditions. Students majoring in landscape architecture acquire technical competencies and creative design skills through a range of projects which represent the breadth of the profession.

Graduates of the program are prepared for positions in private practice, consulting, governmental agencies at the national, state or local levels, industry and construction firms. Graduate study is encouraged for those students interested in pursuing advanced studies or academic positions.

Majors who are in their last two years of study and have at least a 3.2 grade point average may have the opportunity to join Theta Chapter of Sigma Lambda Alpha, the national scholastic honor society for landscape architecture.

Laptop Requirement

The department has a requirement that all freshmen or transfer students have a notebook computer when they enter the program. In the profession of landscape architecture, computing is an integral component, and developing the ability to critically integrate hand and digital tools is a fundamental aspect of landscape architecture education. A notebook computer is the key to having computing capabilities available at all times and all locations. Financial aid may be available to cover the cost of the notebook computer (contact the Financial Aid Office for more information).

BACHELOR OF LANDSCAPE ARCHITECTURE

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

* = Required in Major or Support; also satisfies GE
Note: No major or support courses may be taken as credit/no credit.

MAJOR COURSES

LA 101 Introduction to Landscape Architecture	4	
LA 130 Landscape Interpretation	4	
LA 170 Principles of Design Communication	4	
LA 202 Design Fundamentals I	4	
LA 203 Design Fundamentals II	4	
LA 204 Design Fundamentals III	4	
LA 211 History of Landscape Architecture: Ancient Civilizations through Colonial America (C3)*	4	
LA 212 History of Modern and Contemporary Landscape Architecture (Area C elective)*	4	
LA 220 Landscape Ecology: Concepts, Issues and Interrelationships.....	4	
LA 221 California Plants and Plant Communities or EHS 381 Native Plants for California Landscapes	4	
LA 241 Site Engineering Techniques & Apps.....	4	
LA 242 Implementation Strategies	4	
LA 243 Materials/Techniques of Landscape Constr.	4	
LA 320 Design Theory for Landscape Architecture	4	
LA 330 Cultural Landscapes: People, Places and Ethical Decisions.....	4	
LA 370 Professional Practice.....	4	
LA 371 Internship	3	
LA 401 Research Project	2	
LA 402 Design Theory & Exploration Focus Studio	4	
LA 403 Natural Envmnts Design Focus Studio.....	4	
LA 404 Cultural Envmnts Design Focus Studio.....	4	
LA 405 Proj. Design/Implementation Focus Studio	4	
<i>Select one course from:</i>		
LA 402, LA 403, LA 404, or LA 405	4	
<i>Select 20 units from the following Integrated Learning Course (ILC) topics. At least three (3) different ILCs must be chosen.</i>		
<i>(ILCs are repeatable to 12 units).....</i>		20
LA 431 CAD/Digtl Media Communic. (ILC) (4)		
LA 432 Landscape Ecology Applications (ILC) (4)		
LA 433 Cultural Environments (ILC) (4)		
LA 434 Project Design/Implementation (ILC) (4)		
LA 435 Professional Practice (ILC) (4)		
LA 436 Traditional/Digital Design Communications (ILC) (4)		
LA 437 3D Digital Design Communic. (ILC) (4)		
LA 438 GIS App. To Design Projects (ILC) (4)		
LA 461 Senior Design Project Focus Studio	4,4	
Upper division LA electives	8	
Any 300 or 400-level LA course, or EDES 333.		

SUPPORT COURSES

ARCH 217/218/219 History of Architecture	4
BOT 121 General Botany <i>or</i>	
BIO 114 Plant Diversity and Ecology (B2&B4)*	4
CRP 212 Introduction to Urban Planning	4
EDES 101 Intro Architecture & Env Design	2
EHS 231 Plant Materials	4
EHS 232 Plant Materials	4
MATH 118 Pre-Calculus Algebra (B1)*	4
MATH 119 Pre-Calculus Trigonometry (B1)*	4
Select 8 units from the following	8
BIO 227 Wildlife Conservation Biology (4)	
BRAE 337 Landscape Irrigation (4)	
SS 121 Introductory Soil Science (4)	
STAT 217 Intro to Stat Concepts and Methods (4)	
<i>or</i> STAT 218 Applied Stat for Life Sciences (4)	
Professional electives.....	8
May include any course in: College of	
Architecture and Environmental Design; Art and	
Design Department; TH 330; any minor in the	
College of Architecture and Environmental	
Design.	
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GENERAL EDUCATION (GE)

72 units required, 20 of which are specified in Major/Support.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing.....	4

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Support....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (12 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts * 4 units in Major	0
C4 Upper-division elective	4
Area C elective (Choose one course from C1-	
C4)* 4 units in Major	0

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division)

(4 units).....	4
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FREE ELECTIVES.....

0

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MBA – Landscape Architecture Management Track

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

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

MBA Common Required Courses (36)

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

Blended Program-Bachelor of Landscape Architecture/Master of City and Regional Planning (BLA/MCRP)

The blended BLA/MCRP Program is an accelerated route to the graduate professional degree in City and Regional Planning. Under this program a student can simultaneously graduate with a BLA and MCRP. Students shall meet the minimum eligibility requirements for a blended degree set down in the university catalog, complete a planning internship and the required MCRP classes. An updated list pertaining to which courses can be counted in the program is available from the City and Regional Planning Department. Students choosing this program shall make a request for admission to the CRP department head or graduate coordinator, who determines eligibility.

MCRP courses for the blended program include: CRP 420, 510, 516, 518 or 513, 520, 525, 530, 552, and 554.

Orfalea College of *Business*

David P. Christy, Dean
Bradford P. Anderson, Associate Dean
Kris McKinlay, Assistant Dean
Eddy Quijano, Advancement Director
Business Bldg. (03), Room 455, 805 756-2704

<u>Area/Contact</u>	<u>Bachelor of Science Degrees:</u>
	Business Administration, BS
	<i>Concentrations:</i>
Accounting	Accounting
Finance	Financial Management
Management	Information Systems
	Management & Human Resources
Marketing.....	Marketing Management
Interdisciplinary....	Entrepreneurship
Studies	International Business
Industrial Tech.....	Packaging and Logistics
Economics	Economics, BS
	<i>Concentrations:</i>
	Real Estate
	Quantitative
Industrial Tech.....	Industrial Technology, BS
<u>Area/Contact</u>	<u>Minors:</u>
Advising	Business
Center	
Economics	Economics
Industrial Tech.....	Industrial Technology
	Packaging
<u>Area/Contact</u>	<u>Graduate Programs:</u>
Accounting	Accounting, MS
	Financial Accounting
	Specialization
	Tax Specialization
Economics	Economics, MS
Graduate	Business Administration, MBA
Management	General Management
Programs	Specialization
	Agribusiness Specialization
	Graphic Communication
	Document Systems
	Management Specialization
	Architectural Management Track
	Bachelor of Architecture, MBA
	Engineering Management
	MBA & MS Engineering
Industrial Tech.....	Business and Technology, MS

Mission Statement

We are an engaged learning community that contributes to business and society through discovery and application.

Amplifications of our Mission Statement

- We strive to contribute to the well being of our students and the communities to which they belong by instilling in them a love and an ability for learning and discovery that will serve them for the rest of their lives. We reinforce this by cultivating that love and ability for learning and discovery within ourselves.
- We embrace the principles in the 1940 AAUP Statement of Academic Freedom.
- We treat one another with respect and integrity, communicate honestly, and consult with one another when making important decisions that affect our learning community.
- We value research that is theoretical, applied and interdisciplinary, rooted in both our academic disciplines and the scholarship of teaching and learning.
- We are committed to providing our academically talented students with hands-on experiences and opportunities for discovery.
- Members of our community are ready to contribute to one another, to our organizations, and to the world.
- We challenge students, faculty and staff to assume responsibility for lifelong learning.
- We are committed to earning external accreditation of our college and its programs.

The BS degree program and the graduate programs in Business Administration are accredited by the AACSB–The International Association to Advance Collegiate Schools of Business. The BS degree program in Industrial Technology is accredited by the Association of Technology, Management, and Applied Engineering (ATMAE). The objective of accreditation is to foster high quality educational programs.

The college is organized into seven areas: Accounting, Economics, Finance, Industrial Technology, Marketing, Management and Graduate Management Programs. This organizational structure allows for programs of study that blend broad-based knowledge of the functional disciplines of Business and Economics with an in-depth study of particular discipline(s).

The college's educational philosophy follows the Cal Poly tradition—that of enlisting maximum student involvement in the learning process through case analysis, special projects, internships, computer simulations and other learn-by-doing exercises. The college has state-of-the-art computer facilities which are available to students to meet their coursework needs. Educational programs are designed to challenge highly motivated students to become tomorrow's socially responsible business leaders through a learn-by-doing technology oriented education. The curricula include general education requirements and specialized studies in

the student's major field. Optional areas of concentration within each major enable the student to select the program most closely suited to the chosen career field.

Business Honor Society

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

Advising Center

*Business Bldg. (03), Room 100; 805 756-2601
www.cob.calpoly.edu/advising*

The Advising Center Mission Statement

The Orfalea College of Business Advising Center serves as a peer-driven resource for students seeking academic guidance. Trained and knowledgeable staff provide all students of the Orfalea College of Business community to achieve their unique educational goals by providing timely and effective support in a professional, welcoming environment. We give students the resources needed to successfully negotiate the curriculum they select and empower them to make educated decisions.

The Peer Advising Model

The Orfalea College of Business Advising Center utilizes a student-to-student advising structure, which has been proven as a key factor to successful graduation rates. It is beneficial for students to meet with peer advisors, who are extensively trained on all college and university policies, expectations, curriculum and resources for advising students in their major.

Peer advisors take part in a quarter-long highly specialized training program to meet the needs of all Business, Economics, and Industrial Technology students. They update and review students' files before an advising session and are prepared to answer any questions or concerns the students may have about the curriculum and/or policies. Two professional academic advisors are involved with direct supervision and specialty student concerns; their appointments involve career/internship advising and serving students with special concerns, assisting students having academic difficulty. Faculty advisors within the college provide further information on course content, career planning, and clarification on concentration areas. Faculty advisors are assigned by the student's area office or by the student's concentration.

Areas of Specialty

- Academic advising and planning courses towards graduation
- Assist students with strategies for success in their academics
- Advising students on academic probation
- Interpretation of curriculum sheets and flowcharts, articulation agreements, requirements towards degree, and online advising tools
- Change of major advising
- Study abroad advising
- College and university policies and procedures
- Process forms related to student's degree progress
- Quarterly advising workshops and programs

Transfer Students

Transfer students to the Orfalea College of Business should refer to the curricula listed for the appropriate major. Please note that all lower division courses may be completed at most California Community Colleges. Full time students who have successfully completed all lower division courses prior to transferring to the College of Business can usually anticipate graduating in six quarters. Admitted transfer students should seek immediate advising assistance from the Advising Center.

Bachelor of Science Degree Programs

BS Business Administration
BS Economics
BS Industrial Technology

BS BUSINESS ADMINISTRATION

The undergraduate business program provides students with the knowledge and the analytical skills essential for employment in all sectors of business, industry, governmental and non-profit organizations. Graduates of the business program will understand the fundamentals of how a successful enterprise operates, and will have sufficient depth in an area of study to begin a successful career by providing immediate value to an organization.

Learning Objectives

The learning objectives for the business administration degree program are aligned with the Orfalea College of Business's mission and the business administration majors will:

1. demonstrate breadth of knowledge and skills in general business fundamentals.
2. demonstrate depth of knowledge, skills, and perspectives within their selected, specific business discipline.
3. recognize the ethical dimensions of business decisions and the wider responsibility of business organizations for societal level outcomes above and beyond firm level profit or loss.
4. be able to generate innovative solutions to business problems that are supported by appropriate data analysis and evaluation of alternatives.
5. understand diverse perspectives and generate solutions that incorporate them.
6. demonstrate effective writing and speaking skills, peer leadership and participation in teams.
7. engage in career-related interactions with business professionals and industry leaders.

The Orfalea College of Business engages in a comprehensive assessment plan to ensure student achievement of these objectives.

Concentrations

Concentrations are provided for students preparing for careers in Accounting, Financial Management, Management, Information Systems, Marketing Management, Entrepreneurship, International Business, and Packaging and Logistics.

The Quantitative concentration and the Real Estate concentration, offered under the BS Economics, are also available to Business Administration majors.

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

BS BUSINESS ADMINISTRATION

- 60 units upper division GWR
 2.0 GPA USCP

* = Required in Support; also satisfies GE

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

MAJOR COURSES

BUS 207 Legal Responsibilities of Business	4
BUS 214 Financial Accounting	4
BUS 215 Managerial Accounting.....	4
BUS 342 Fundamentals of Corporate Finance	4
BUS 346 Principles of Marketing	4
BUS 387 Organizational Behavior.....	4
BUS 391 Information Systems	4
BUS 401 Seminar in General Mgmt and Strategy	4
BUS 404 Governmental and Social Influences	4
Technology management. <i>Select one:</i>	4
IT 326, 330, 341, 371	
International business. <i>Select one:</i>	4
BUS 302, 303, 410, 427, 433, 446; ECON 330.	
Senior Project. <i>Select:</i>	
BUS 461 and 462, or BUS 416, 463, 464, 465 ...	4
Concentration courses (<i>see following pages</i>)	24-28
	72-76

SUPPORT COURSES

ECON 221 Microeconomics	4
ECON 222 Macroeconomics (D2)*	4
ECON elective (300–400 level)	4
MATH 221 Calculus for Business and Econ (B1)*	4
STAT 251 Statistical Inference-Mgmt. I (B1)*	4
STAT 252 Statistical Inference-Mgmt. II.....	5
	25

GENERAL EDUCATION (GE)

72 units required, 12 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (8 units)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)	
C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4
Area D/E Society and the Individual (16 units)	
D1 The American Experience (40404)	4
D2 Political Economy * 4 units in Support	0
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4
Area F Technology Elective (upper division)	
(4 units).....	4
	60
FREE ELECTIVES	19-23
	180

Accounting

Business Bldg. (03), Room 403
805 756-1543

Area Chair, Douglas C. Cerf

Lee B. Burgunder	Charles R. (Tad) Miller
Chris Carr	Steven Mintz
Janice L. Carr	Rodney Mock
Li Dang	Arline Savage
Earl C. Keller	Andreas Simon
Kathryn A. S. Lancaster	Jeffrey Tolin

Accounting is known as the “language of business” and is fundamental to understanding the operations of organizations. It provides information for making sound and informed business decisions. The Accounting Area works closely with the accounting profession to help ensure curriculum relevancy and technical competency.

ACCOUNTING CONCENTRATION

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

BUS 319 Accounting Information Systems.....	4
BUS 320 Federal Income Taxation for Individuals	4
BUS 321 Intermediate Accounting I.....	4
BUS 322 Intermediate Accounting II	4
BUS 424 Accounting Ethics	4
BUS 425 Auditing	4
Accounting elective	4
Select from BUS 412, 417, 422	

Finance

Business Bldg. (03), Room 407
805 756-1472

Area Chair, Cyrus Ramezani

Bing Anderson	Sanjiv Jaggia
John Dobson	Hervé Roche
Samir Dutt	Alan M. Weatherford
Larry R. Gorman	

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

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

FINANCIAL MANAGEMENT CONCENTRATION

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

BUS 431 Security Analysis and Portfolio Mgmt.....	4
BUS 438 Advanced Corporate Finance.....	4
BUS 439 Fixed Income Securities and Markets.....	4
Finance electives (400 level)	8
Select two courses from: BUS 433, 442, 443, 444	
Approved electives	8
Select one course from: BUS 432, 434, 435, 436, 437, 440, 441, 445	
Select one course from: BUS 320, 321, 322, 412, 417, 425, 427, 429; ECON 311, 313, 330, 337, 339, 340, 405, 406, 408, 409, 420, 424	

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Management

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

Area Chair, Rosemary Wild

Dawn Chandler	Kevin Lertwachara
Jean-Francois Coget	Alison Mackay
Rebecca Ellis	Tyson Mackay
Barry Floyd	Patricia A. McQuaid
Colette Frayne	William Pendergast
J. Michael Geringer	James Sena
Kenneth A. Griggs	A. B. (Rami) Shani

The Management Area offers coursework in human resource management, information systems, international management, organization behavior, organization theory, management science, and small business management. The area’s objectives include: 1) to provide students with knowledge, skills, and competencies critical to managerial success in small and complex organizations; 2) to prepare students for initial employment and subsequent management career advancement; 3) to help professionally oriented students use theory, concepts, analytical tools, and problem solving techniques; 4) to provide experiences that integrate functional business knowledge; and 5) to prepare students for integrating technology-based solutions in the business environment. The Management Area includes two concentrations: Management and Human Resources, and Information Systems.

MANAGEMENT AND HUMAN RESOURCES CONCENTRATION

Concentration Coordinators

Rebecca Ellis and A. B. (Rami) Shani

The Management Concentration has five required courses devoted to managing people, processes, and change. This is an interdisciplinary program that prepares students to manage knowledge workers in both small and large enterprises within a global marketplace. Selected electives support a human resources emphasis *or* a selected course of study tailored to an individual’s career or occupational goals.

BUS 382 Organizations, People and Technology.....	4
BUS 384 Human Resources Management.....	4
BUS 386 Employee Training and Development.....	4
BUS 475 Staffing.....	4
BUS 477 Managing Change and Development	4
Approved electives.....	8
Select two courses from the following:	
BUS 407, 471, 488, 489	

28

INFORMATION SYSTEMS CONCENTRATION
Concentration Coordinator
 Barry Floyd

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

BUS 392 Business Application Development	4
BUS 393 Database Systems in Business	4
BUS 394 Systems Analysis and Design	4
BUS 395 Systems Design and Implementation	4
Approved electives	8
Select two courses from the following:	
BUS 491, 494, 496, 498, 499	

24

Marketing

Business Bldg. (03), Room 403
 805 756-1543

Area Chair, Lynn E. Metcalf

Norm A. Borin	Joan M. Lindsey-Mullikin
Jeffrey Danes	Stern Neill
Jeffrey Hess	

The objective of the Marketing Area is twofold: 1) to prepare students for rewarding careers in marketing, and 2) to provide non-marketing students with a basic understanding of marketing and its role in business. At the heart of marketing is a customer-focus; the same is true of the Area and its faculty. The marketing faculty is student-oriented and is committed to helping students develop the skills necessary to successfully transition from the academic environment to the business world. The Area offers classes in the undergraduate and graduate degree programs offered through the College and works to develop courses to meet student and market place needs.

MARKETING MANAGEMENT CONCENTRATION

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

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

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

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

24

Interdisciplinary Studies

Coordinator, Bradford P. Anderson,
Associate Dean
Business Bldg. (03), Room 408
805 756-5210

ENTREPRENEURSHIP CONCENTRATION

This interdisciplinary concentration provides an environment in which students develop an entrepreneurial mindset and acquire the knowledge and decision skills necessary to envision, plan and implement new ventures in start-up and existing organizations, domestic and international settings, in either service, product or technology-based companies and in for-profit and non-profit contexts. It draws expertise and coursework from across the College and emphasizes interdisciplinary problem-based learning.

BUS 310 Introduction to Entrepreneurship	4
BUS 436 Entrepreneurial Finance	4
BUS 488 Planning and Managing New Ventures	4
Approved electives. <i>Select four courses from:</i>	16
BUS 308, 311, 418, 451, 489; IT 326, 402, 406, 407, 408, 428; BUS/IT 470 (Advanced Topics in Entrepreneurship)	
	28

INTERNATIONAL BUSINESS CONCENTRATION

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

BUS 302 International and Cross Cultural Mgmt.	4
BUS 402 International Business Management	4
BUS 403 Adv. Seminar in International Mgmt.	4
BUS 407 Managing People in Global Markets	4
Approved electives selected from the following	12
courses:	
BUS 303, 311, 350, 405, 406, 410, 433, 446; ECON 304, 325, 330, 404, 405; AGB 318; GEOG 308	
	28

Industrial Technology

Business Bldg. (03), Room 435
805 756-1754

PACKAGING AND LOGISTICS CONCENTRATION **Concentration Coordinator, Eric Olsen**

This concentration provides business majors entry into a rapidly expanding field that has been fueled by the globalization of manufacturing and customer-supplier relationships. This trend has been enabled by new approaches to value chain management and packaging technology. Packaging plays a key role in any logistics system as products are shipped between value chain partners. The interactions between packaging and the logistics system creates a rich environment for students to examine complex problems. Lessons are drawn from a range of established and emerging industries, food and auto parts as well as biomedical devices and electronic components.

IT 330 Fundamentals of Packaging	4
IT 403 Quality Systems Management.....	4
IT 410 Operations Planning and Control	4
IT 457 Radio Frequency Identification in Supply Chain Management	4
IT 475 Packaging Performance Testing.....	4
Approved electives selected from the following	8
courses:.....	
IT 341, 406, 408, 435, 470	
	28

Economics

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

Area Chair: Steve Hamilton

Eric Fisher	Kathryn Marshall
Sanjiv Jaggia	Aric Shafran
Jason Lepore	Daniel J. Villegas
Michael L. Marlow	Eduardo Zambrano

The mission of the economics program is to educate students in the models and problem solving tools of economics. The degree program:

- instructs students on the analytical tools of economics and the application of these tools to business and social problems,
- instructs students on the economic structure of our society and its interdependence with the global marketplace,
- instructs students about the economic forces that affect business, the natural environment, technology and political decision-making,
- instructs students on the role of business, government and households in our economy,
- prepares students for successful careers in business, government and non-profit organizations, and
- prepares students for graduate studies in business, economics, law and public administration.

General Economics or Concentration

Economics majors do not need to choose a concentration but they can if they choose. Students may develop their own program of study by selecting one of the following: 1) General Economics; 2) an economics concentration; or 3) a business concentration. Students who choose not to declare a concentration must fulfill the requirements of General Economics.

General Economics. The most fundamental and enduring strength of economics is that it provides a logical way of looking at a variety of problems. Economic tools can be applied to the analysis of costs and benefits, crime, the environment, health, labor, law, politics and other fields. The study of economics can be preparation for careers in engineering cost-benefit analysis, environmental protection, health administration, labor representation, law, and public administration. General Economics offers the opportunity for students to design a pro-gram of study to emphasize individual talents and interests.

Quantitative. Emphasizes the skills needed to analyze market data in fast-paced industries such as manufacturing, financial services, and advertising, and provides the technical training required to engage in consulting. There is also a continued need for quantitative economic analysis by

lawyers, accountants, engineers, health service administrators, urban planners, and local, national, and international government agencies. The concentration prepares students for jobs that entail forecasting, market assessment, economic feasibility studies, commodity pricing and data analysis, and provides a solid foundation for graduate study in economics and business.

Real Estate. Provides a program of study that focuses on emerging trends and issues in real estate markets. Students learn to apply economic techniques to real estate markets, and to describe, explain, and predict patterns of real estate prices, building production, and real estate consumption. The program prepares real estate professionals for public sector and private industry jobs in real estate analysis, appraisal, corporate asset management, development, insurance, and investment.

Business Concentrations. Choose from accounting, entrepreneurship, finance, international business, management, marketing, packaging and logistics, and management information systems. For the requirements of each concentration, please check the information listed under the Business major.

BS ECONOMICS

- | | |
|--|-------------------------------|
| <input type="checkbox"/> 60 units upper division | <input type="checkbox"/> GWR |
| <input type="checkbox"/> 2.0 GPA | <input type="checkbox"/> USCP |
- * = Required in Major/Support; also satisfies GE
Note: No major, support or concentration courses may be taken as credit/no credit.

MAJOR COURSES

ECON 221 Microeconomics	4
ECON 222 Macroeconomics (D2) *	4
ECON 311, 312 Intermed. Microeconomics I, II	4,4
ECON 313 Intermediate Macroeconomics.....	4
ECON 339 Econometrics	4
ECON 461 Senior Project I <i>and</i> ECON 462 Senior Project II, <i>or</i> ECON 464 Applied Senior Project	4
ECON electives (300-400 level).....	4
ECON electives (400 level).....	16
General Economics or concentration	28
	76

SUPPORT COURSES

BUS 207 Legal Responsibilities of Business	4
BUS 214 Financial Accounting.....	4
BUS 215 Managerial Accounting	4
¹ MATH 221 Calculus-Business & Econ. <i>or</i> MATH 141, 142 Calculus I, II (B1)*.....	4/8
² STAT 251, 252 Statistical Inference-Mgmt I, II (B1)* <i>or</i> STAT 301, 302 Statistics I, II.....	9/8
	24-29

¹ Students pursuing the Quantitative concentration should take MATH 141 and 142 instead of MATH 221.

² Students pursuing the Quantitative concentration should take STAT 301 and 302 instead of STAT 251 and 252.

GENERAL EDUCATION (GE)

72 units required, 12 of which are specified in Major/Support.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (8 units)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy * 4 units in Major	0
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective (Not ECON)	4

Area F Technology Elective (upper division) (4 units) 4

60

FREE ELECTIVES **15-20**

180

GENERAL ECONOMICS OR CONCENTRATIONS

(select one)

General Economics

Students are required to complete at least 8 units 300-400 level ECON coursework, plus any 20 units of coursework at 300-400 level..... 28

Quantitative Concentration

ECON 406 Applied Forecasting..... 4

ECON 408 Mathematical Economics..... 4

Approved electives. Select from the following approved courses: 20

- ECON 340, 403, 404, 405, 409, 431, 432;
- BUS 431, 439, 442, 444;
- IME 301, 405, 407;
- MATH 143, 206, 211, 212, 241, 242, 244, 248, 304, 306, 344, 406, 408, 409, 412, 413, 414, 416, 418, 437, 451, 453;
- STAT 323, 324, 325, 330, 331, 416, 419, 425, 426, 427

28

Real Estate Concentration

ECON 424 Monetary Economics 4

ECON 434 Urban Economics..... 4

ECON 435 Economics of Land and Water..... 4

Approved electives. Select from the following approved courses: 16

- AGB 310, 315, 324, 326;
- BUS 320, 409, 434, 435, 439;
- CM 475;
- CRP 446;
- ECON 406, 409, 410, 431, 432

28

Industrial Technology

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

Area Chair: Lou Tornatzky

Clifford S. Barber	Jagjit Singh
Manocheer Djassemi	Keith Vorst
Eric O. Olsen	Jonathan York

Industrial Technology prepares individuals to be effective technical managers and entrepreneurial leaders in a rapidly-changing technological and global economy. The baccalaureate curriculum is particularly suited for careers that involve working with people and technology concurrently. It includes instruction in electro-mechanical systems, industrial materials and processes, and quality and safety management that are then applied to technology-based business problems in packaging, value chain management, and technology entrepreneurship. Students take complementary courses in physics, chemistry, calculus and statistics. The curriculum also includes a business core with accounting, economics, marketing, and information systems.

The themes of insuring quality, enabling innovation, and enhancing value are woven through the curriculum.

Learning Objectives

The Industrial Technology majors will:

1. demonstrate detailed knowledge, skills, and perspectives within program specific areas of technology application.
2. explain and act on ethical issues regarding the applications of technology.
3. explain and act on issues of sustainability regarding the applications of technology.
4. act upon decision tools and methods and explain the action taken.
5. work effectively in teams.
6. demonstrate effective verbal communications skills.
7. will demonstrate effective technical written communications skills.
8. explain and act on interactions between humans and technological systems.

BS INDUSTRIAL TECHNOLOGY

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

* = Required in Major/Support; also satisfies GE
Note: No major, support or concentration courses may be taken as credit/no credit.

MAJOR COURSES

IT 137 Electrical/Electronic Systems	4
IT 150 Industrial Power Systems.....	4
IT 233 Decision Making/Prob Solving using CAD	4
IT 260 Manufacturing Processes	4
IT 326 Product Evaluation.....	4
IT 329 Industrial Materials.....	4
IT 330 Issues of Packaging (Area F)*	4
IT 341 Plastics Processes and Applications	4
IT 403 Quality Systems Management	4
IT 407 Applied Industrial Product Design, Fabrication and Sales	4
IT 408 Paper and Paperboard Packaging.....	4
IT 410 Operations Planning and Control.....	4
IT 411 Industrial Safety and Quality Program Leadership.....	4
IT 428 Commercialization of New Technologies....	4
IT 475 Packaging Performance Testing	4
Choose two of the following three courses:	8
IT 402, 435, 406	
Senior Project: IT 461, 462 Senior Project I, II or IT 464 Applied Industrial Technology Senior Project Seminar.....	4
Upper-division electives.....	8
Select any 300 or 400 level university-wide courses. Students are encouraged to consult with IT faculty for a list of recommended courses.	

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SUPPORT COURSES

BUS 212 Financial Acctg for Nonbusiness Majors	4
BUS 346 Principles of Marketing	4
BUS 391 Information Systems	4
CHEM 110 World of Chemistry – Essentials or CHEM 111 Survey of Chemistry (B3 & B4)*	4/5
ECON 201 Survey of Economics (D2)*	4
MATH 141 Calculus I or MATH 221 Calculus for Business and Economics (B1)*	4
PHYS 121, 122 College Physics I, II	4,4
STAT 217 Intro to Statistical Concepts and Methods or STAT 218 Appl. Statistics-Life Sciences (B1)*	4

36/37

GENERAL EDUCATION (GE)

72 units required, 20 of which are specified in Major and Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Support....	0
B2 Life Science	4
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy * 4 units in Support	0
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division)

* 4 units in Major	0
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52**FREE ELECTIVES..... 11/12****180**

Academic Minors

**Business
Economics
Industrial Technology
Packaging**

Business Minor

College Advising Center
Business Bldg. (03), Room 100
805 756-2601

This minor provides non-business students with an introduction to the body of knowledge expected of persons pursuing careers in business. A business minor gives a student a competitive edge when applying for certain jobs, by providing concepts, tools and skills which enhance one's progress in a career. In addition, students who plan on a career in the non-business sector gain a greater appreciation of the challenges and opportunities facing business, now and in the future.

Enrollment is limited and selection is made based upon the applicant's performance in the prerequisite courses listed below. After admission to the minor, the student must complete the remaining required courses while satisfying specified academic performance standards in all minor courses.

Prerequisites. The following courses must be taken *before* admission to the minor.

- BUS 207 Legal Responsibilities of Business (4)
- BUS 214 Financial Accounting (4)
- ECON 221 Microeconomics (4)
- ECON 222 Macroeconomics (D2) (4)
- MATH 221 Calculus for Business and Economics (B1) (4)
- STAT 251 Statistical Inference for Management I (B1) (4)
- STAT 252 Statistical Inference for Management II (B1) (5)

Required courses	<i>Units</i>
BUS 215 Managerial Accounting	4
BUS 342 Fundamentals of Corporate Finance.....	4
BUS 346 Principles of Marketing	4
IT 371 Decision Making in Supply Chain, Services, and Project Management.....	4
BUS 387 Organizational Behavior.....	4
BUS 391 Management Information Systems	4
	24

Economics Minor

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

This minor is designed to give students from other majors a general competency in economics. Students are encouraged to meet with the advisor of the Economics Minor to develop a course of study that complements their major curriculum. For more information, contact the Economics Area office.

Required courses	<i>Units</i>
ECON 221 Microeconomics	4
ECON 222 Macroeconomics (D2)	4
ECON 311 Intermediate Microeconomics I.....	4
ECON 312 Intermediate Microeconomics II.....	4
ECON 313 Intermediate Macroeconomics.....	4
Electives	8
8 units of 400 level ECON courses.	
	28

Environmental Studies Minor

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

Packaging Minor

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

The purpose of this interdisciplinary minor is to complement the student's degree major with a planned curriculum in packaging. The program is designed to capitalize on theories and skills learned in other disciplines thereby uniquely preparing students for success as packaging professionals in positions ranging from highly technical research and development through purchasing, production, sales and management.

Students gain the skills needed for the design of package forms and graphics, the specifications of materials and machinery to be used, the evaluation of package systems, as well as the planning and coordinating of packaging requirements. These specialized skills result from an integration of knowledge gained through the packaging curriculum with that of the major discipline. A significant understanding of packaging issues and their impact on the industry is also gained.

	<i>Units</i>
Required courses (15-17)	
CHEM 110 World of Chemistry - Essentials <i>or</i>	
CHEM 111 Survey of Chemistry (B3 & B4)	4/5
FSN 230 Elements of Food Processing <i>or</i>	
FSN 334 Food Packaging	4/3
IT 330 Issues of Packaging (Area F) <i>or</i> IT 435	
Packaging Development	4
PHYS 104 Introductory Physics (B3) <i>or</i>	
PHYS 121 College Physics I (B3&B4)	4
Approved electives	11-12
<i>Select 11-12 units from the following list.</i>	
FSN 335 Food Quality Assurance (4)	
FSN 354 Packaging Function in Food	
Processing (3)	
GRC 211 Substrates, Inks and Toners (4)	
GRC 337 Consumer Packaging (3)	
IT 330 Issues of Packaging (4)	
IT 341 Plastic Processes and Applications (4)	
IT 400 Special Problems (2-4)	
IT 408 Paper and Paperboard Packaging (4)	
IT 409 Machinery for Packaging (4)	
IT 435 Package Development (4)	
IT 457 Radio Frequency Identification (4)	
IT 475 Packaging Performance Testing (4)	
	26-29

Industrial Technology Minor

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

This minor is an interdisciplinary program. Students learn about the technical, social and business issues related to the use of new technology and how the technology is integrated into corporate operations. The minor appeals to students who are majoring in nontechnical disciplines.

	<i>Units</i>
Technology Issues (Required course)	
BUS 311 Managing Technology in the	
International Legal Environment	4
Materials and Processes electives (select three).....	12
IT 137 Electrical/Electronic Systems (4)	
IT 150 Industrial Power Systems (4)	
IT 233 Decision Making and Problem Solving	
Using CAD (4)	
IT 260 Manufacturing Processes (4)	
IT 329 Industrial Materials (4)	
IT 330 Issues of Packaging (4) (Area F)	
IT 336 Textiles Technology (4) (Area F)	
IT 341 Plastics Processes and Applications (4)	
(Area F)	
IT 411 Industrial Safety and Quality Program	
Leadership (4)	
Management and IT elective (select one)	4
IT 371 Decision Making in Supply Chain,	
Services, and Project Management (4)	
BUS 387 Organizational Behavior (4)	
IT 403 Quality Systems Management (4)	
IT 410 Operations Planning and Control (4)	
IT 428 Commercialization of New Technologies (4)	
Humanities and Social Issues (select one).....	4
HUM 303 Values and Technology (4) (C4)	
IME 320 Human Factors and Technology (4)	
(Area F)	
	24

Graduate Programs

Programs of Study Available

Master of Business Administration (MBA)
 Accounting – MS
 Business and Technology – MS
 Economics – MS
 Engineering Management Program – MBA and MS
 Engineering

Master of Business Administration

Bradford P. Anderson, Associate Dean
 Business Bldg. (03), Room 409
 805 756-2637
mba@calpoly.edu
www.cob.calpoly.edu/gradProgram

Programs of Study/Specializations Available

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

General Characteristics

Cal Poly's MBA programs are designed to prepare students to enter successful management positions in industry, government, and not-for-profit organizations. The programs give graduates a broad management background. Cal Poly's MBA programs are 60 to 64 units in length, depending on specialization, and consist of required courses and advanced elective courses.

The learning goals of the MBA programs are for students to be able to:

- Demonstrate an understanding of and ability to integrate general business concepts, theories, strategies, perspectives.
- Recognize issues and solutions using an approach that reflects ethical and sustainable values.
- Apply analytics to decision-making.
- Demonstrate knowledge of the issues involved in conducting business in a diverse, global environment.
- Recognize leadership skills and link them to leadership theory, demonstrate effective written communication and oral communication and presentation skills, and recognize and explain effective team behavior.

Prerequisites

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

Admission/Acceptance Requirements

Admission to the MBA programs is based upon:

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

Culminating Experience

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

PROGRAMS OF STUDY

MBA – General Management

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

	<i>Units</i>
MBA Common Required Courses	36
GSB 511 Accounting for Managers (4)	
GSB 512 Quantitative Analysis (4)	
GSB 513 Organization Behavior (4)	
GSB 523 Managerial Economics (4)	
GSB 524 Marketing Management (4)	
GSB 531 Managerial Finance (4)	
GSB 533 Aggregate Economic Analysis and Policy (4)	
GSB 534 Production and Operations Mgmt (4)	
GSB 562 Seminar in General Mgmt & Strategy (4) or GSB 567 Adv Sem International Business Mgmt (4) or other approved culminating experience (4)	
Advisor approved electives	24
	60

MBA – Agribusiness Specialization

This specialization is offered in conjunction with the Agribusiness Department in the College of Agriculture, Food and Environmental Sciences. The program is designed for those interested in agribusiness management careers. Graduates are prepared for large farm and ranch management as well as for positions in supporting agribusiness industries such as commodity marketing or food processing.

	<i>Units</i>
MBA Common Required Courses	36
GSB 511 Accounting for Managers (4)	
GSB 512 Quantitative Analysis (4)	
GSB 513 Organization Behavior (4)	
GSB 523 Managerial Economics (4)	
GSB 524 Marketing Management (4)	
GSB 531 Managerial Finance (4)	
GSB 533 Aggregate Economic Analysis and Policy (4)	
GSB 534 Production and Operations Mgmt (4)	
GSB 562 Seminar in General Mgmt & Strategy (4) or GSB 567 Adv Sem International Business Mgmt (4) or other approved culminating experience (4)	
Specialization Required Courses	20
AGB 514 Agribusiness Managerial Leadership (4)	
AGB 539 Graduate Internship in Agriculture (4)	
AGB 543 Agribusiness Policy/Program Analysis (4)	
AGB 554 Food System Marketing (4)	
AGB 555 Technological and Economic Change in Agribusiness (4)	
Advisor approved electives	<u>8</u>
	64

MBA – Graphic Communication Document Systems Management Specialization

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

	<i>Units</i>
MBA Common Required Courses	36
GSB 511 Accounting for Managers (4)	
GSB 512 Quantitative Analysis (4)	
GSB 513 Organization Behavior (4)	
GSB 523 Managerial Economics (4)	
GSB 524 Marketing Management (4)	
GSB 531 Managerial Finance (4)	

GSB 533 Aggregate Economic Analysis and Policy (4)	
GSB 534 Production and Operations Mgmt (4)	
GSB 562 Seminar in General Mgmt & Strategy (4) or GSB 567 Adv Sem International Business Mgmt (4) or other approved culminating experience (4)	
Specialization Required Courses	16
GRC 595 Internship/Co-Op Experiential Education (8)	
GRC 500 Special Problems in GRC (8)	
Advisor approved electives	<u>12</u>
	64

MBA – Architectural Management Track

This program is available only to those students who are enrolled in Cal Poly's Bachelor of Architecture (BArch) program. During the fifth/final year of the architecture program, students may request permission to enroll in MBA courses. See page 127 for additional information.

MBA – Landscape Architecture Management Track

This program is available only to those students who are currently enrolled in Cal Poly's Bachelor of Landscape Architecture (BLA) program. During the fifth/final year of the landscape architecture program, students may request permission to enroll in MBA courses. See page 137 for additional information.

Option to Concurrently Pursue MBA & Another Master's Degree

The Orfalea College of Business permits students to develop an individualized program of study that incorporates the required elements of two distinct Cal Poly graduate degree programs. This option offers graduate students the opportunity to simultaneously pursue an MBA degree in the Orfalea College of Business and an MA or MS degree in one of Cal Poly's other colleges.

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

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

Engineering Management Program, MBA & MS Engineering

Orfalea College of Business
Bradford P. Anderson, Associate Dean
Business Bldg. (03), Room 409
805 756-2637

College of Engineering
Engineering Bldg. (13), Room 266
805 756-2131

mba@calpoly.edu
www.cob.calpoly.edu/gradProgram

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

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

The three major objectives of this program are to:

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

Prerequisites

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

Admission/Acceptance Requirements

Admission to the EMP is based upon:

- successful completion of an accredited undergraduate program of study
- prior academic performance with particular emphasis placed on the last 90 quarter units (60 semester units)

- achievement on the Graduate Management Admission Test (GMAT)
- prior work experience (desirable).

Culminating Experience

In order to satisfy the culminating experience requirement, students must satisfactorily complete a comprehensive examination at the end of GSB 562 or GSB 567 and satisfactorily complete a comprehensive project, IME 596 or design project/thesis, IME 599. Other courses and/or options may be available, but must be approved in advance by the Orfalea College of Business Associate Dean and by the College of Engineering, Engineering Management Program Coordinator.

	<i>Units</i>
Required courses	57-58
GSB 511 Accounting for Managers (4)	
GSB 513 Organization Behavior (4)	
GSB 523 Managerial Economics (4)	
GSB 524 Marketing Management (4)	
GSB 531 Managerial Finance (4)	
GSB 533 Aggregate Economic Analysis and Policy (4)	
GSB 562 Seminar in General Mgmt & Strategy (4) <i>or</i> GSB 567 Adv Sem International Business Mgmt (4) <i>or</i> other approved culminating experience	
IME 417 Supply Chain and Logistics Management (4) <i>or</i> IME 430 Quality Engineering (4)	
IME 503 Applied Statistical Methods in Engrg (4)	
IME 507 Graduate Seminar (4)	
IME 556 Technological Project Management (4)	
IME 580 Manufacturing Systems (4)	
IME 596 Internship/Team Project (10) <i>or</i> IME 599 Design Project (Thesis) (9)	
College of Engineering approved electives	16-17
Other advisor approved electives	16
	90

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

MS Accounting

Bradford P. Anderson, Associate Dean
Business Bldg. (03), Room 409
805 756-2637
mba@calpoly.edu
www.cob.calpoly.edu/gradProgram

General Characteristics

The MS Accounting program is a one-year academic course of study designed to prepare students for careers that require employees to be licensed as a Certified Public Accountant (CPA). This includes careers with international public accounting firms, regional and local CPA firms, industry and government. Students may select a specialization in financial accounting or taxation. The program is designed to meet the CPA eligibility requirements in the state of California effective January 2014.

All students are required to pass a comprehensive examination which is normally given during the final quarter of the program.

Tuition and Fees

The MS Accounting program is offered through Continuing Education and University Outreach. As such, the program carries a separate tuition and fee schedule available in the Office of the Associate Dean, Orfalea College of Business.

Admission/Acceptance Requirements

Acceptance to the program is based upon an applicant's:

- submission of an application for graduate admission via www.csumentor.edu,
- successful completion of an accredited undergraduate program of study
 - Tax Specialization: a minimum of (i) one (1) course in federal taxation *and* (ii) eight (8) quarter units in accounting or two (2) years of equivalent experience in accounting,
 - Financial Accounting Specialization: (i) eight (8) quarter units of lower division *and* (ii) twenty-eight (28) quarter units of upper division accounting courses,
- prior academic performance with particular emphasis placed on performance during the last 90 graded quarter units completed prior to application (or equivalent), and
- achievement on the Graduate Management Admission Test (GMAT).

MS Accounting, Specialization in TAX

	<i>Units</i>
GSA 529 Effective Communication Skills for Managers.....	4
GSA 536 Taxation of Trusts, Estates, and Transfer Taxes.....	4
GSA 537 State and Local Taxation	4
GSA 538 Current Developments in Taxation.....	4
GSA 539 Internship	9
GSA 546 Tax Research and Administrative Procedures	4
GSA 548 Advanced Individual Taxation and Tax Planning	4
GSA 549 Advanced Taxation of Flow-through Entities (includes comprehensive examination)	4
GSA 550 Advanced Corporate Taxation.....	4
GSA 551 International Taxation	4
¹ BUS 417 Taxation of Corporations and Partnerships.....	4
	45/49

Graduates Are Prepared To:

- Research tax literature to identify potential solutions to tax issues.
- Analyze and solve tax compliance issues through the application of critical-thinking skills.
- Communicate complex tax information and solutions orally and in writing to support decision-making.
- Prepare state and federal tax returns for individuals and business entities.
- Recognize and apply ethical and professional responsibility concepts in tax practice.

Structure

The 45/49-quarter-unit taxation specialization begins with a three-week intensive session in the summer immediately preceding the fall quarter and continues through the spring quarter of the following year. The program requires an internship during the winter quarter.

MS Accounting, Specialization in FINANCIAL ACCOUNTING

	<i>Units</i>
GSA 529 Effective Communication Skills for Managers.....	4
GSA 540 Taxation of Corporations and Partnership.....	4
GSA 541 Advanced Financial Reporting Issues I...	4
GSA 543 Advanced Financial Reporting Issues II	5
GSA 544 Advanced Enterprise Wide Business Processes.....	4
GSA 545 Applied Research and Communications	4

¹ Students who, prior to admission to the program have not successfully completed BUS 417 at Cal Poly (or an identical course elsewhere) will be required to take BUS 417 as a part of this degree program.

GSA 552 Fraud Auditing and Examination	4
GSA 553 International Accounting.....	4
GSA 554 Advanced Spreadsheet Modeling for Accounting	4
GSA 555 Accounting Database Modeling and Analysis.....	4
GSA 556 Financial Statement Analysis and Valuation	4
	<hr/> 45

Graduates Are Prepared To:

- Demonstrate the ability to use databases and develop advanced spreadsheets to analyze financial and auditing information.
- Demonstrate the ability to understand database structures that are the foundation of accounting information systems.
- Demonstrate the ability to document business processes, perform risk assessment of these processes, and evaluate the internal controls (including IT controls) that apply to these processes.
- Communicate the results of research into accounting, taxation, and financial reporting.
- Analyze financial statement data and conduct business valuations.
- Recognize and apply ethical and fraud-related concepts in accounting and financial reporting.
- Research issues related to accounting standards including international financial reporting standards.

Structure

The 45-quarter-unit financial accounting specialization begins in the fall quarter and continues through the spring quarter of the following year.

MS Business and Technology

Lou Tornatzky, Area Chair
Industrial Technology
Business Bldg. (03), Room 405
805-756-2680

Bradford P. Anderson, Associate Dean
Business Bldg. (03), Room 409
805 756-2637
mba@calpoly.edu
www.cob.calpoly.edu/gradProgram

General Characteristics

The Master of Science in Business and Technology (MS BT) program is designed to prepare students for critical "hands-on" positions in companies as operations-based facilitators.

Two tracks are offered. One provides applied development and learning opportunities for students with an interest in focused, faculty driven research projects. The second is focused upon the development of business-based decision tools with emphasis on technically-focused industrial processes and methods.

Prerequisites

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

Admission Requirements

Admission to the MS BT program is based upon:

- (a) Successful completion of an accredited undergraduate program of study;
- (b) Prior academic performance, with particular emphasis placed on performance in the last 90 quarter units (60 semester units);
- (c) Achievement on the General Test of the Graduate Record Examination (GRE) or the Graduate Management Admission Test (GMAT); and
- (d) Applicants to the *Applied Research & Development Track* must demonstrate an interest in a research project that is faculty driven (an interview and selection based upon ability to contribute to said projects is likely). Applicants to the *Working Professional Track* must possess related work experience.

Tuition and Fees

The MS Business and Technology *Working Professional Track* is offered through Continuing Education and University Outreach. As such, the program carries a separate tuition and fee schedule available in the Office of the Associate Dean, Orfalea College of Business.

Program of Study

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

1. Understand global and national issues affecting industrial technology, in terms of the state of knowledge in the subfields of value chain management; packaging science and technology; technology entrepreneurship and innovation; and industrial processes and systems.
2. Be able to generate timely and creative solutions that jointly improve business, technological and human outcomes, in the key sub-fields of industrial technology.
3. Understand and apply decision tools and methods to a range of business and technological problems pertaining to the IT-relevant subfields of value chain management; packaging science and technology; technology entrepreneurship and innovation; and industrial processes and systems.
4. Understand and apply knowledge of important societal issues that pervade the business and technological environment, particularly environmental sustainability; business ethics; and workforce growth and development.
5. Demonstrate organizational leadership skills via written technical communication; oral communication and presentation; and effective team behavior.

Culminating Experience

In order to satisfy the culminating experience requirement, students following either the *Applied Research and Development Track* or the *Working Professional Track* must satisfactorily complete a comprehensive examination at the end of their program. Other courses and/or options may be available, but must be approved in advance by the Associate Dean.

	<i>Units</i>
Required courses	24
IT 531 Lean Six Sigma Value Chain Management (4)	
IT 532 Technology Entrepreneurship (4)	
IT 533 Industrial Processes and Materials (4)	
IT 534 Adv. Packaging Dynamics for Distribution (4)	
IT 545 Product Conceptualization and Execution Using Rapid Prototyping (4)	
GSB 583 Management of Human Resources (4)	
Select one of the following tracks	21
<i>Applied Research and Development Track</i>	
IT 594, 595, 596 Business and Technology Project I, II, III (3,3,3)	
GSB 529 Effective Communication Skills for Managers (4)	
GSB 563 International Business Study Tour (4)	
STAT 513 Applied Experimental Design and Regression Models (4)	
<i>Working Professional Track</i>	
IT 527 Trends and Issues in Technology (4)	
IT 591, 592 Applied Industry Project I, II (2,3)	
GSB 511 Accounting for Managers (4)	
GSB 514 Legal/Regulatory Environment of Business (4)	
GSB 531 Managerial Finance (4)	

MS Economics

Steve Hamilton, Area Chair
 Graduate Programs in Economics
 Business Bldg. (03), Room 407
 805 756-2783

Bradford P. Anderson, Associate Dean
 Business Bldg. (03), Room 409
 805 756-2637
mba@calpoly.edu
www.cob.calpoly.edu/gradProgram

General Characteristics

The master of science degree program in economics is a full-time, four-quarter program designed to provide advanced preparation in economics for individuals desiring careers as economists in the academic, governmental, business, and financial communities. The program provides the technical skills required to engage in quantitative economic analyses that involve forecasting, market assessment, economic feasibility studies, commodity pricing and data analysis.

Prerequisites

For admission to the program with a classified or conditionally classified status, a student should hold a bachelor’s degree from an accredited institution with a minimum grade point average of 2.5 in the last 90 quarter units (60 semester units) attempted and have completed coursework in intermediate microeconomics, intermediate macroeconomics, econometrics, calculus, and statistics. Applicants are required to submit scores for the General Test of the Graduate Record Examination. An applicant who meets these standards but lacks the prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Program of Study

Graduate students must file formal study plans with their advisor, department, college, and university graduate studies office no later than the end of the quarter in which the 12th unit of approved coursework is completed. The formal program of study must include a minimum of 45 units (at least 29 of which must be at the 500 level).

Advancement to master's degree candidacy requires completion of a minimum of 24 units of required courses, specified in a formal program of study, with a minimum grade point average of 3.0. Students must maintain a minimum GPA of 3.0 in all coursework completed subsequent to admission to the program.

Culminating Experience

Students who choose the coursework option instead of the thesis option are required to pass a written comprehensive exam in economics.

Curriculum for MS Economics

	<i>Units</i>
ECON 510 Quantitative Methods	4
ECON 511 Microeconomic Analysis	4
ECON 512 Macroeconomic Analysis	4
ECON 520 Advanced Econometrics I	4
ECON 522 Advanced Econometrics II	4
Advisor Approved Electives (400-500 level).....	17
<p>To be selected with advisor's approval from economics or other courses in masters programs, such as: Master of Business (GSB), Agribusiness (AGB), Master of City and Regional Planning (CRP), Engineering, Mathematics, Master of Public Policy. Maximum 12 units from courses other than ECON.</p>	
ECON 599 Thesis (4, 4) <i>or</i>	
Comprehensive exam <i>and</i> 8 units additional coursework	<u>8</u>
(Minimum 29 units at 500 level)	45

College of *Engineering*

Erling A. Smith, Acting Dean
Fred W. DePiero, Associate Dean
Stacey M. Breitenbach, Assistant Dean
Matthew S. Cottle, Assistant Dean

Engineering Bldg. (13), Room 266
805 756-2131
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ACADEMIC PROGRAMS

Aerospace Engineering	<i>BS*, MS</i>
Biomedical Engineering	<i>BS*, MS</i>
Civil and Environmental Engineering	<i>MS</i>
Civil Engineering	<i>BS*</i>
Computer Engineering.....	<i>BS*</i>
Computer Science.....	<i>BS**, MS, Minor</i>
Electrical Engineering	<i>BS*, MS</i>
Engineering.....	<i>MS</i>
Environmental Engineering	<i>BS*</i>
Fire Protection Engineering	<i>MS</i>
General Engineering	<i>BS</i>
Industrial Engineering	<i>BS*, MS</i>
Manufacturing Engineering	<i>BS*</i>
Materials Engineering.....	<i>BS*</i>
Mechanical Engineering	<i>BS*, MS</i>
Multidisciplinary Design	<i>Minor</i>
Software Engineering	<i>BS*</i>
Joint Programs***	
Engineering Management.....	<i>MBA/MS</i>
Environmental Studies.....	<i>Minor</i>
Liberal Arts & Engineering Studies	<i>BA</i>
Transportation Planning	<i>MCRP/MS</i>

* Engineering programs accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone: (410) 347-7700.

** BS Computer Science program accredited by the Computing Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone: (410) 347-7700.

***For the Joint Graduate Programs, see page 166. For the Undergraduate Joint Program, BA Liberal Arts & Engineering Studies, see page 206. For the Environmental Studies Minor, see page 257.

Engineering and computer science programs at Cal Poly are strongly oriented toward preparing graduates for immediate entry into professional practice. Students declare their majors when they enter as freshmen, and they generally take at least one course in that major each quarter. This early introduction better motivates and prepares students to master the foundational mathematics, basic

science, and engineering science or computer science central to success in all the engineering disciplines.

The undergraduate bachelors of science engineering disciplines listed above provide the education needed for entry to the engineering profession and for continued academic work toward advanced degrees. Many of our graduates enter graduate programs at Cal Poly or other institutions. Cal Poly engineering and computer science graduates are highly desired by industry and find a variety of professional opportunities awaiting them, such as engineering design, computer hardware and software engineering, test and evaluation, systems analysis, modeling and simulation, manufacturing, applied research, development, sales and field engineering. Graduates pursue careers in a broad cross-section of industry, government agencies, public utilities, marketing groups, and educational institutions.

The College of Engineering is an internationally-recognized, premier undergraduate engineering college. Its mission is to educate students for careers of service, leadership and distinction in engineering or other fields by using a participatory, learn by doing, "hands-on" approach.

State-of-the-art facilities and laboratories form the core of Engineering's project-centered curriculum. Ranging from the Aircraft Design Lab to the Rotor Dynamics Laboratory, these facilities offer advanced technological systems that allow students to link theory with practice. New college buildings also promote interdisciplinary project activities, including the Advanced Technology Laboratories, Bonderson Projects Center, and Engineering IV. With 19,000 square feet of space for individual and team-based projects, the Bonderson Center offers enriched opportunities for multidisciplinary projects and collaboration with industry. The newest facility, Engineering IV, concentrates many of the engineering programs in one area. The \$28 million, 104,000-square-foot building includes modern classrooms and laboratories for aerospace, mechanical, civil, environmental, industrial and manufacturing engineering programs.

The Accreditation Board for Engineering and Technology (ABET) defines engineering as "the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind."

Engineering and computer science programs at Cal Poly prepare graduates for practice in professional engineering and computer science. Attributes of engineering graduates include:

- (a) an ability to apply knowledge of mathematics, science, and engineering;
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data;

- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
- (d) an ability to function on multidisciplinary teams;
- (e) an ability to identify, formulate, and solve engineering problems;
- (f) an understanding of professional and ethical responsibility;
- (g) an ability to communicate effectively;
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
- (i) a recognition of the need for, and an ability to engage in life-long learning;
- (j) a knowledge of contemporary issues; and
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Multidisciplinary Requirement

Consistent with ABET's requirement (d) on multidisciplinary teams, accredited engineering programs have adopted an explicit graduation requirement in this area. This provides students an opportunity to practice team skills. Such experience is important for practicing engineers, with the ever increasing diversity of engineering science and applications. Required activities for students are defined by each individual program, and may include items such as:

- Project embedded in curriculum
- Team senior project
- CO-OP or internship employment
- Certain club activities
- Working with faculty on a sponsored project
- Taking certain technical electives
- Service learning project

Contact department for specific requirements, or the College of Engineering Advising Center.

Our curricula reflects a "learn by doing" philosophy via incorporation of numerous design-centered laboratories, integration of design, and inclusion of the senior design project capstone design experience.

The excellence of Cal Poly's undergraduate engineering and computer science programs provides the foundation for master's degree programs. Industry often considers the master's degree as an important requirement for the design, development, applied research and analysis occupations in engineering and computer science. The master's degree allows entry into these occupations at higher levels of technical skills and responsibilities.

ENGINEERING STUDENT AFFAIRS

Stacey Breitenbach, Assistant Dean
Engineering Bldg (13), Room 266
805 756-2131

The College of Engineering Student Affairs encompasses the Advising Center, International Exchange Program, Multicultural Engineering Program/MESA Schools Program, Outreach Services, and the Women's Engineering Program.

Advising Center

Kim Marsalek, Coordinator for Advising Services
Dawn Sirois, Assistant Coordinator for Advising Services
Jamey Hunstad, Academic Advisor
Greg Roldan, Academic Advisor
Maria Sklar, Academic Advisor
Engineering South (40), Room 114
805 756-1461
eadvise.calpoly.edu

The College of Engineering Advising Center serves undergraduate students with academic advising issues in conjunction with each student's faculty advisor.

The academic advising staff tracks the academic and administrative progress of each student based on the academic expectations outlined below.

Academic Expectations

Undergraduates and students in 4+1 BS/MS programs are expected to:

- maintain current, cumulative, higher education, *and* major grade point averages of a 2.0 or higher.
- enroll and complete a *minimum* of six units of degree applicable major/support coursework each quarter.
- enroll and complete courses in one attempt.
- complete their lower-division math and science courses as early as possible.
- be enrolled in a math course each quarter until their sequence is completed.

Students are expected to graduate with no more than 24 excess units above the total number of units required for their program (the 24 units do not include advanced placement credit or transfer work from other two or four year schools). Students pursuing 4+1 (BS/MS) programs are expected to graduate with no more than 24 excess units above the total number of units required for their BS + MS program.

Students can take non-degree applicable coursework if they can show they will graduate with no more than 24 excess units above their program degree requirement (this applies to minors). Students are expected to limit their non-degree applicable units to 4 units per quarter at most. Students wishing to pursue minors must submit a graduation plan for approval to the Advising Center staff for review.

All academically oriented student paperwork is processed through the Advising Center (for example, course substitution petitions, excess unit forms, late enrollment forms, withdrawal forms, change of major forms, etc). In order to process paperwork in a timely manner, it is important for students to submit paperwork to the Advising Center for initial review.

The Advising Center maintains working folders on each student. These folders are used for general advising purposes. The Advising Center has past and present flowcharts for all engineering majors and information regarding catalog changes.

While the Advising Center is responsible for providing procedural advice, faculty advisors are responsible for providing academic content and technical advice. Student course scheduling, course content questions, and career planning are usually done by the faculty advisors.

International Exchange Program

Maria Sklar, IEP Advisor
Engineering South (40), Room 114
805 756-1461
eadvise.calpoly.edu

The College of Engineering has agreements with several overseas universities. These exchange programs differ from the University wide exchange programs in that they offer students the opportunity to attend overseas universities with an engineering focus, while paying Cal Poly tuition. The partner universities have been specifically selected by the College for their innovative technology and engineering coursework. Participation gives students the opportunity to gain a global engineering perspective while taking coursework that may be degree applicable. Students typically return with improved communication skills, a better understanding of other cultures, and a more marketable resume for industry. The current list of partner universities is located at www.eadvise.calpoly.edu/iep/.

Multicultural Engineering Program (MEP)/MESA Schools Program

Maria Manzano, Coordinator
Engineering South (40), Room 117
805 756-1433
mep.calpoly.edu

The MESA Engineering Program (MEP) is an academic support program designed to recruit, retain, and graduate educationally disadvantaged students in engineering and computer science disciplines. MEP builds an academic support community among students and provides the necessary bridges for students' academic and professional success.

MEP offers an orientation class in effective learning techniques. A study center is available for students so that they can overcome feelings of isolation, develop supportive academic peer groups, and share information about classes

and scholarship opportunities. Tutoring is available for undergraduate technical courses. Group study workshops teach students complex technical concepts through group study and support. MEP fosters professional development by helping coordinate summer jobs, internship, and scholarship opportunities with companies who recognize the MEP as a valuable source for skilled future employees.

Outreach Services

Engineering South (40), Room 119
805 756-1320
outreach@calpoly.edu

Outreach is an important part of the mission of Cal Poly's College of Engineering. The K-14 outreach programs stimulate student interest in engineering. Cal Poly attracts non-traditional and underrepresented students to engineering through the outreach activities of the Multicultural Engineering Program and the Women's Engineering Program. By partnering with K-12 schools and community colleges in the community, Cal Poly offers engineering projects and presentations in the classroom. For middle and high school students, schools are invited to visit Cal Poly labs to inspire students with the exciting hands-on opportunities in engineering. The schools are encouraged to implement an engineering curriculum and partner with Cal Poly for support, tutoring and curriculum development.

The Engineering Possibilities in College (EPIC) summer camp provides a hands-on learning opportunity for high school students to explore engineering disciplines. The Exploring Engineering bi-lingual program brings parents and students from MESA schools programs and Parent Institute for Quality Education programs to campus during Open House to encourage students to pursue a college education.

Cal Poly students are encouraged to volunteer for outreach activities to increase their speaking abilities and share their experiences with aspiring young minds.

Women's Engineering Program (WEP)

Helene Finger, Director
Engineering South (40), Room 119
805 756-2350
wep.calpoly.edu

The mission of the Women's Engineering Program (WEP) is to recruit and retain women engineering and computer science students by focusing on outreach, on-campus support and professional preparation objectives. To meet these objectives, WEP works closely with the Society of Women Engineers (SWE) Cal Poly student section, one of the top student sections in the nation, in supporting a variety of programs directed at pre-college, undergraduate and graduate students.

Outreach activities are directed at students from kindergarten through community college. These programs are designed to encourage pre-university women and girls to

consider engineering as a career choice. Outreach recruitment activities include: Engineering Summer Camp, Building an Engineer workshops, Shadow an Engineering Student day, Engineering Road Show, Girl Scout Engineering Badge day, elementary school workshops, and career fairs.

The Women's Engineering Program provides on-campus support to Cal Poly women engineering students through a variety of academic, leadership and social activities. These activities help students connect to their peers while concurrently assisting them in achieving their educational goals. On-campus support activities include: scholarships, academic counseling and referrals, pre-registration counseling, big sibling program, test files, teacher evaluations, SWE meetings, and community service activities.

Professional preparation activities are designed to prepare students for a productive career by facilitating networking with professionals and corporations. Professional preparation activities include: Shadow an Engineer, Evening With Industry banquet, Team Tech, Industry Tours, Resume Book, and MentorNet.

Graduate Programs

Fred W. DePiero, Associate Dean

Engineering Bldg. (13), Room 266
805 756-2131

Programs of Study/Specializations Available

Aerospace Engineering– MS (see page 170)

with Specializations in:

Research

Space Systems Engineering

Biomedical Engineering – MS, see page 175

Civil and Environmental Engineering – MS, see page 181

Computer Science – MS, see page 190

Electrical Engineering – MS, see page 194

Engineering – MS with Specializations in:

Biochemical Engineering

Bioengineering

Biomedical Engineering

Integrated Technology Management

Materials Engineering

Water Engineering

Fire Protection Engineering – MS

Industrial Engineering – MS, see page 199

Mechanical Engineering – MS, see page 205

Blended BS+MS Programs

Joint Programs:

Engineering Management Specialization,

MBA/MS Engineering, see page 166

Transportation Planning Specialization,

MCRP/MS Engineering, see page 166

MS FIRE PROTECTION ENGINEERING

General Characteristics

The profession of Fire Protection Engineering is directed toward the identification, analysis and mitigation of fire hazards and risks across a broad spectrum of applications, including buildings, consumer products, industrial processes, transportation vehicles, infrastructure facilities and the wildland-urban interface.

A pilot program, the Master of Science in Fire Protection Engineering prepares individuals to assess and reduce the potential for property and human loss from fire in these and other settings. Students learn to analyze how buildings are used, how fires start, how fires grow, and how fire and smoke affect people, buildings and property. Fire protection engineers use the latest engineering and construction technologies to:

- Design systems that control fires, alert people to danger and provide means for escape;
- Evaluate buildings to identify fire risks of and the means to prevent or mitigate them;

- Conduct fire safety research on consumer products and construction materials; and
- Investigate fires to discover how fires start, how they spread, why protective measures fail, and how those measures could be designed more effectively.

To meet these program goals, the fire protection engineering curriculum requires that students successfully complete a total of 45 units including a fire protection engineering project as the culminating experience (FPE 596). The culminating experience will be innovative and require independent thinking. Typically, the students will perform a detailed fire and life safety evaluation of a selected building, the preparation of a comprehensive report documenting the results of this evaluation and the presentation of their analysis and findings in an oral defense to a review committee. Other innovative culminating experiences of similar scope and complexity may be submitted for approval.

Program Goals

The Fire Protection Engineering program is designed to build on the skills, knowledge, and broad engineering principles students acquire in an undergraduate engineering program. The required and elective courses composing the Master of Science degree in Fire Protection Engineering address the specific body of knowledge required by the fire protection engineering profession. Students completing the program will possess the technical knowledge, skills and tools required to practice fire protection engineering in a variety of local, national and international settings. Upon completion of this program, students should possess the necessary knowledge and skills to pursue professional certification and licensure in the fire protection engineering discipline. Furthermore, the program addresses unique fire challenges faced by California and other western states, including wildland-urban interface fires and post-earthquake fires. Upon completing the requirements for a Master of Science degree in Fire Protection Engineering, students should be able to:

- Identify relevant fire safety codes, standards and regulations, comprehend the fire safety performance objectives and criteria associated with these documents, and apply these fire safety objectives and criteria to a broad range of applications.
- Analyze the flammability characteristics of different materials, interpret the results of standard and non-standard fire test methods and evaluate the fire hazards associated with different materials in a range of anticipated settings.
- Analyze the dynamics of fires in and around buildings and other structures through the application of fundamental principles and the use of state-of-the-art computer-based fire simulation models.
- Understand how people interact with fire conditions in buildings and calculate evacuation times through the application of fundamental principles of people movement

and the use of state-of-the-art computer-based evacuation models.

e) Design fire detection and alarm systems, fire suppression systems, smoke management systems, egress systems and structural fire protection to achieve specified performance objectives.

f) Perform comprehensive fire and life safety evaluations of buildings and other structures through application of the knowledge, skills and tools acquired in this program and effectively communicate the results and findings of such evaluations.

Prerequisites

For admission as a classified graduate student, an applicant should hold a bachelor’s degree in engineering or a closely related field from a regionally accredited institution, college, or university. An undergraduate grade point average of 3.0 is required. On occasion, where other credentials are exceptionally strong, a GPA in the 2.5-3.0 range may be accepted.

Tuition and Fees

As a special session program through Continuing Education and University Outreach, the MS Fire Protection Engineering program is administratively and academically completely self-supporting. As such, the program carries a separate tuition and fee schedule. Please refer to www.fpe.calpoly.edu/cost.html for the current cost of the program.

MS FIRE PROTECTION ENGINEERING

	<i>Units</i>
Core Courses	37
FPE 501 Fundamental Thermal Sciences (4)	
FPE 502 Fire Dynamics (4)	
FPE 503 Flammability Assessment Methods (4)	
FPE 504 Fire Modeling (4)	
FPE 521 Egress Analysis and Design (4)	
FPE 522 Fire Detection, Alarm and Communication Systems (4)	
FPE 523 Water-based Fire Suppression (4)	
FPE 524 Structural Fire Protection (4)	
FPE 596 Culminating Experience in Fire Protection Engineering (5)	
Technical electives	8
<i>Select 8 units from the following:</i>	
FPE 551 Fire Safety Regulation and Management (4)	
FPE 552 Smoke Management and Special Hazards (4)	
ME 541 Advanced Thermodynamics (4)	
ME 554 Computational Heat Transfer (4)	
NR 455 Wildland-Urban Interface Fire Protection (3)	
	45

Master of Science in Engineering

**MS Engineering
General Characteristics**

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

- Provide an empowering terminal professional degree for students who intend to become practicing engineers, retaining the strong laboratory emphasis and industrial interaction found in the BS curriculum.
- Provide preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree.
- Provide job-entry education for the more complex and evolving interdisciplinary areas of engineering, such as research and development, innovative design, systems analysis and design, bio-engineering, biomedical engineering, manufacturing, mechatronics, and engineering management.
- Update and upgrade opportunities for practicing engineers.
- Allow 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 field with a minimum grade point average of 2.5 in the last 90 quarter units (60 semester units) attempted.

Some programs impose higher GPA requirements.

Applicants for most graduate engineering programs are required to submit scores for the General Test of the Graduate Record Examination. An applicant who meets program 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. Contact the individual program graduate coordinator for details.

Program of Study

Each graduate student must prepare a formal study plan with his or her advisor early in the program, usually before the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 23 of which must be at the 500 level) with a specialization in one of the following areas: Biochemical Engineering, Bioengineering, Biomedical Engineering, Integrated Technology Management, Materials Engineering, Water Engineering, or another individualized course of study.

Requirements

The broad curriculum requirements for the Master of Science degree in Engineering are:

- a) a number of required units in the field of specialization, in many cases supplemented by analytical and technical breadth requirements;

- b) additional units taken as advisor-approved electives;
 c) at least 23 units of the 45 unit program at the 500 level;
 d) at least 32 units taken “in residence.”

In some specializations, two culminating requirement options are available: a thesis/project option, which requires coursework and an up-to-9 unit thesis or project with oral defense; or a non-thesis/project option, which involves additional coursework and a comprehensive examination. The non-thesis option is normally allowed only for students who have completed a senior project or have had significant prior engineering project experience.

Blended BS + MS Engineering Program

The blended program provides motivated students with an accelerated route to the MS Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Eligibility for Blended BS+MS Engineering

Students majoring in BS General Engineering, BS Computer Engineering, BS Manufacturing Engineering, and BS Materials Engineering may be eligible to pursue the blended program toward the MS Engineering with a specialization in Biochemical Engineering, Bioengineering, Biomedical Engineering, Materials Engineering, or Integrated Technology Management. They may also be able to pursue blended programs incorporating other MS degrees or specializations in the College of Engineering.

In addition, students in departments with their own master's degrees may be able to pursue masters degrees in other areas, or the MS Engineering degree via the blended program, based on agreements between their bachelors granting program and their target masters program.

Participation in the program is based on prior academic performance and other measures of professional promise. Students are selected by a faculty committee, chosen on the basis of the student's area of interest. Please see page 60 for eligibility criteria.

Program of Study

Some programs allow students to complete a capstone experience that integrates the senior project with the graduate thesis. This arrangement also increases the possibilities for industrial interaction in students' professional programs.

The blended program may allow students to earn graduate credit for several senior electives, effectively decreasing the summed unit requirements for both degrees. Requirements concerning shared units vary by degree program. Contact the program graduate coordinator for details.

Other Blended Programs

Blended BS+MS programs are also available in Aerospace Engineering, Biomedical Engineering, Civil and Environmental Engineering, Computer Science, Electrical Engineering, Industrial Engineering, and Mechanical

Engineering. Additional information about these programs may be obtained from the individual departments.

MS Engineering, Specialization in BIOCHEMICAL ENGINEERING

Units

Required Courses	37
Analytical methods for engineering (6)	
Advanced mathematics (3)	
ENGR 599 Design Project (Thesis) (2) (2) (5) or 9 units of approved technical electives <i>and</i> written comprehensive examination	
<i>Select 19 units from the following:</i>	
ME 541 Advanced Thermodynamics (4)	
ME 552 Advanced Heat Transfer I (4)	
ME 553 Advanced Heat Transfer II (4)	
ENVE 421 Mass Transfer Operations (4)	
ENGR 581, 582, 583 Biochemical Engr (4,4,4)	
Approved Electives	8
	45

MS Engineering, Specialization in BIOENGINEERING

Units

Required Courses	33
ENGR 551 Advanced Topics in Bioengineering (4)	
MATE 530 Biomaterials (4)	
ENGR 581 Biochemical Engineering I (4)	
ENGR 599 Design Project (Thesis) (9)	
<i>Select 12 units from the following:</i>	
BIO 432	
CSC 471, 473, 474, 541	
ENGR 451, 582	
ENVE 443, 536	
IME 507	
MATE 425, 501	
ME 401, 504, 551, 552, 553, 554	
STAT 419, 512, 542	
Approved Engineering Electives	12
	45

MS Engineering, Specialization in BIOMEDICAL ENGINEERING

Units

Required Courses	27
BMED 450 Special Topics in Bioengineering (4)	
BMED 460 Engineering Physiology (4)	
BMED 530 Biomaterials (4)	
BMED 550 Advanced Topics in Bioengineering (4)	
BMED 563 Biomedical Engineering Graduate Seminar (2)	
BMED 599 Design Project (Thesis) (9) (BMED 591/592 substitute for 2 or 4 units of BMED 599)	
Approved Engineering, Science and Mathematics Electives	18
	45

**MS Engineering, Specialization in
INTEGRATED TECHNOLOGY MANAGEMENT**

The program goal is to develop "industry ready" graduates who will be integrators of engineering disciplines, industry concerns, and technology management. Many of the program courses involve actual integrated problems or opportunities from industrial organizations in a collaborative learning environment.

<i>Units</i>	
Required Courses	29/30
IME 417 Supply Chain/Logistics Management (4) or IME 430 Quality Engineering (4)	
IME 503 Applied Stat. Analysis for Engineers (4)	
IME 507 Graduate Seminar (2)(2)	
IME 556 Technological Project Management (4)	
IME 580 Manufacturing Systems (4)	
IME 596 Team Project/Internship (10) or IME 599 Design Project/Thesis (9)	
Approved Electives	<u>16/15</u>
	45

**MS Engineering, Specialization in
MATERIALS ENGINEERING**

<i>Units</i>	
Required Courses	24
MATE 599 Design Project (Thesis) (2) (2) (5)	
<i>Select 15 units from the following:</i>	
MATE 425, 430, 440, 481, 501, 504, 510, 522, 540, 550, 555, 570, 571, 580, 590;	
MATE/BMED 530;	
MATE/CHEM 446;	
MATE/IME 458	
Approved Electives	<u>21</u>
	45

**MS Engineering, Specialization in
WATER ENGINEERING**

<i>Units</i>	
Required Courses	35
Analytical methods for engineering (6)	
ECON 410 Public Finance/Cost-Benefit Analysis (4)	
BRAE 414 Irrigation Engineering (4)	
BRAE 532 Water Wells and Pumps (4)	
BRAE 533 Irrigation Project Design (4)	
CE 533 Adv Water Resources Engineering (4)	
BRAE/CE 599 Design Project (Thesis) (2) (2) (5) or 9 units of approved technical electives <i>and</i> written comprehensive examination	
Approved Elective Courses	10
<i>Select 10 units from the following:</i>	
BRAE 405, 435, 440;	
CE 434, 435, 440, 573;	
ENVE 438, 439, 535	
	<u>45</u>

Joint Graduate Programs

The College of Engineering offers two joint programs: in conjunction with the Orfalea College of Business, the MBA/MS Engineering, with a specialization in Engineering Management; and with the College of Architecture and Environmental Design (City and Regional Planning Department), the MCRP/MS Engineering, with a specialization in Transportation Planning.

MBA/MS Engineering, Specialization in ENGINEERING MANAGEMENT

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

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

The three major objectives of this program are to:

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

Prerequisites

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

Admission/Acceptance Requirements

Admission to the EMP is based upon:

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

- prior work experience (desirable).

Culminating Experience

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

	<i>Units</i>
Required courses	57-58
GSB 511 Accounting for Managers (4)	
GSB 513 Organization Behavior (4)	
GSB 523 Managerial Economics (4)	
GSB 524 Marketing Management (4)	
GSB 531 Managerial Finance (4)	
GSB 533 Aggregate Economic Analysis and Policy (4)	
GSB 562 Seminar in General Mgmt & Strategy (4) <i>or</i> GSB 567 Adv Sem International Business Mgmt (4) <i>or</i> other approved culminating experience	
IME 417 Supply Chain and Logistics Management (4) <i>or</i> IME 430 Quality Engineering (4)	
IME 503 Applied Statistical Methods in Engrg (4)	
IME 507 Graduate Seminar (4)	
IME 556 Technological Project Management (4)	
IME 580 Manufacturing Systems (4)	
IME 596 Internship/Team Project (10) <i>or</i> IME 599 Design Project (Thesis) (9)	
College of Engineering approved electives	16-17
Other advisor approved electives	16
	90

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

MCRP/MS Engineering, Specialization in TRANSPORTATION PLANNING

The Transportation Planning Specialization is a joint interdisciplinary program between the College of Engineering and the City and Regional Planning Department of the College of Architecture and Environmental Design. Participation in the program requires enrollment in both Colleges. Participants successfully completing the program are awarded both the MCRP and the MS in Engineering, each with a Specialization in Transportation Planning.

The major objectives of this joint program are to:

- (a) Provide an interdisciplinary graduate program which combines elements of transportation planning with city and regional planning to address a need for professionals who understand the technology of transportation planning and the importance of transportation within the urban environment. The required master's project enables students to integrate their work through directed study applied to special areas of their choosing.
- (b) Provide planners with courses essential to understanding the technologies of transportation planning. Provide engineers with a broad background in urban studies and knowledge of contemporary environmental issues.
- (c) Take advantage of the backgrounds of program participants. The graduate students of both sponsoring departments include both mature professionals returning for advanced degrees and recent graduates with diversity of specializations.

Prerequisites

Applicants must have satisfactorily completed courses that cover the following or equivalent subject areas:

- CE 321 Fundamentals of Transportation Engineering *or* CRP 435 Transportation Theory
- COMS 101 Public Speaking
- ECON 201 Survey of Economics *or* ECON 222 Macroeconomics
- ENGL 148 Reasoning, Argumentation and Professional Writing *or* ENGL 149 Technical Writing for Engineers
- MATH 142 Calculus II
- PHYS 141 General Physics IA *or* PHYS 131 General Physics I
- STAT 321 Probability and Statistics for Engineers and Scientists *or* STAT 312 Statistical Methods for Engineers *or* STAT 221 Introduction to Probability and Statistics

Applicants for admission are expected to:

- * Have earned a bachelor's degree from an accredited university or college,
- * Have attained a grade point average of 3.0 in last 90 units of undergraduate work,
- * Provide results of the Graduate Record Examination (GRE) Aptitude Test to the Admissions Committee (GRE requirement may be waived for Cal Poly bachelor of science graduates and applicants with superior academic records).
- * Give indications of motivation, maturity, and high standards of academic involvement through work and references (three letters required) and submission of a project or paper demonstrating writing ability,

- * Provide a statement (maximum of 500 words) addressing their understanding of and areas of interest in planning, career objectives, and educational objectives.

Applicants lacking prerequisites or other background requirements for classified standing may be admitted on a conditionally classified basis, depending on the results of an individual analysis of their applications.

Units

Core Courses	64
CE 523 Transportation System Planning (4)	
CE 528 Transportation Analysis <i>or</i>	
CE 421 Traffic Engineering (4)	
CE 591 Graduate Seminar I (1)	
CE 599 Design Project (Thesis) (2,2,2) <i>or</i>	
CRP 599 Thesis (2)(2)(2) <i>or</i>	
CRP 596 Professional Project (2)(2)(2) <i>or</i>	
CRP 556 Community and Regional Planning Studio III (4)	
CRP 435 Transportation Theory (3)	
CRP 501 Foundations of Cities and Planning (4)	
CRP 509 Professional Development (1-3)	
CRP 510 Planning Theory (4)	
CRP 513 Planning Research Methods (4)	
CRP 516 Methods of Data Analysis (4)	
CRP 518 Policy Analysis for Planners (4)	
CRP 525 Plan Implementation (4)	
CRP 530 Planning Agency Management (3)	
CRP 535 Land Use Law (4)	
CRP 552 Community and Regional Planning Studio I (4)	
CRP 554 Community and Regional Planning Studio II (4)	
Advisor approved electives (4/8)	
Emphasis Area (select one of the following)	11
<i>Urban Development and Design Emphasis</i>	
CRP 520 Feasibility Studies in Planning (4)	
CRP 548 Principles of Urban Dev. and Design (4)	
Urban Development and Design elective (3)	
<i>Environmental Planning Emphasis</i>	
CRP 545 Principles of Environmental Planning (4)	
Environmental Planning electives (7)	
Approved CE/ENVE electives:	15
Select from: CE 421, 422, 423, 424, 500, 521, 522, 525, 526, 527, 528, 529, 573, ENVE 411 or other advisor approved CE/ENVE courses	

Aerospace Engineering

Engineering III Bldg. (40A), Room 134
805 756-2562

College of Engineering Advising Center
Engineering South (40), Room 114
805 756-14612 FAX 805 756-2376

Department Chair, Eric A. Mehiel

Kira J. Abercromby	Faysal A. Kolkailah
Daniel J. Biezad	David D. Marshall
Dianne J. DeTurriss	Rob A. McDonald
William W. Durgin	Jordi Puig-Suari
Kristina K. Jameson	Jin Tso

ACADEMIC PROGRAMS

Aerospace Engineering – BS, MS
Multidisciplinary Design – Minor

The Bachelor of Science degree in Aerospace Engineering prepares students for engineering work related to aerodynamics, flight testing, structures, propulsion, control systems, vehicle dynamics, stability and control, flight simulation, and design for both fixed and rotary wing aircraft, missiles, and spacecraft. The problems faced by the aerospace industry offer an unusual engineering challenge. Much of the analysis and testing must be accomplished at the very frontiers of knowledge. Nevertheless, products must be designed and manufactured; thus, an exceptionally wide range of engineering abilities is required within the industry and government.

The Aerospace Engineering Department's mission is to educate students using a laboratory-based, hands-on approach. This approach, coupled with a systems view of engineering, is encouraged through coursework and a group-based capstone design experience. This educational philosophy has yielded engineers capable of working in positions of technical responsibility and leadership in a modern multidisciplinary, systems-based environment.

Graduates in Aerospace Engineering 1) are well rounded engineers for positions of technical responsibility and leadership in a modern multidisciplinary system-oriented environment that emphasizes problem solving; 2) achieve high-quality professional performance in both aeronautical and astronautical engineering by integrating a systems view of engineering that is built upon group based design experiences; and 3) demonstrate a solid foundation in aerodynamics, controls, structures, propulsion and their integration into systems design.

Aerospace Engineering graduates obtain employment in all phases of the aerospace industry such as general design, aerodynamics, stress analysis, flight testing, flight simulation, dynamics, stability and control, and propulsion systems.

The BS degree program in Aerospace Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (page 158). It places emphasis on both analysis and design, with supplementary basic work in laboratory projects. Throughout the entire program there is constant interplay between theory and application. Opportunities are available for advanced elective work in the student's field of special interest.

The program maintains laboratory facilities for fabrication, propulsion, structures and composites, aerodynamics, dynamics and control, flight simulation and flight test, aerothermodynamics, and design.

Aerospace students may participate in two student chapters of national professional societies—the American Institute of Aeronautics and Astronautics and the Society for the Advancement of Material and Process Engineering. There is also a student chapter of the national aerospace engineering honor society, Sigma Gamma Tau.

Blended BS + MS Aerospace Engineering

The blended program provides motivated students with an accelerated route to the MS Aerospace Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Eligibility

Students majoring in BS Aerospace Engineering may be eligible to pursue the blended program toward the MS Aerospace Engineering. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 2.5 required (3.0 GPA recommended). Students are selected by a faculty committee. Please see page 60 for eligibility criteria.

Program of Study

The program allows students to complete a more meaningful capstone experience that integrates the senior project with the graduate thesis. This arrangement also increases opportunities for industrial interaction.

The blended program allows students to double count up to nine units of coursework to fulfill the requirements for the BS and MS degrees. For instance, five of the nine units of AERO 599 Thesis (Design Project) can serve to complete the senior project requirement and a graduate lecture/lab course can be used as a senior elective.

Multidisciplinary Design Minor

The minor enhances students' ability to work in multidisciplinary engineering teams. The students develop an understanding of the design process and the role of systems engineering in product design and development including costs analysis. They also learn the systems integration process and how different subsystems are interfaced to develop a successful product.

Non-AERO students in the minor are admitted by permission of the minor coordinator, and not held to the prerequisites for AERO 443/444/445 or AERO 447/448/449, nor IME 418.

Introductory courses	15
IME 314 Engineering Economics (3)	
IME 418 Product-Process Design (4)	
BUS 382 Organizations, People and Technology (4)	
PSY 350 Teamwork (4)	
Core courses	16
AERO 360 Creative Prob. Solv/Engrg Design (2)	
AERO 443/444/445 or AERO 447/448/449 (10)	
AERO 450 Aerospace Systems Engineering (4)	
	<hr/>
	31

BS AEROSPACE ENGINEERING

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

AERO 121 Aerospace Fundamentals	2
AERO 215 Introduction to Aerospace Design	2
AERO 300 Aerospace Engineering Analysis	5
AERO 301, 302, 303 Aerothermodynamics	4,4,4
AERO 304 Experimental Aerothermodynamics	2
AERO 306 Aerodynamics and Flight Performance	4
AERO 307 Experimental Aerodynamics	2
AERO 320 Fundamentals of Guidance and Control	4
AERO 331 Aerospace Structural Analysis I	4
AERO 401 Propulsion Systems	4
AERO 420 Stability/Control of Aerospace Vehicles	4
AERO 431 Aerospace Structural Analysis II	4
AERO 433 Experimental Stress Analysis	1
AERO 446 Introduction to Space Systems	4
AERO 461, 462 Senior Project I, II <i>or</i>	
AERO 463, 464 Senior Project Laboratory I, II	2,3
CE 204 Mechanics of Materials I	3
CE 207 Mechanics of Materials II	3
EE 201, 251 Electric Circuit Theory and Lab	3,1
Concentration courses (see below)	22
	<hr/>
	91

SUPPORT COURSES

BIO 213 <i>and</i> ENGR/BRAE 213 (B2)*	2,2
CHEM 124 Gen Chem for Engineering (B3/B4)* ...	4
EE 321, 361 Electronics and Lab	3,1
ENGL 149 Technical Writing for Engineers (A3)*	4
IME 144 Intro Design and Manufacturing	4
MATE 210 Materials Engineering	3
MATH 141, 142 Calculus I, II (B1)*	4,4
MATH 143 Calculus III (Add'l Area B)*	4
MATH 241 Calculus IV	4
MATH 244 Linear Analysis I	4
ME 211 Engineering Statics	3
ME 212 Engineering Dynamics	3
PHYS 131 General Physics (Add'l Area B)*	4
PHYS 132, 133 General Physics II, III	4,4
STAT 312 Statistical Methods for Engineers (B6)*	4
	<hr/>
	65

GENERAL EDUCATION (GE)

72 units required, 32 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support	0

Area B Science and Mathematics (no add'l units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support	0
B3 Physical Science * 4 units in Support	0
B4 One lab taken with either a B2 or B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support	0
Additional Area B units* 8 units in Support	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
	<hr/>
	40

FREE ELECTIVES	0
	<hr/>
	196

CONCENTRATIONS (select one)**Aeronautics Concentration**

AERO 405 Supersonic/Hypersonic Aerodynamics....	4
AERO 443, 444, 445 Aircraft Design I, II, III	4,3,3
¹ Aeronautics approved electives	8

Select 8 units from the following:

AERO 407, 409, 416, 419, 432, 435, 450, 452,
470, 510, 511, 512, 515, 519, 520, 521, 522,
523, 524, 525, 526, 530, 532, 533, 534, 535,
540, 541, 550, 551, 552, 553, 555, 560, 561,
562, 565, 566, 567.

AERO 360, 570, 571 require a petition.

Astronautics Concentration

AERO 451 Spaceflight Dynamics I	4
AERO 447, 448, 449 Spacecraft Design I, II, III	4,3,3
¹ Astronautics approved electives	8

Select 8 units from the Aeronautics approved
electives list, above.

¹ Consultation with advisor is recommended prior to selecting approved
electives; bear in mind your selections may impact pursuit of post-
baccalaureate studies and/or goals.

MS AEROSPACE ENGINEERING

General Characteristics. The Master of Science program in Aerospace Engineering prepares the student for entry into a well-established field of aerospace engineering. Two versions of the master’s program are available: MS Aerospace Engineering with Specialization in Research or MS Aerospace Engineering with Specialization in Space Systems Engineering.

General 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 are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination.

An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing. Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Department of Aerospace Engineering.

General Program of Study.

Graduate students must file a formal study plan with their advisor, department, college and graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed. The formal program of study must include a minimum of 45 units (at least 24 of which must be at the 500 level).

MS Aerospace Engineering, Specialization in RESEARCH

Characteristics. Emphasizes engineering science and research activity. Graduates have an increased capability for complex research, development, and innovative design, and are prepared for further study in engineering, leading to the Doctor of Engineering or Ph.D. or advanced positions within industry.

Program of Study. A thesis is required as a culminating experience. Students work with their advisor and the Department Graduate Coordinator to develop a program of study which supports their thesis topic. A thesis topic would typically be in an area such as: dynamics and control, fluid dynamics and aerodynamics, multidisciplinary design and optimization, aerospace propulsion, aerospace structures, and systems engineering.

For the most recent, comprehensive list of courses offered by the department, please contact the Department Graduate Coordinator or see the listing at <http://aero.calpoly.edu>.

Mathematics courses	8
MATH 501 Applied Mathematics I (4)	
MATH or approved numerical methods elective (4)	
Advisor approved electives	28
16 units must be 500-level AERO courses;	
12 units must be 400-500 level courses from the	
College of Engineering or College of Science	
and Mathematics	
Culminating experience	9
AERO 599 Thesis (Design Project) (2) (2) (5)	
	45

M.S. Aerospace Engineering, Specialization in SPACE SYSTEMS ENGINEERING

Characteristics. Emphasizes space systems and systems engineering. It is designed to accommodate students with undergraduate degrees in science or engineering disciplines other than aerospace engineering. Students develop an understanding of all subsystems in a space vehicle (spacecraft or missile/launch vehicle) and how they are combined to form a complete space vehicle. The program also presents the basic principles of systems engineering and their application to space vehicle design. A project is required as a culminating experience.

Systems engineering courses	12
AERO 450 Intro to Space Systems (4)	
AERO 510 Systems Engineering I (4)	
AERO 511 Systems Engineering II (4)	
Space systems courses	16
AERO 446 Intro to Space Systems (4)	
AERO 512 Aerospace Vehicle Software App (4)	
AERO 519 Fundamentals of Vehicle dynamics and	
Control (4)	
AERO 566 Adv Topics in Spacecraft Design (4)	
or AERO 567 Launch Vehicle and Missile	
Design (4)	
Advisor approved electives	12
Must be 500-level courses from the College of	
Engineering	
Culminating experience	5
AERO 599 Thesis (Design Project) (5)	
	45

Biomedical & General Engineering

Engineering Bldg. (13), Room 260
805 756-6400

College of Engineering Advising Center
Engineering South (40), Room 114
805 756-1461

Department Chair, Lanny Griffin

Kristen O'Halloran Cardinal	Scott Hazelwood
Trevor Cardinal	Lily Laiho
David Clague	Robert Szlavik
Robert Crockett	Daniel W. Walsh

ACADEMIC PROGRAMS

Biomedical Engineering – BS, MS
General Engineering – BS

BS Biomedical Engineering

Biomedical engineering is an interdisciplinary field in which the principles and tools of engineering are applied to biomedical problems. Engineering plays an increasingly important role in medicine and in projects that range from basic research in physiology to advances in biotechnology and the improvement of health care delivery. By its very nature, biomedical engineering is broad and requires a foundation in the engineering sciences as well as in physiology and other biological sciences.

The mission of the Biomedical Engineering program is to educate students for careers of service, leadership and distinction in engineering or other fields by using a participatory, learn-by-doing, “hands-on” laboratory, projects and design centered approach.

The program offers a four-year curriculum leading to a B.S. degree. The main educational objectives of the program are to prepare graduates who will excel in the biomedical engineering profession, understand that their education is a continuous enterprise, and seek graduate degrees for increased flexibility and mobility. The curriculum provides a sound theoretical background, practical engineering knowledge and solid laboratory exposure. It highlights an immediate introduction to the major, strong personal interaction with faculty, strong partnerships with industrial participants and a signature laboratory emphasis. The degree is an excellent preparation for an applied terminal masters degree in these interdisciplinary fields such as the Blended BS+MS program described in the MS Engineering section of this catalog.

The application of engineering to medicine and biology underpins a strong and growing segment of the industrial sector, and continues to be an area of inherent interest to students. The need for well educated professionals in this interdisciplinary area has become more acute as the technology being applied has become more sophisticated. Evolution in computing, electronics, signal analysis and mechatronic systems have resulted in dramatic improvements in diagnostic efforts, therapeutic approaches and bioindustrial applications. Studies of biological materials, physiological mechanisms, biochemical kinetics and heat and mass transport in biological systems require engineering expertise. With the advent of research into artificial organs, prosthetic devices and tissue engineering, applied medical research and applied biological research has taken on a distinct engineering aspect.

Biomedical engineering combines engineering expertise with medical needs for the enhancement of health care. It is a branch of engineering in which knowledge and skills are developed and applied to define and solve problems in biology and medicine. Students choose the biomedical engineering field to be of service to people; for the excitement of working with living systems; and to apply advanced technology to the complex problems of medical care.

Some well established specialty areas exist within the field of biomedical engineering: *bioinstrumentation*, *biomechanics*, *biomaterials*, *systems physiology*, *tissue engineering*, *clinical engineering*, and *rehabilitation engineering*.

Bioinstrumentation is the application of electronics and measurement principles and techniques to develop devices used in diagnosis and treatment of disease. Computers are becoming increasingly important in bioinstrumentation, from the microprocessor used to do a variety of small tasks in a single purpose instrument to the extensive computing power needed to process the large amount of information in a medical imaging system. *Biomechanics* is mechanics applied to biological or medical problems. It includes the study of motion, of material deformation, of flow within the body and in devices, and transport of chemical constituents across biological and synthetic media and membranes. *Biomaterials* describes both living tissue and materials used for implantation. Understanding the properties of the living material is vital in the design of implant materials. *Systems physiology* is the term used to describe that aspect of biomedical engineering in which engineering strategies, techniques and tools are used to gain a comprehensive and integrated understanding of the function of living organisms ranging from bacteria to humans. *Tissue engineering* is a rapidly developing field that combines engineered materials with living cells to restore or replace lost organ function. *Clinical engineer-ing* is the application of technology for health care in hospitals. The clinical engineer is a member of the health care team along with physicians, nurses and other hospital staff. *Rehabilitation*

engineering is a new and growing specialty area of biomedical engineering. Rehabilitation engineers expand capabilities and improve the quality of life for individuals with physical impairments.

In addition to the objectives for all engineering programs, the goal of the BS program in Biomedical Engineering is the preparation of engineering professionals who have: (1) an understanding of biology and physiology; (2) an ability to apply advanced mathematics to problems at the interface of engineering and biology; (3) an ability to measure and interpret data from living systems; and (4) an ability to address the problems associated with the interaction between living and nonliving systems.

BS General Engineering

Flexibility, core competency and self-determination are the keywords for students of the General Engineering Program. The mission of the General Engineering Program is to provide students with the highest quality technical and professional engineering education, with a particular emphasis in new or evolving interdisciplinary areas, while allowing the students to participate in designing their curricula. General Engineering graduates have directed the technical electives in their programs towards studies of project management, technical sales, law, medicine and a hundred other paths defined by their keen intellects and adventuresome spirits.

The primary goal of the General Engineering Program is to provide students with a theoretically rigorous and a laboratory-centered, practice-oriented, hands-on education that allows graduates to immediately participate and to excel in professional environments. The program is underpinned by a rigorous selection of mathematics, science, basic engineering and liberal-arts courses. The students, with their advisors, then select forty technical elective classes that allow the students to put their own mark on their degrees, ensuring a unique competency with a solid underpinning.

General Engineering graduates are ready for immediate entry into the professional engineering field. They demonstrate an ability to satisfy their personal needs for further education, as expressed in their matriculation to graduate or professional schools in many cases, and an interest in life-long learning in all cases. They possess a solid engineering foundation which underpins a successful career. They can become leaders, based on strong communication skills, a capacity to form teams and perform in teams, and an understanding of the economic and social impact of their decisions.

In addition to the abilities expected of all engineering graduates, articulated in the section of this catalog describing the College of Engineering, General Engineering graduates are expected to leave the University with special capabilities pertinent to their own concentrations.

The Bachelor of Science degree in General Engineering is designed to allow students the latitude in course selection

required to educate themselves either in the classical study of engineering or in new and evolving interdisciplinary technologies such as bioengineering, biochemical engineering and mechatronics. The degree is an excellent preparation for an applied terminal masters degree in these interdisciplinary fields such as the Blended BS+MS program described in the MS Engineering section of this catalog. General Engineering can also accommodate those students who wish to major in engineering but have not presently decided in which specific program their interest is centered. The curriculum builds a sound foundation in the fundamental principles of engineering and engineering systems during the early years of study. During their final quarters of study, students customize their study plan with the help of a faculty advisor and are given the opportunity to focus their education while still at the undergraduate level. The BS degree in General Engineering is, therefore, a direct path to employment in a classic engineering field or in an area of emerging technology. It is also a natural step toward a professional or a graduate degree.

General Engineering students are encouraged to participate in the Blended BS+MS program. This program recognizes that the expertise required of entry level engineers in many fields, particularly new and evolving technological fields, implies that a masters degree is a prerequisite for success. The program allows motivated students to reduce the time necessary to earn both degrees.

All practitioners of engineering must have an understanding of the physical sciences and mathematics. Further, they must have a firm grasp of engineering sciences. The General Engineering curriculum provides the framework for this matrix of understanding, upon which the practitioner may begin to develop a unique area of expertise.

This program is for directed, highly motivated students. The technical elective courses are selected to be consistent with a sharply defined career goal. Each student is 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, management of technology, bioengineering, ocean engineering and engineering in unique environments.

One example of a highly multidisciplinary field of study is *mechatronics*, defined as the application of decision making to physical systems. Today's engineered products are complex, composed of integrated mechanical and electronic components, and operate with the aid of control software. Design and fabrication of such products requires knowledge of manufacturing, mechanical engineering, electronics and materials as well as experience with concurrent engineering tools. Embedded computers of all sizes and capabilities are used in the decision making elements of products which daily affect the lives of essentially each resident in the developed world. Microcontrollers and mechatronic systems are found in devices as mundane as lawnmowers and as esoteric as deep space probes, and every system in between.

Bioengineering Concentration. Provides students with interdisciplinary exposure in a burgeoning field. The program highlights an immediate introduction to the major, strong personal interaction with faculty, strong partnerships with industrial participants and a signature laboratory emphasis. Rooted in a strong engineering exposure, the curriculum allows students to pursue applied biotechnical research in practical, interdisciplinary settings. Students and faculty are concerned with the design, analysis, integration and operation of engineered materials and engineered systems in biological applications. Typical areas of study include bioinstrumentation, bioelectric signals and communication, remediation and bioindustrial systems.

Individualized Course of Study. Permits students to pursue a course of study which meets their individual needs and interests. Courses are selected by the student with the advice and approval of the student's academic advisor and department chair.

BS BIOMEDICAL ENGINEERING

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

* = Required in Support; also satisfies GE
Note: No major or support courses may be taken as credit/no credit.

MAJOR COURSES

ENGR 110 Engineering Science I.....	3
BMED 111 Biomedical Engrg Calculations	3
BMED 212 Intro to Biomedical Engrg Design	3
BMED 310 Biomed. Engrg Measurement/Analysis	4
BMED 410 Biomechanics.....	4
BMED 420 Biomaterials.....	4
BMED 425 Biomedical Engineering Transport.....	4
BMED 430 Biomedical Modeling	2
BMED 440 Bioelectronics and Instrumentation	4
BMED 450 Special Topics in Biomedical Engrg	4
BMED 455 Biomedical Engineering Design I.....	4
BMED 456 Biomedical Engineering Design II	4
BMED 460 Engineering Physiology.....	4
Approved technical electives (300/400).....	14
BMED 481, 482, 483 or ENGR 462 Senior Project.....	4
	65

SUPPORT COURSES

BIO 161 Intro to Cell & Molecular Bio (B2/B4)*	4
CE 204 Mechanics of Materials I.....	3
CHEM 124 Gen Chem for Engrg I (B3/B4)* and CHEM 125 Gen Chem for Engrg II (Add'l Area B)* or CHEM 127, 128 Gen Chem I, II.....	4,4
CSC 101 Fundamentals of Computer Science or CSC 234 C and Unix	3
EE 201 Electric Circuit Theory	3
ENGL 149 Technical Writing for Engineers (A3)*	4
MATE 210 Materials Engineering.....	3
MATH 141,142 Calculus I, II (B1)*.....	4,4
MATH 143 Calculus III (Add'l Area B)*.....	4
MATH 241 Calculus IV	4
MATH 244 Linear Analysis I.....	4

ME 211 Engineering Statics	3
ME 212 Engineering Dynamics.....	3
ME 302 Thermodynamics I	3
ME 341 Fluid Mechanics I	3
PHYS 141 General Physics IA	4
PHYS 132 General Physics II.....	4
PHYS 133 General Physics III	4
ZOO 331 or ZOO 332 Human Anatomy/Physiology I or II	5
¹ Approved support electives.....	16
	93

GENERAL EDUCATION (GE)

72 units required, 32 of which are specified in Support.
→See page 39 for complete GE course listing.
→Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support.....	0

Area B Science and Mathematics (no add'l units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science *4 units in Support	0
B3 Physical Science* 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support.....	0
Additional Area B units * 8 units in Support.....	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
	40

FREE ELECTIVES	0
	198

¹ For a total of 16 units:

Select one course from GE B6*:
MATH 344, STAT 312, PHYS 417.

Typical remaining course selections include, but are not limited to:
BIO 302 or 303 or 351, BIO 405, BIO 426, BIO 441, BIO 452;
CE 207; CHEM 312, CHEM 313, CHEM 444, CHEM 446,
CHEM 473; CSC 448; EE 321, EE 361; MCRO 221 or 224,
MCRO 225, MCRO 320, MCRO 402.

Consultation with advisor is recommended prior to selecting approved support electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

BS GENERAL ENGINEERING

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

* = Required in Support; also satisfies GE
 Note: No major, support or concentration courses may be taken as credit/no credit.

MAJOR COURSES

CE 204 Mechanics of Materials I.....	3
CSC 234/CSC 101.....	3
EE 201 Electric Circuit Theory	3
¹ ENGR 110,111,112 Engineering Science I,II,III	3,3,3
IME 314 Engineering Economics	3
MATE 210 Materials Engineering <i>and</i>	
MATE 215 Materials Laboratory I.....	3,1
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics	3
ME 302 Thermodynamics I.....	3
ME 341 Fluid Mechanics I.....	3
ME 343 Heat Transfer.....	4
ENGR 481, 482 Sr. Project Design Lab I, II <i>or</i>	
Sr. Project-appropriate engineering discipline	2,2
² Concentration or individual course of study.....	46
	91

SUPPORT COURSES

BIO 213 <i>and</i> ENGR/BRAE 213 (B2)*	2,2
CHEM 124 Gen Chem for Engrg I (B3/B4)* <i>and</i>	
CHEM 125 Gen Chem for Engrg II (Add'l Area	
B)* <i>or</i> CHEM 127, 128 Gen Chem I, II.....	4,4
ENGL 149 Technical Writing for Engineers (A3)*	4
MATH 141,142 Calculus I, II (B1)*.....	4,4
MATH 143 Calculus III (Add'l Area B)*.....	4
MATH 241 Calculus IV.....	4
MATH 244 Linear Analysis I.....	4
Select one of the following: MATH 344; STAT	
312, 321, 350 (B6)*	4
PHYS 141 General Physics IA.....	4
PHYS 132, 133 General Physics.....	4,4
Physical science electives.....	4,4
	60

GENERAL EDUCATION (GE)

72 units required, 32 of which are specified in Support.
 →See page 39 for complete GE course listing.
 →Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4	
units in Support	0

Area B Science and Mathematics (no add'l units req'd)

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science *4 units in Support.....	0
B3 Physical Science* 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support ...	0
Additional Area B units * 8 units in Support	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
	40

FREE ELECTIVES

0
191

CONCENTRATIONS OR INDIVIDUALIZED COURSE OF STUDY (select one)

Bioengineering Concentration

CSC 341 Numerical Engineering Analysis	4
ENGR 450 Special Topics in Bioengineering.....	4
IME 144 Introduction to Design and Manufacturing	4
MATH 344 Linear Analysis II	4
ME 326 Intermediate Dynamics.....	4
Select 12 units from the following:	12

BIO 361, 432, 442; CHEM 305, 371; CSC 471;
 EE 336, 419; ENVE 304, 331, 421, 443; MATE
 330; ME 328, 329, 401, 428, 445; STAT 312, 321,
 350

Approved electives.....	14
	46

Individualized Course of Study

Technical electives. A minimum of 35 units must be at 300-400 level.

¹ BMED 212 may be substituted for ENGR 112.

² A minimum of 35 units at 300-400 level must be completed, in a concentration, individual course of study or free electives, in addition to those required in Major, Support and General Education, for a total of 60 upper division units.

MS BIOMEDICAL ENGINEERING

General Characteristics

The Master of Science degree program in Biomedical Engineering is well-suited for those individuals who desire depth in engineering application to living systems, with a strong pragmatic and rigorous, hands-on educational experience. Graduates will be well-equipped to make significant contributions to the biomedical field. The MS in Biomedical Engineering program objectives are to:

- Provide graduates with a rigorous, broad-based advanced education in engineering coupled with applied biology that will prepare graduates for the many diverse career opportunities of biomedical engineering.
- Provide an empowering professional degree for students who intend to become practicing engineers
- Provide job-entry education for the more complex and evolving interdisciplinary area of biomedical engineering.
- Provide a base that enables graduates to maintain currency in their fields.
- Provide preparation for further study in engineering and/or medicine, leading to the Doctor of Engineering, MD, Ph.D, or MD/Ph.D. degrees.

Prerequisites

For admission as a classified graduate student, an applicant must possess 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 scores for the General Test of the Graduate Record Examination. Applicants are also required to submit 3 letters of reference in support of their application. A college level biology course, with laboratory, for biology majors is highly recommended. Applicants who meet these standards but lack prerequisite coursework may be admitted as conditionally classified students and must make up any deficiencies before advancement to candidacy. Applicants from other academic disciplines, such as biology or chemistry are encouraged to apply and may be admitted to the program conditionally in order to make up deficiencies in prerequisite coursework. Information regarding specific admission requirements and classification as a graduate student may be obtained from the Graduate Coordinator, Biomedical Engineering.

Program of Study

Graduate students must file formal study plans with their advisor, department, college, and university graduate studies office as well as fulfill the Graduation Writing Requirement no later than the end of the quarter in which the 12th unit of approved graduate course work is completed. The formal program of study must include a minimum of 45 units with:

- a) At least 23 units of the 45 unit program at the 500 level.
- b) A thesis or project as the mandatory culminating experience.

Curriculum for MS Biomedical Engineering

	<i>Units</i>
Required Courses	27
1 BMED 460 Engineering Physiology (4)	
BMED 512 Biomedical Engineering Horizons (4)	
BMED 530 Biomaterials (4)	
BMED 550 Current and Evolving Topics in Biomedical Engineering (4)	
BMED 563 Biomedical Engineering Graduate Seminar (2)	
2 BMED 599 Design Project (Thesis) (9)	
Approved Engineering, Science and Mathematics Electives	18
a) A minimum of 8 units from an advisor approved list of mathematics, statistics, biology, or analytic engineering courses, with at least 4 units at the 500 level. Typical courses could be, but are not limited to: BMED 404; CSC 448; IME 503; MATH 418, MATH 501, MATH 502; STAT 513.	
b) Remaining elective units are advisor approved. BMED 520 is required for non-BMED undergraduate majors.	

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MS Biomedical Engineering, Specialization in STEM CELL RESEARCH

Characteristics. Prepares students for research careers working with stem cells. Graduates of the program are well-prepared to matriculate into stem-cell focused doctoral programs. Following completion of a PhD in a stem-cell focused program (and likely post-doctoral training), students would have job opportunities as principal investigators at universities/non-profit research institutes or as lead scientists at for profit institutions. Graduates are also well prepared for immediate employment as research specialists/laboratory managers at universities, research institutes, or private companies in the field of stem cells/regenerative medicine.

Culminating Experience. Students who obtain a degree in the Master of Science in Biomedical Engineering with a specialization in Stem Cell Research are not required to complete BMED 599. In place of the thesis as a culminating experience, students are required to complete a non-traditional Comprehensive Exam. This non-traditional Comprehensive Exam includes a 9-month internship in a stem cell research laboratory³ (BMED/ASCI/BIO 593), a

¹ BMED 460 is not required for BMED undergraduates as it is a core course in the major.

² BMED 591 and/or BMED 592 can substitute for up to 4 units of thesis. Recommended for BMED BS 4+1 students.

³ Students will complete their internship in stem cell research laboratories at UCSD, the Salk Institute, the Scripps Research Institute, Stanford University, or Novocell Inc.

quarter-long project course at Cal Poly (BMED/ASCI/BIO 594), a written report of their internship research, a written report of their quarter-long project course, and an oral presentation of their internship research. Through the completion of these components, students demonstrate their “ability to integrate the knowledge of the area, show critical and independent thinking, and demonstrate mastery of the subject matter.”

Required Courses	38
BMED 460 Engineering Physiology (4)	
BMED 510 Principles of Tissue Engineering (4)	
BMED 512 Biomedical Engineering Horizons (4)	
BMED 515 Introduction to Biomedical Imaging (4)	
BMED 545 Cell Transplantation and Biotherapeutics (4)	
BMED 563 Biomedical Engineering Graduate Seminar (2)	
BMED/ASCI/BIO 593 Stem Cell Research Internship (10)	
BMED/ASCI/BIO 594 Applications in Stem Cell Research (2)	
BIO 534 Principles of Stem Cell Biology (2)	
BIO 590 (1) and ASCI 581 (1) Stem Cell Research Seminars	
Approved engineering, science and mathematics electives	$\frac{7}{45}$

Civil & Environmental Engineering

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College of Engineering Advising Center
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ACADEMIC PROGRAMS

Civil Engineering – BS
Civil and Environmental Engineering – MS
Environmental Engineering – BS

BS Civil Engineering

Graduates of a civil engineering program must have the engineering skills needed to plan, design, construct, and maintain infrastructure and industrial facilities. In addition, graduates must have the broad education necessary to communicate effectively with other engineers, architects, planners, administrators, government officials, and the general public. The faculty and staff of the Civil Engineering program at Cal Poly understand these needs and take pride in preparing their students for the challenges associated with engineering practice.

The Civil Engineering program at Cal Poly has quickly grown into one of the largest and most respected programs in California and the nation. The program consistently attracts top student candidates because of its modern, well-equipped laboratories, the close interaction that occurs between undergraduates and full-time faculty, and a strong reputation among employers in the civil engineering and construction industries. Scientific depth is included within the curriculum for those students who are interested in graduate study.

The Civil Engineering program recognizes the importance of student organizations and strongly supports the American Society of Civil Engineers (ASCE) Student Chapter as well as Chi Epsilon, the national civil engineering honor society. These student groups sponsor opportunities for professional development, community service, and social activities which help to complement the formal academic program. The ASCE Student Chapter, an active member of the campus community, has been recognized as the nation's most outstanding civil engineering student organization twice during the past decade.

The Civil Engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET) (see page 158). The program's mission is to prepare students for successful careers in civil engineering by providing a high quality, practice-oriented education that emphasizes design project experiences, "hands-on" laboratory activities, and teamwork. The program's faculty, in consultation with civil engineering practitioners and alumni, have developed a number of educational objectives to support this mission. These objectives are:

- To prepare students for success in civil engineering practice by providing them with the knowledge, skills, and tools needed to solve engineering problems and develop design solutions;
- To prepare students to work effectively with others in their community by providing them with team-based instructional activities and frequent opportunities to sharpen their communication skills;
- To encourage students to understand the ethical and professional responsibilities of civil engineers and to appreciate the impact that their engineering solutions will have on the environment and society;
- To prepare students for professional licensure and advanced studies in civil engineering by introducing them to state-of-the-practice design procedures as well as current research findings; and
- To encourage students to understand and appreciate the value of a broad-based civil engineering education.

The undergraduate curriculum in civil engineering is designed to support the educational objectives. Therefore, the curriculum includes broad coverage of mathematics, engineering and basic sciences, liberal arts, humanities, and social sciences. The program also includes a number of required civil engineering courses that are designed to ensure that students become proficient in four areas of civil engineering: geotechnical, structural, transportation, and water resources.

All majors must complete a two-quarter senior design project that focuses on current civil engineering design procedures, standards and multiple realistic constraints. Topics related to interpersonal communication, teamwork, leadership, ethics, and professional practice are also covered

so that students have an understanding of the issues and skills to become a successful design professional.

Flexibility within the curriculum allows students to select from a wide range of upper division civil engineering technical electives. Student use these technical electives to focus in one of the four areas of civil engineering noted above or to design a “general” curriculum that allows for a broad range of civil engineering interests. Students must formally consult with a faculty advisor prior to selecting and enrolling in upper division civil engineering technical electives.

The Civil Engineering program requires students to be “Multidisciplinary Certified” for graduation. This provides students an opportunity to practice skills associated with working on multidisciplinary teams. Such experience is important for practicing engineers, with the ever-increasing diversity of engineering science and applications. For Civil Engineering majors, this requirement is satisfied by taking a required course sequence, either CE 466/467 or CE 468/469. Visit the department web site for more information. Also see further discussion in the catalog under College of Engineering.

BS Environmental Engineering

The BS program in Environmental Engineering is concerned with the interrelation of people, materials, and processes in a complex and changing environment. The broad field of environmental engineering includes control of air and water pollution, industrial hygiene, environmental health and safety, solid waste, hazardous waste management, and pollution prevention.

The program offers a sound background in the fundamentals of thermodynamics, fluid mechanics, mass transfer, water resources, and geotechnical engineering. The problem-oriented approach to instruction, in modern well-equipped laboratories, provides an excellent opportunity to gain understanding and experience of the discipline. The program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (see page 158).

The main focus of the program is to prepare graduates for practice in professional engineering. Thus, Cal Poly’s “learn by doing” philosophy is emphasized by integrating design throughout the curriculum, especially in the numerous design-centered laboratories. In the required senior design project, which is completed in a two-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

The Environmental Engineering program educational objectives are that its graduates will:

- Practice as professional engineers by gaining a thorough foundation in water and wastewater, air pollution, and solid and hazardous wastes.
- Pursue higher studies, research and life-long learning, and develop an appreciation of liberal arts and social sciences.

- Have a global awareness of environmental issues and use appropriate technologies to solve them.

The Environmental Engineering program requires students to be “Multidisciplinary Certified” for graduation. This provides students an opportunity to practice skills associated with working on multidisciplinary teams. Such experience is important for practicing engineers, with the ever-increasing diversity of engineering science and applications. For Environmental Engineering majors, this requirement is satisfied by taking a required course sequence, ENVE 466/467. Visit the department web site for more information. Also see further discussion in the catalog under College of Engineering.

An engineering approach to the subject enables graduates of the program 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.

Various program constituencies, such as graduates and employers, are consulted periodically for input on the appropriateness as well as the attainment of the educational objectives. Other indicators such as student/alumni placement and success rates in the statewide fundamentals in engineering examination are also used to evaluate attainment.

The Society of Environmental Engineers offers technical programs and other activities, including field trips each year to study typical installations of systems. Student memberships also are available in the Air and Waste Management Association, the California Water Pollution Control Association, and the Water Environment Federation.

Blended BS + MS Civil and Environmental Engineering

The blended program provides motivated students with an accelerated route to an MS in Civil and Environmental Engineering, with simultaneous conferring of both bachelor’s and master’s degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Eligibility

Students majoring in BS Civil Engineering or BS Environmental Engineering may be eligible to pursue the blended program toward an MS in Civil and Environmental Engineering after completing all required support and CE/ENVE 300-level classes. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 3.0. Please see page 60 for additional eligibility criteria.

Program of Study

Students originating in the BS Civil and Environmental Engineering programs are required to take Senior Design I and II (CE 466/467 or CE 468/469, or ENVE 466/467) and complete nine units of thesis (CE 599 or ENVE 599).

The blended program allows students to earn graduate credit for several of their senior electives, effectively decreasing the summed unit requirements for both degrees. Students in the blended program are required to complete a thesis.

BS CIVIL ENGINEERING

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

* = Required in Support; also satisfies GE
 Note: No major or support courses may be taken as credit/no credit.

MAJOR COURSES

CE 111 Introduction to Civil Engineering	1
¹ CE 112 Design Principles in Civil Engineering	2
¹ CE 113 Computer-Aided Drafting in Civ Engr.....	2
CE 201 Mechanics of Materials (6) or CE 204, CE 207 Mechanics of Materials I, II (3)(3)	6
CE 321, 322 Fund Transportation Engr and Lab	3,2
CE 251 Numerical Methods in Civil Engineering ...	4
CE 259 Civil Engineering Materials	2
CE 336 Water Resources Engineering	4
CE 337 Hydraulics Laboratory	1
CE 351 Structural Analysis	4
CE 355 Reinforced Concrete Design	4
CE 356 Structural Steel Design.....	4
CE 381, 382 Geotechnical Engineering and Lab	4,1
CE 466, 467 or CE 468, 469	3,3
^{2,3} Technical electives	24

In consultation with faculty advisor, select 24 units from any 400-500 level CE and ENVE courses not required in the major, ENVE 325, and a maximum of 4 units from the following list:

- ARCE 305, 372, 403;
- BRAE 345, 447, 532;
- CE/ME/BMED 404;
- CHEM 318, 341;
- CM 333, 364, 432, 454;
- CRP 420, 435; CRP/NR 404, 408,
- ERSC/GEOL 401, 402; GEOL 415;
- IME 314;
- MATE 425, 450;
- MATH 344;
- LA/NR 318;
- SS 423, 442; SS/BIO/NR 421

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SUPPORT COURSES

BIO 213 and ENGR/BRAE 213 (B2)*	2,2
BRAE 239 Engineering Surveying	4
CHEM 124 Gen Chem for Engineering (B3/B4)*	4
CHEM 125 Gen Chem for Engineering	4
ENGL 149 Technical Writing for Engineers (A3)*	4
ENVE 331 Intro to Environmental Engineering	4
GEOL 201 Physical Geology	3
MATE 210 Materials Engineering	3
MATE 215 Materials Laboratory I	1
MATH 141, 142 Calculus I, II (B1)*	4,4

MATH 143 Calculus III (Add'l Area B)*	4
MATH 241 Calculus IV.....	4
MATH 244 Linear Analysis I	4
ME 211 Engineering Statics	3
ME 212 Engineering Dynamics	3
ME 302 Thermodynamics I	3
ME 341 Fluid Mechanics I	3
PHYS 141 General Physics IA (Add'l Area B)*	4
PHYS 132, 133 General Physics II, III.....	4,4
STAT 312 Statistical Methods for Engineers (B6)*	4
^{2,4} Approved engineering science elective	3

Select 3 units from:

- CSC 231, 234, 270, 341, 342;
- EE 201;
- IME 314;
- MATH 206, 211, 304, 344

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GENERAL EDUCATION (GE)

72 units required, 32 of which are specified in Support.
 →See page 39 for complete GE course listing.
 →Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support	0

Area B Science and Mathematics (no addl units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support.....	0
Additional Area B units * 8 units in Support.....	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4

- ¹ CE 114 substitutes for CE 112 and CE 113.
- ² Consultation with advisor is recommended prior to selecting technical electives or approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ³ Additional guidelines for technical electives:
 - a) More than 4 units of coursework outside CE/ENVE is only permitted in special/unusual cases and requires written justification by the student, and approval by the Department Chair.
 - b) CE 400, 500 and ENVE 400, 500 require a course substitution form and no more than 4 total units are allowed.
 - c) No more than 8 combined units of CE/ENVE 470, 471, 570, 571 can be credited.
 - d) Co-op, graduate seminar, senior project/design, and thesis courses are not permitted.
 - e) Only one course can be credited for CE 458/558; 459/556.
- ⁴ The courses selected to satisfy this requirement may not be used to satisfy other major, support, or general education requirements (no double counting of coursework).

C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area D/E Society and the Individual (16 units)	
D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
	40

FREE ELECTIVES	0
	196

BS ENVIRONMENTAL ENGINEERING

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

CE 113 Computer-Aided Drafting in Civ Engr.....	2
CE 201 or CE 204, 207 Mechanics of Materials	6
CE 336 Water Resources Engineering.....	4
CE 337 Hydraulics Laboratory	1
CE 381 Geotechnical Engineering	4
CE 434 Groundwater Hydraulics and Hydrology	4
ENVE 111 Intro to Env. Engineering Profession	1
ENVE 264 Environmental Fluid Mechanics.....	4
ENVE 304 Thermodynamics of Processes	3
ENVE 309 Noise and Vibration Control.....	3
ENVE 325 Environmental Air Quality	4
ENVE 331 Intro to Environmental Engineering	4
ENVE 411 Air Pollution Control	3
ENVE 421 Mass Transfer Operations.....	4
ENVE 426 Air Quality Measurements.....	3
ENVE 434 Water Chemistry and Water Quality Measurements.....	4
ENVE 436 Intro Hazardous Waste Management....	4
ENVE 438 Water & Wastewater Treatment Design	3
ENVE 439 Solid Waste Management.....	3
ENVE 450 Industrial Pollution Prevention.....	4
ENVE 455 Environmental Health and Safety.....	4
ENVE 466, 467 Senior Project Design Lab.....	2,2
^{1,2} Technical electives	11
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SUPPORT COURSES

³ CHEM 127 General Chemistry I (B3/B4)*	4
CHEM 128 General Chemistry II	4
CHEM 129 General Chemistry III.....	4
CHEM 312 Surv Org Chem	5
(trans equiv CHEM 212)	
CSC 231 Programming for Engineering Students ...	2
ENGL 149 Technical Writing for Engineers (A3)*	4
MATH 141, 142 Calculus I, II (B1)*	4,4
MATH 143 Calculus III (Add'l Area B)*	4
MATH 241 Calculus IV	4
MATH 244 Linear Analysis I	4

MCRO 221 Microbiology (B2)* or MCRO 224 General Microbiology I	4
ME 211 Engineering Statics	3
ME 302 Thermodynamics I	3
PHYS 141 General Physics IA (Add'l Area B)*	4
PHYS 132, 133 General Physics II, III.....	4,4
STAT 312 Statistical Methods for Engineers (B6)*	4
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GENERAL EDUCATION (GE)

72 units required, 32 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support	0

Area B Science and Mathematics (no add'l units required)

B1 Mathematics/Statistics * 8 in Support	0
B2 Life Science * 4 units in Support	0
B3 Physical Science * 4 in Support	0
B4 One lab taken with either a B2 or B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 in Support.....	0
Additional Area B units* 8 in Support.....	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective (PHIL 340 or NR 360 recommended).....	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
	40

FREE ELECTIVES	0
	196

¹ To be selected in accordance with the A.B.E.T. 24-unit and Culminating Engineering Design requirement, in consultation with your academic advisor.

² No more than 4 units of ENVE 400 or CE 400 can be counted towards technical electives.

³ CHEM 124, 125 substitute for CHEM 127, 128.

MS Civil and Environmental Engineering

General Characteristics

The Master of Science program in Civil and Environmental Engineering has the following objectives:

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and managerial engineering;
- Updating opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree.

Prerequisites

For admission as a classified graduate student, an applicant must hold a bachelor’s degree in engineering or a closely related physical science with a minimum GPA of 3.0 in the last 90 quarter units (60 semester) attempted. Applicants are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make-up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Civil and Environmental Engineering Department.

Program of Study

Graduate students must file a formal study plan with their advisor, department, college and university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed. The formal program of study must include a minimum of 45 units (at least 24 of which must be at the 500 level). With the graduate advisor’s approval, students select their elective units in one of the following areas of study: geotechnical engineering, structural engineering, transportation and planning, or water resources and environmental engineering.

The broad curriculum requirements for the MS in Civil and Environmental Engineering are:

- * a core of 11 units as required;
- * a minimum of 20 units of advisor approved electives within the major;
- * a minimum of 8 units of advisor-approved electives outside the department;
- * at least 24 units of the 45 unit program at the 500 level;
- * a comprehensive written examination (non-thesis option) or an oral defense examination (thesis option).

Two program options are available:

Thesis option. 36 units of advisor-approved coursework, 9 units of thesis research/design, and an oral thesis defense examination administered by a panel of three faculty.

Non-thesis option. 45 units of advisor-approved coursework and a written comprehensive examination

administered by a panel of three faculty (maximum of three opportunities to pass this examination). Not an option for the blended BS+MS program.

	<i>Units</i>
Required Courses	11
CE 591 Graduate Seminar I (1)	
CE 592 Graduate Seminar II (1)	
CE 599/ENVE 599 Design Project (Thesis) (9) <i>or</i> additional 9 units of advisor approved analysis and design electives within the major (non- thesis option) and Comprehensive Examination.	
Advisor approved analysis and design electives within the major (normally to be selected from the following list after consultation with your academic advisor and the CE/ENVE graduate coordinator)	20-26
CE 400 ¹ , 401, 405, 407, 421, 422, 423, 424, 431, 432, 433, 434, 440, 454, 455, 456, 457, 458, 459, 464, 481, 482, 484, 486, 487, 488, 500 ¹ , 501, 502, 504, 505, 521, 522, 523, 525, 527, 528, 529, 533, 535, 537, 539, 552, 555, 557, 559, 571, 573, 574, 581, 582, 583, 584, 585, 586, 588, 589	
ENVE 400 ¹ , 411, 421, 434, 436, 438, 439, 443, 450, 455, 466, 467, 500 ¹ , 535, 536, 542, 551, 552	
Advisor approved electives outside the major (to be selected after consultation with your academic advisor and the CE/ENVE graduate coordinator).	8-14 45

¹ No more than 4 total units of technical elective credit from CE 400, 500 and ENVE 400, 500 combined.

Computer Engineering

Engineering East Building (20), Room 215
805 756-1229
www.cpe.calpoly.edu

College of Engineering Advising Center
Engineering South (40), Room 114
805 756-1461

Director, Hugh M. Smith

John Bellardo	C. Arthur MacCarley
David B. Braun	Bryan Mealy
Christopher M. Clark	Phillip L. Nico
Fred W. DePiero	John Oliver
James G. Harris	John S. Seng
Albert A. Liddicoat	Lynne A. Slivovsky
Christopher Lupo	Tina Smilkstein

ACADEMIC PROGRAM

Computer Engineering – BS

The Bachelor of Science in Computer Engineering prepares students interested in the design and application of computers and computer-based systems. The program incorporates a firm foundation in both electrical engineering and computer science, with a focus on the integration of hardware and software systems.

The mission of the Computer Engineering Program (CPE) is to provide students with a well-rounded education encompassing the theory and practice of selected, balanced topics in electrical engineering and computer science, to enable students to contribute and continue their education in a wide range of computer-related engineering careers. The program seeks to emphasize “hands-on” experience, problem solving skills, the creative process and responsible action. Through professional development activities, faculty contribute to the advancement of the state-of-the-art, and strive to directly incorporate this experience in the classroom.

Four educational objectives inspire alumni of the Cal Poly Computer Engineering program to excel professionally:

1. Make positive contributions to society and the practice of computer engineering by applying foundational knowledge and the engineering process to solve engineering problems.
2. Work in an individual or team environment in a socially responsible manner.
3. Engage in lifelong learning through continued professional development or graduate studies.
4. Communicate effectively and demonstrate leadership.

In addition to the general abilities expected of College of Engineering graduates, computer engineering students are expected to graduate with:

- a knowledge of probability and statistics appropriate to computer engineering applications;

- a knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences to analyze and design complex devices and systems containing hardware and software components; and
- a knowledge of discrete mathematics.

The Computer Engineering program requires students to be “Multidisciplinary Certified” for graduation. This provides students an opportunity to practice skills associated with working on multidisciplinary teams. Such experience is important for practicing engineers, with the ever-increasing diversity of engineering science and applications. Contact the Computer Engineering Program Office or visit the Computer Engineering web site for more information. Also see further discussion in the catalog under College of Engineering. The Computer Engineering program is ABET accredited (see page 158).

The program prepares graduates for professional practice in industry, as well as continued study in graduate school. Cal Poly’s “learn by doing” philosophy is emphasized by integrating design throughout the curriculum, especially in the numerous design-centered laboratories. In the required senior capstone experience, which is a group-project based course completed over two quarters, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

This integrated approach allows students to work effectively in such diverse areas as digital systems simulation and digital control systems. Knowledge and laboratory experience in computer architecture and structures provide the understanding necessary to design and build computer systems, computer networks and digital communications systems. A thorough knowledge of modern microprocessors enables the graduate to apply these machines in applications such as robotics and data acquisition. Twelve units of technical electives allow students the option to specialize in an area of special interest. For a complete list, please visit the technical electives selection at <http://eadvise.calpoly.edu>.

Current technical electives include courses in:

- robotics
- embedded systems
- computer architecture
- computer networks
- computer based controls
- software systems
- graphics and multimedia
- electronics implementation and VLSI

In addition to a sound theoretical background in computer engineering concepts, students experience practical design courses intended to build problem solving skills. Laboratory courses supplement the program to develop “hands on” skills in all areas of study. Students are exposed to a wide variety of computing equipment: microprocessor development systems, workstations and personal computers, and advanced network hardware and software.

Active student groups of interest to computer engineering majors include the IEEE Computer Society, the IEEE Student Branch, the Association for Computing Machinery, and many other project-oriented student clubs and activities.

Blended and Graduate Programs

Graduates of the Computer Engineering Program are qualified for admission to Cal Poly master's degree programs in electrical engineering, computer science, general engineering, and biomedical engineering.

The opportunity also exists for advanced students to begin graduate study in these areas prior to completion of the BS degree, via a blended program. This provides a number of advantages to qualified students, and makes it possible for completion of both the BS and MS degrees in as little as five years. Computer engineering students participating in a blended program are permitted to fulfill the computer engineering senior project requirement with the master's degree thesis. Students must be prepared for engineering practice via the curriculum which culminates in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints, as listed in the ABET Engineering Criteria. Further details are provided in the graduate study sections for each of these programs.

BS COMPUTER ENGINEERING

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

* = Required in Major/Support; also satisfies GE
Note: No major or support courses may be taken as credit/no credit.

MAJOR COURSES

CPE 100 Computer Engineering Orientation.....	1
CPE 123 Intro to Computing.....	4
CPE 101 Fundamentals Computer Science I.....	4
CPE 102 Fund Computer Science II <i>or</i> CPE 108 Accelerated Intro to Computer Science.....	4
CPE 103 Fund Computer Science III.....	4
CPE 129, 169 Digital Design and Lab (3)(1) <i>or</i> CPE/EE 133 Digital Design (4).....	4
CPE 229, 269 Comp Des/Assembly Lang Prog, Lab (3)(1) <i>or</i> CPE/EE 233 Comp Des/Assembly Lang Prog (4).....	4
CPE 315 Computer Architecture.....	4
CPE 329 Progr Logic/Micro-Based Sys Des.....	4
CPE 350 Capstone I.....	4
CPE 357 Systems Programming.....	4
CPE 450 Capstone II.....	4
CPE 453 Operating Systems I.....	4
CPE 461, 462 Senior Project I, II.....	3,2
CPE 464 Introduction to Computer Networks.....	4
CSC 141 Discrete Structures I.....	4
EE 112 Electric Circuit Analysis I.....	2
EE 211, 241 Electric Circuit Analysis II and Lab	3,1
EE 212, 242 Electric Circuit Analysis III and Lab	3,1
EE 228 Continuous-Time Signals and Systems.....	4

EE 306, 346 Semiconductor Device Electr, Lab.....	3,1
EE 307, 347 Digital Integrated Electronics and Lab	3,1
^{1,2,3} Technical electives.....	12

Select 12 units from the following:

Any 300-500 level CPE, CSC³ or EE³ course;
CPE 400 (up to 4 units);

Up to four units from the following:

BMED 440, 450 (Topic: Tissue Engineering);
CHEM 312, 316;
CSC 300;
ENGR 551 (Topic: Microcirculation);
IME 301, 314, 319, 351, 401, 457;
IME/MATE 458/CPE 488;
MATE 430, 435, 550, MATE/ME 555;
MATH 304, 408, 409, 412, 413, 414, 417,
432, 451[†], 453;
ME 318, 341, 342, 343, 405, 415;
PHYS 323, 403, 408, 412, 424, 452;
UNIV/HNRS 424

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SUPPORT COURSES

BIO 213 <i>and</i> ENGR/BRAE 213 (B2)*.....	2,2
CHEM 124 Gen Chem for Engineering (B3/B4)*	4
¹ Approved CSC, EE, Math or Science elective.....	3
Select from:	
CHEM 125, CSC 349, EE 328, MATE 210/215 (both needed), or ME 211	
ENGL 149 Technical Writing for Engineers (A3)*	4
IME 156/IME 157/IME 458.....	2
MATH 141, 142 Calculus I, II (B1)*.....	4,4
MATH 143 Calculus III (Add'l Area B)*.....	4
MATH 241 Calculus IV.....	4
MATH 244 Linear Analysis I.....	4
PHYS 141 General Physics IA (Add'l Area B)*....	4
PHYS 132, 133 General Physics II, III.....	4,4
PHYS 211 Modern Physics I.....	4
STAT 350 Prob/Random Processes Engr (B6)*.....	4
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GENERAL EDUCATION (GE)

72 units required, 32 of which are specified in Major/Support.

→See page 39 for complete GE course listing.

→Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing.....	4
A2 Oral Communication.....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support.....	0

¹ Consultation with advisor is recommended prior to selecting approved elective; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² The courses selected to satisfy this requirement may not be used to satisfy other major, support, or general education requirements (no double counting of coursework).

³ The following courses may not be used to satisfy this requirement:
COOP units; any 100 or 200 level course; BUS 499; CSC 302, 303,
310, 400, 500; EE 321, 361, 400, 460, 500, 563.

[†] Not for students with credit in CSC 341 or 342 or 343.

Area B Science and Mathematics (no add'l units reqd)

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support	0
Additional Area B units * 8 units in Support	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4

40

FREE ELECTIVES	0
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Computer Science

Computer Science Bldg. (14), Room 254
805 756-2824
www.csc.calpoly.edu

College of Engineering Advising Center
Engineering South (40), Room 114
805 756-1461

Department Chair, Ignatios Vakalis

John M. Bellardo	Aaron W. Keen
W. Chris Buckalew	Franz J. Kurfess
Christopher M. Clark	Mei-Ling Liu
John B. Clements	Chris Lupo
Alexander Dekhtyar	Phillip L. Nico
Gene Fisher	John S. Seng
Hasmik Gharibyan	Hugh Smith
Joseph E. Grimes	Clinton A. Staley
Michael L. Haungs	Clark S. Turner
David S. Janzen	Zoë J. Wood

ACADEMIC PROGRAMS

Computer Engineering – BS
Computer Science – BS, MS, Minor
Software Engineering – BS

The Computer Science Department educates students in the discipline of computer science and teaches them to apply their education to solve practical problems in a socially responsible way. To support the department's educational mission, faculty engage in research and professional development.

In all of the department's programs, laboratory experiences ensure that students have both a theoretical and practical understanding of computer science. Individual and team projects, culminating in the capstone experience of a senior project, reinforce concepts and provide students the opportunity to apply and communicate their knowledge.

The department has active student chapters of the Association for Computing Machinery, IEEE Computer Society and Upsilon Pi Epsilon (the national computer honor society). Student teams compete in national competitions and student organizations sponsor industry/student events.

The department, with industry support, provides a modern computing environment that includes the most current software tools running on a variety of workstations and servers. Projects in advanced courses are supported by specialized laboratories for databases, computer architecture, operating systems, software engineering, computer networks, computer graphics, and human/ computer interaction.

BS Computer Science

The BS Computer Science program provides in-depth study of computer science fundamentals and practice, including programming concepts and languages, software engineering, operating systems and computer architecture.

In addition, the major offers a wide choice of technical electives that allows students to focus on particular areas of computer science and their application. Typical areas of emphasis include databases, distributed computing, software engineering, programming languages, graphical user interfaces, operating systems, computer networks, computer graphics, and artificial intelligence.

The curriculum is project-oriented and develops students' ability to solve problems using modern computing concepts. Students can expect to complete many projects in a variety of programming languages and on a variety of computer systems. During their last year of study, students complete a senior project, either individually or as members of a team, spanning two academic quarters.

Graduates of the computer science program are well prepared to become successful professionals and to pursue graduate study. They are sought by the computer industry for positions as software developers, quality assurance and test engineers, and other technical positions in computer-related industries.

Graduates in computer science:

- Have a broad knowledge of computer science and substantial knowledge of at least one key area of computer science;
- Are prepared to be successful professionals, and, if they desire, are prepared to pursue graduate study;
- Think independently, acquire knowledge, and continue their development as professionals;
- Apply scientific and engineering methodology to the design, implementation, analysis, and evaluation of computer-based systems;
- Communicate effectively, both orally and in writing, and collaborate effectively in teams; and
- Are prepared for the ethical, societal, and global issues associated with the computing field.

The BS Computer Science program is accredited by the Computing Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700.

BS Software Engineering

The BS in Software Engineering prepares students to become software professionals who develop software products on time, within budget, and that meet customer requirements. Building on the fundamentals of computer science, the program focuses on practical aspects of

building and deploying software systems in a socially responsible way. The program's educational mission supports the faculty in research and professional development that keeps them current in their field and in touch with current industry practices and trends.

The hallmark of the program is "hands on" experience where students follow a curriculum that builds on traditional computer science but differs from the BS in Computer Science in the following ways:

1. Classes emphasize the team approach to building software and provide leadership opportunities for every student.
2. Classes place an emphasis on software processes and lifecycles.
3. Classes include significant learning in engineering and management areas such as quality assurance, testing, metrics, maintenance, configuration management and interpersonal management skills.
4. The curriculum has a stronger emphasis on mathematics and the use of engineering methods in software design.

The software engineering curriculum culminates in a year-long capstone sequence where the students work in teams to build a large software system. Students are required to develop an ability to work in a significant application domain through the requirement of an advisor approved cooperative education experience.

Department programs are designed to be flexible. Although freshmen choose their major when they apply for admission, students can easily switch among software engineering, computer engineering and computer science since the lower division curricula are similar.

The software industry increasingly requires both a software and an engineering background for their cutting edge projects. Graduates with a BS in Software Engineering can expect to find significant opportunities in software development and management, software engineering and marketing.

The Software Engineering program requires students to be "Multidisciplinary Certified" for graduation. This provides students an opportunity to practice skills associated with working on multidisciplinary teams. Such experience is important for practicing engineers, with the ever-increasing diversity of engineering science and applications. For Software Engineering majors, this requirement is satisfied in two ways: 1) all SE majors must complete CSC 402/405/406 wherein students work in teams to complete a project for an industrial partner in some applied discipline, and 2) all SE majors must complete a project that applies software engineering principles to some other discipline.

BS Computer Engineering

This program is jointly administered by the Computer Science Department and the Electrical Engineering

Department. For information regarding this program, please refer to Computer Engineering (see page 182).

Blended BS + MS Computer Science

The department offers an accelerated program for motivated, well-qualified students. The blended program allows BS Computer Science, BS Computer Engineering, and BS Software Engineering students to progress toward the Master's degree while still undergraduates. The scheduling flexibility provided by the program enables students to complete the BS and MS degrees efficiently.

Eligibility

Students majoring in BS Computer Science, BS Software Engineering, and BS Computer Engineering are eligible to apply to the blended program if they meet the following minimum eligibility requirements:

- Junior status and completion of 20 units of CSC/CPE courses past CSC/CPE 103;
- Meet the minimum GPA requirement of 3.0; and
- Have not enrolled in senior project.

Participation in the program is based on prior academic performance and other measures of professional promise. Students are selected by a faculty committee.

Program of Study

Students in the blended program complete all courses required for the MS degree and all courses required for the BS degree except the senior project. Completion of the MS thesis may satisfy the senior project requirement. Please refer to your undergraduate degree department office for any restrictions on the master's thesis where a major design experience is required to complete the undergraduate degree.

Upon completion of the program, students are awarded the BS and the MS degrees at the same graduation ceremony and at the same time. Degrees are earned concurrently.

Computer Science Minor

Nearly all disciplines use the capabilities of computers. The minor consists of a core and upper-division courses selected in consultation with an advisor. The core provides common knowledge and skills needed by anyone who wishes to advance further in computer science. The remaining courses enable students to specialize in areas relevant to their goals.

Prerequisite. CSC 101 (Fundamentals of Computer Science I) must be taken *before* admission to the minor.

Admission to the minor is limited and selection is based upon the applicant's performance in CSC 101, CSC 102, CSC 103, and CSC 141. Students who intend to minor in computer science should consult the College of Engineering Advising Center website for GPA and course grade requirements for admission to the minor. In addition, they should contact the Advising Center for further information *before* planning to enter the minor.

Before formally applying, students must make an appointment at the College of Engineering Advising Center. The computer science minor is not open to CSC, CPE or Software Engineering (SE) major students. Questions concerning the minor should be directed to the Advising Center.

Curriculum for Computer Science Minor

Core courses (20)

CSC 102, 103 Fund Computer Science II, III	4,4
CSC 141 Discrete Structures I.....	4
CSC 225 Intro to Computer Organization	4
CSC 357 Systems Programming.....	4

Approved elective courses

Choose from CSC/CPE upper-division courses open to CSC majors. Must be approved via the CSC minor form upon acceptance to the minor.

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BS COMPUTER SCIENCE

- 60 units upper division GWR
 2.0 GPA USCP

* = Required in Support; also satisfies GE

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

MAJOR COURSES

CSC 123 Introduction to Computing	4
CSC 101 Fundamentals of Computer Science I.....	4
CSC 102 Fundamentals of Computer Science II or CSC 108 Accelerated Intro Computer Science	4
CSC 103 Fundamentals of Computer Science III	4
CSC 141 Discrete Structures I	4
¹ CSC 225 Intro to Computer Organization (4)	4
CSC 300 Professional Responsibilities	4
CSC 307 Intro to Software Engineering (4) or ² CSC 308, 309 Software Engineering I, II (4)(4)	4/8
CSC 315 Computer Architecture	4
CSC 349 Design and Analysis of Algorithms	4
CSC 357 Systems Programming	4
CSC 430 Programming Languages I.....	4
CSC 445 Theory of Computing	4
CSC 453 Introduction to Operating Systems	4
CSC 491, 492 Senior Project Design Lab I, II	2,3
³ Technical electives.....	28/24
Select from lists in technical electives guidelines, below.	
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SUPPORT COURSES

BIO 213 and ENGR/BRAE 213 (B2)*	2,2
ENGL 149 Technical Writing for Engineers (A3)*	4
MATH 141, 142 Calculus I, II (B1)*.....	4,4
STAT 321 Prob/Stats for Engrs/Scientist or STAT 312 Stat Methods for Engrs (B6)*	4

³ Approved support electives.....	8
The courses selected may not be used to satisfy other major, support, or General Education requirements (no double counting of coursework) Select 8 units from the following: ENGL 302, 310, 392; PSY 252, 302; RELS 370; COMS 201, 301, 315	
Mathematics/statistics electives. Select from	8
CSC 142; MATH 143, 206, 241, 244, 248, 306, 335, 336, 437, 470; STAT 325.	
Science elective (Add'l Area B)* Select from BIO 111, 115, 161; BOT 121; CHEM 124; MCRO 221, 224; PHYS 141 (no double counting of units)	4
Physical science electives (B3/4)* (Add'l Area B)* CHEM 124, 125, 129 or PHYS 141, 132, 133	12
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GENERAL EDUCATION (GE)

72 units required, 32 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support	0

Area B Science and Mathematics (no add'l units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with a B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support.....	0
Additional Area B units * 8 units in Support.....	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
	<hr/> 40

FREE ELECTIVES

0

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¹ CPE 129&169 or CPE 133, and CPE 229&269 or CPE 233 may be substituted for CSC 225.

² CSC 309 counts as technical elective.

³ Consultation with advisor is recommended prior to selecting technical electives or approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Technical Electives Guidelines

BS Computer Science

Courses used to satisfy any other major, support, or general education requirement are not allowed to count toward Technical Elective requirement. Credit/No Credit grading is not allowed.

Contact the CSC Department for further information.

Category 1 16

Category 1a: Prerequisites and Individual Courses

Select 8 units from the following:

- CSC/CPE 305, 341/342, 365, 369, 448, 464, 471, 477, 480, 484, 488, 587

Category 1b: Specialization Areas

Select 4 units from each of two separate areas:

- Graphics: CSC/CPE 473, 474, 475, 476, 478, or CSC 572
- Databases: CSC/CPE 366, 466, 468, or CSC 560
- Networks: CSC/CPE 465 or 564
- Distributed Computing: CSC/CPE 469 or 569
- OS: CSC/CPE 454, 456, 458, 556, or CSC 550
- Architecture: CSC/CPE 316, 416, 459, 520, or CPE 482 "Robotics"
- Languages/Compilers: CSC/CPE 434 or CSC 530
- Software Engineering: CSC/CPE 402, 405, 406, 409, 437; CSC 508, or 509
- GUI/HCI: CSC/CPE 435, 483, 487, 581, or CSC 486
- Artificial Intelligence: CSC/CPE 416, 481, 485, 489, 580, 581, or CPE 482 "Autonomous Mobile Robots" or Multi-Robot Systems",
- Computational Sciences/Theory: CSC/CPE 449, CSC 343, 540, or 541

Category 2 8/12

Select from Categories 2a, 2b, and/or 2c.

If CSC 308 and 309 are taken for the Major Core, only 8 units are required for Category 2.

Category 2a: Additional CSC/CPE Electives

Select any unused course from Categories 1a and 1b (maximum 12 units).

Category 2b: Auxiliary CSC/CPE Electives

(maximum 4 units)

Select from:

- CSC 358, 400 (requires form/approval), 479 (maximum 2 units), 490

Category 2c: External Electives

(maximum 4 units)

Select from:

- AERO 450;
- ART 384;
- BUS 310, 320;
- CHEM 312, 316, 317, 318;
- ECON 339;
- EE 201/251, 314, 336, 424;
- ENVE 542;
- GRC 316, 331, 338 ;

- IME 301, 314, 356;
- MATH 206, 241, 242, 244, 248, 304, 341, 350, 412;
- ME 211, 212, 405;
- PHIL 412, 422;
- PSY 329, 333, 351, 366, 457;
- STAT 323, 324, 330

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BS SOFTWARE ENGINEERING

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

* = Required in Major/Support; also satisfies GE
 Note: No major or support courses may be taken as credit/no credit.

MAJOR COURSES

CSC 123 Introduction to Computing	4
CSC 101 Fundamentals of Computer Science I.....	4
CSC 102 Fundamentals of Computer Science II or CSC 108 Accelerated Intro Computer Science	4
CSC 103 Fundamentals of Computer Science III	4
CSC 141 Discrete Structures I	4
CSC 225 Intro to Computer Organization	4
CSC 300 Professional Responsibilities	4
CSC 305 Individual Software Design & Dev	4
CSC 308 Software Engineering I.....	4
CSC 309 Software Engineering II	4
CSC 349 Design and Analysis of Algorithms	4
CSC 357 Systems Programming.....	4
CSC 402 Software Requirements Engineering	4
CSC 405 Software Construction	4
CSC 406 Software Deployment.....	4
CSC 430 Programming Languages I	4
CSC 453 Intro to Operating Systems	4
CSC 484 User-Centered Interface Design & Dev.	4
CSC 491, 492 Senior Project Design Lab I, II.....	2,3
¹ Technical electives	20
Select from Category 1 and 2 in technical electives guidelines, below.	

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SUPPORT COURSES

BIO 213 and ENGR/BRAE 213 (B2)*.....	2,2
ENGL 149 Technical Writing for Engineers (A3)*	4
IME 314 Engineering Economics	3
MATH 141, 142 Calculus I, II (B1)*	4,4
MATH 143 Calculus III (Add'l Area B)*	4
MATH 241 Calculus IV.....	4
MATH 244 Linear Analysis I	4
Select one from: MATH 248, 304, 335, 336, 451 ...	4
PSY 201/202 General Psychology (D4)*	4
PSY 350 Teamwork or PSY 351 Group Dynamics	4

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Science electives (B3/4)* (Add'l 4 units Area B)* <i>Select either</i> CHEM 124, 125, 129 <i>or</i> PHYS 141, 132, 133 STAT 312 Statistical Methods for Engineers (B6)*	12 <u>4</u> 59
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GENERAL EDUCATION (GE)
72 units required, 36 of which are specified in Major/Support.
→See page 39 for complete GE course listing.
→Minimum of 8 units required at the 300 level.

Area A Communication (8 units)	
A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation and Writing * 4 units in Support	0
Area B Science and Mathematics (no add'l units req'd)	
B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with a B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support	0
Additional Area B units * 8 units in Support	0

Area C Arts and Humanities (16 units)	
C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (12 units)	
D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Dev (CSU Area E) * 4 units in Support...	0

	36
FREE ELECTIVES	0
	192

**Technical Electives Guidelines
BS Software Engineering**

Courses used to satisfy any other major, support, or general education requirement are not allowed to count toward Technical Elective requirement. Credit/No Credit grading is not allowed.

Contact the CSC Department for further information.

Category 1	
Category 1a: Prerequisites and Individual Courses	8
<i>Select 8 units from the following:</i>	
CSC/CPE 341/342, 365, 369, 448, 464, 471, 477, 480, 484, 488, 587	

Category 1b: Specialization Areas	8
<i>Select 4 units from each of two separate areas:</i>	
Graphics: CSC/CPE 473, 474, 475, 476, 478, or CSC 572	
Databases: CSC/CPE 366, 466, 468, or CSC 560	
Networks: CSC/CPE 465 or 564	
Software Engineering: CSC/CPE 409, 437; CSC 508, or 509	
Distributed Computing: CSC/CPE 469 or 569	
OS: CSC/CPE 454, 456, 458, or CSC 550	
Architecture: CSC/CPE 315, 316, 416, 459, 520, or CPE 482 "Robotics"	
Languages/Compilers: CSC/CPE 431, 434, or CSC 530	
GUI/HCI: CSC/CPE 435, 483, 487, 581, or CSC 486	
Artificial Intelligence: CSC/CPE 416, 481, 485, 489, 580, 581, or CPE 482 "Autonomous Mobile Robots" or Multi-Robot Systems",	
Computational Sciences/Theory: CSC/CPE 449, CSC 343, 445, 540, or 541	

Category 2	4
<i>Select 4 units from the following:</i>	
+ Additional CSC/CPE Electives	
Select any unused course from Categories 1a or 1b or from upper division courses approved as technical electives by CSC Department;	
+ Auxiliary CSC/CPE Electives	
<i>Select from:</i>	
CSC 358, 400 (requires form/approval), 479 (maximum 2 units), 490	
+ External Electives	
<i>Select from:</i>	
AERO 450;	
ART 384;	
BUS 310, 320;	
CHEM 312, 316, 317, 318;	
ECON 339;	
EE 201/251, 314, 336, 424;	
ENVE 542;	
GRC 316, 331, 338 ;	
IME 301, 314, 356;	
MATH 206, 242, 248, 304, 341, 350, 412;	
ME 211, 212, 405;	
PHIL 412, 422;	
PSY 329, 333, 366, 457;	
STAT 323, 324, 330	

MS COMPUTER SCIENCE

The MS program in Computer Science offers students the opportunity to prepare for careers in several areas of emphasis including software engineering, computer architecture, programming languages, theory of computing, operating systems, database systems, distributed computing, computer networks, artificial intelligence, computer graphics, and human-computer interaction. The program is designed for maximum flexibility to allow students to concentrate in one or more areas of study.

Admission to the program requires a baccalaureate degree from an accredited institution and good standing at the last college attended. Applicants with a bachelor’s degree in computer science, software engineering, or computer engineering are required to have a minimum 3.0 grade point average in the last 90 quarter hours (60 semester hours) of study, including a minimum 3.0 grade point average in major courses. A minimum grade point average of 3.25 is required for all other applicants. A satisfactory score on the General Graduate Record Exam (GRE) is required; applicants are expected to achieve the following minimum scores: 425 verbal, 650 quantitative, 4.0 analytical writing. A satisfactory score on the TOEFL is required for foreign applicants; expected minimum scores are: 80 for internet-based test with a minimum 20 on each portion; 213 for computer-based test; 550 for paper-based test, plus 4.5 on TWE. All applicants must provide three letters of recommendation. Women and underrepresented minorities are strongly encouraged to apply for admission.

Qualified students who do not have an undergraduate degree in computer science, computer engineering, or software engineering may be admitted as unclassified students. Unclassified students must complete the necessary undergraduate coursework to be admitted to candidacy. While fulfilling the undergraduate requirements, unclassified students retain official status as graduate students in the University.

Unclassified students may advance to candidacy by completing each of the following undergraduate courses with a "B" or better grade. These courses do not count toward the graduate degree:

- CSC/CPE 103 Fundamentals of Computer Science III (4)
- CSC/CPE 307 Introduction to Software Engineering *or*
CSC/CPE 308 Software Engineering I (4)
- CSC/CPE 315 Computer Architecture (4)
- CSC/CPE 349 Design and Analysis of Algorithms (4)
- CSC/CPE 357 Systems Programming (4)
- CSC/CPE 430 Programming Languages I (4)
- CSC/CPE 445 Theory of Computation (4)
- CSC/CPE 453 Introduction to Operating Systems (4)

The department may offer several graduate teaching assistantships. Preference is given to continuing graduate

students and experienced teachers. Other grant, fellowship, scholarship and loan information can be obtained from the Financial Aid office.

Degree Requirements

Students must file a Formal Study Plan with the Computer Science Department office no later than the end of the quarter in which they complete the twelfth unit of coursework to be counted toward the degree. The formal study plan identifies specific courses to be taken to fulfill requirements of the MS degree. The formal study plan may be amended with approval of the graduate coordinator.

The MS degree requires at least 45 units beyond the undergraduate degree. Courses must be chosen according to the following requirements:

Curriculum for MS Computer Science

	<i>Units</i>
Select five courses from the following:	20
CSC 508 Software Engineering I (4)	
CSC 509 Software Engineering II (4)	
CSC 520 Computer Architecture (4)	
CSC 530 Language and Translators (4)	
CSC 540 Theory of Computation II (4)	
CSC 541 Numerical Methods (4)	
CSC 550 Operating Systems (4)	
CSC 556 Computer Security (4)	
CSC 560 Database Systems (4)	
CSC 564 Computer Networks: Research Topics (4)	
CSC 568 Distributed Systems (4)	
CSC 569 Distributed Computing (4)	
CSC 570 Current Topics in Computer Science (2-4)	
CSC 572 Computer Graphics (4)	
CSC 580 Artificial Intelligence (4)	
CSC 581 Computer Support for Knowledge Management (4)	
Thesis/Project and Seminar	9
CSC 590 Thesis Seminar (1)	
CSC 596 Thesis I (2)	
CSC 597 Thesis II (3)	
CSC 599 Thesis III (3)	
Electives to be selected with Graduate Coordinator approval	16
	45

For further information or advisement students should communicate with the Graduate Coordinator of the Computer Science Department.

Electrical Engineering

Engineering East Bldg. (20), Room 200
805 756-2781
www.ee.calpoly.edu

College of Engineering Advising Center
Engineering South (40), Room 114
805 756-1461

Department Chair, Dennis Derickson

Samuel O. Agbo	John Y. Oliver
William L. Ahlgren	Wayne Pilkington
Dean Y. Arakaki	Vladimir Prodanov
David B. Braun	John A. Saghri
Michael M. Cirovic	Ali O. Shaban
Fred W. DePiero	Lynne A. Slivovsky
Dale S.L. Dolan	Tina Smilkstein
James G. Harris	Cheng Sun
Xiaomin Jin	Taufik
C. Arthur MacCarley	Xiao-Hua (Helen) Yu
Bryan J. Mealy	Xiaozheng (Jane) Zhang
Ahmad Nafisi	

ACADEMIC PROGRAMS

Computer Engineering – BS
Electrical Engineering – BS, MS

The Electrical Engineering Department offers a Bachelor of Science degree and a Master of Science degree in Electrical Engineering, and supports the Bachelor of Science degree in Computer Engineering; both undergraduate degrees are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

The mission of the Electrical Engineering Department is to educate students to achieve excellence in the discipline of electrical engineering and to teach them to apply their education to solve practical problems in a socially responsible way. Students are prepared for careers of service, leadership, and distinction in engineering and other related fields using a participatory, learn-by-doing, and “hands-on” laboratory, project, and design centered approach. Students are encouraged to participate in lifelong learning in the presence of rapid technological change.

Diversity in the student, faculty and staff is embraced and enhances the quality and creativity of the campus experience and environment.

The primary educational objectives of the Electrical Engineering program are to prepare graduates to:

1. Excel in the electrical engineering profession;
2. Embrace life-long learning as a necessary component to remain current in their profession; and
3. Pursue graduate degrees for enhanced skills and opportunities.

In addition to the general abilities expected of college of engineering graduates, electrical engineering students are expected to graduate with:

- a knowledge of probability and statistics, including applications appropriate to the electrical engineering field;
- a knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex devices and systems containing hardware and software components; and
- a knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

The Electrical Engineering program requires students to be “Multidisciplinary Certified” for graduation. This provides students an opportunity to practice skills associated with working on multidisciplinary teams. Such experience is important for practicing engineers, with the ever-increasing diversity of engineering science and applications. Please contact the Electrical Engineering Department office or visit the Electrical Engineering website for more information. Also see further discussion in the catalog under College of Engineering.

The main focus of the program is to prepare graduates for practice in professional engineering. Thus, Cal Poly’s “learn by doing” philosophy is emphasized by integrating design throughout the curriculum in the numerous design-centered laboratories. In the required senior design project, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

The intent of the department is to prepare students for pursuing engineering solutions to urgent problems in reshaping the environment to meet human needs while being responsibly aware of all implications. The curriculum provides a sound theoretical background along with current, practical engineering knowledge. The student begins the major in the first quarter with orientation and generally has one or more major courses each quarter until graduation. The many laboratory courses provide practical experience and lead logically into design.

During their junior and senior years, students choose technical electives. Some courses deal with the development, design and application of circuits, devices and systems for communication, computers, controls, information processing and display, and system instrumentation. Senior courses in this area provide specialized preparation in a selected area such as active and passive network synthesis, advanced communications systems, computer system design, microelectronic circuit engineering, microprocessor systems applications, microwave engineering, photonics, and solid state devices.

Other courses deal with industrial process control systems, power electronics, and with generation, distribution, control and utilization of electric power. Senior elective courses in

this area provide specialized preparation in a selected area such as advanced control systems, energy conversion, power system analysis, protection and stability, and solid state motor control.

Industry recognizes that students who have completed specialized technical courses are early contributors in the workforce. Students wishing to pursue graduate work may select appropriate senior courses in keeping with this goal.

Laboratories are well-equipped to provide students with both hands-on instrumentation and design experiences. Involvement in faculty research is possible for outstanding students. Research areas include computer-aided education, advanced electronics for automotive and transportation applications, signal and image processing, electric vehicles, computer architecture and software systems, photonics, polymer electronics, power systems, power electronics, and electric power quality.

The Electric Power Institute, sponsored by the university and underwritten by major utility companies and electrical equipment manufacturers, offers advanced seminars and lectures in the electrical power field and facilitates student and faculty interaction with industry.

Students are encouraged to participate in professional organizations and clubs such as: Institute of Electrical and Electronics Engineers (IEEE), Audio Engineering Society (AES), IEEE Computer Society (IEEE), Power and Energy Society (PES), Eta Kappa Nu (HKN), Society of Photo-Optical Instrumentation Engineers (SPIE), Student Electrical Engineering Council (SEEC), and Amateur Radio Club. The Department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see the Study Abroad programs.

BS Computer Engineering

This program is jointly offered by the Computer Science Department and the Electrical Engineering Department. For information regarding this program, please refer to Computer Engineering (see page 182).

Blended BS + MS Electrical Engineering Honors Program

The blended program is an honors program that provides a means for academically excellent students to complete the MS Electrical Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Students must be prepared for engineering practice via the curriculum which culminates in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints, as listed in the ABET Engineering Criteria. Therefore, all "Blended B.S. + M.S. Program" students, even those students completing the Master of Science in Engineering, must have a master's thesis with this

major design experience requirement included in order to complete the undergraduate degree.

Eligibility

Students majoring in BS Electrical Engineering or Computer Engineering may be eligible to pursue the blended program after completing all required EE/CPE 300-level courses. Participation in the program is based on prior academic performance and other measures of professional promise. Students are selected by the Graduate Committee. See page 60 for the minimum university eligibility criteria; contact the EE Department for specific program eligibility criteria.

Program of Study

A feature of the program is to allow the use of a common project for fulfillment of both the Master's Thesis (EE 599) and Senior Project (EE 461/462 or EE 463/464). A faculty advisor serves as the thesis committee chairperson and the senior project advisor. *The unit requirements for either degree are unchanged.* When all requirements are met for both the undergraduate and graduate programs, both degrees are awarded at the same time. If a student fails to complete the MS program requirements, then the BS degree may be granted when all requirements for that degree are met.

BS ELECTRICAL ENGINEERING

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

EE 111, 151 Intro to Electrical Engineering & Lab	1,1
EE 112 Electric Circuit Analysis I.....	2
EE 129, 169 Digital Design and Lab (3)(1) or CPE/EE 133 Digital Design (4)	4
EE 211, 241 Electric Circuit Analysis & Lab II	3,1
EE 212, 242 Electric Circuit Analysis & Lab III	3,1
EE 228 Continuous-Time Signals and Systems.....	4
EE 229, 269 Comp Des/Assembly Lang Prog, Lab (3)(1) or CPE/EE 233 Comp Des/Assembly Lang Prog (4)	4
EE 255, 295 Energy Conversion Electromag, Lab ..	3,1
EE 302, 342 Classical Control Systems and Lab	3,1
EE 306, 346 Semiconductor Device Electronics and Lab.....	3,1
EE 307, 347 Digital Electronics and Integrated Circuits and Lab	3,1
EE 308, 348 Analog Electronics and Integrated Circuits and Lab	3,1
EE 314 Introduction to Communication Systems....	3
EE 328 Discrete Time Signals and Systems and EE 368 Signals and Systems Laboratory	3,1
EE 329 Programmable Logic and Microprocessor- Based Systems Design or EE 336 Microprocessor System Design.....	4
EE 335 Electromagnetic Fields and Transmission	4
EE 375 Electromagnetic Fields/Transmission Lab ..	1
EE 402 Electromagnetic Waves.....	4
EE 409, 449 Electronic Design and Lab.....	3,1

EE 460 Senior Project Preparation.....	2
EE 461 Senior Project I or EE 463 Senior Project Design Laboratory I.....	3
EE 462 Senior Project II or EE 464 Senior Project Design Laboratory II	2
¹ Technical electives.....	12
Select from the following, a minimum of 2 EE senior design laboratories and 2 EE senior design lectures:	
<i>EE lecture/laboratory electives</i>	
EE 410, 411, 413, 417, 420, 424, 433, 495 (taken Fall 2009 or later; max 4 units);	
EE/CPE 427, 428, 439, 521, 522, 523;	
EE 431/CPE 441	
<i>EE lecture electives</i>	
EE 400 [†] , 403, 405, 406, 407, 412, 415, 416, 418, 419, 421, 425, 440, 470, 502, 511, 513, 514, 515, 517, 518, 519, 520, 524, 526, 527, 528, 529, 530, 533, 570;	
EE/CPE 432, 438	
<i>EE laboratory electives</i>	
EE 400 ^{††} , 422, 443, 444, 445, 452, 455, 456, 458, 459, 471, 480, 541, 544;	
EE/CPE 472	
<i>Non-EE electives</i>	
BMED 410, 420, 425, 430, 440, 445;	
BUS 311;	
CHEM 305, 313;	
CPE 482;	
CSC 341, 342, 343;	
CSC/CPE 315, 416, 453, 454, 458, 464, 471;	
ECON 330, 337, 403, 413;	
ENVE 331;	
IME 301, 303, 319, 322, 326, 401, 405, 407, 427, 435, 457, 458;	
MATE 340, 430, 435;	
MATH 304, 306, 406, 408, 409, 412, 413, 414, 418, 451, 452, 453;	
ME 302, 318, 321, 343, 405, 406, 415, 423, 450, 488;	
MU 311, 312, 411;	
PHYS 302, 303, 310, 313, 317, 322, 340, 341, 342, 403, 405, 406, 408, 409, 412, 417, 423, 424, 452;	
STAT 426, 427	

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SUPPORT COURSES

BIO 213 and ENGR/BRAE 213 (B2)*	2,2
CHEM 124 Gen Chem for Engineering (B3/B4)*	4
CSC 101 Fundamentals of Computer Science I.....	4
ENGL 149 Technical Writing for Engineers (A3)*	4
IME 156 Basic Electronics Manufacturing or IME 157 Electronics Manufacturing	2
MATH 141, 142 Calculus I, II (B1)*	4,4
MATH 143 Calculus III (Add'l Area B)*.....	4
MATH 241 Calculus IV	4
MATH 244 Linear Analysis I	4
PHYS 141 General Physics IA (Add'l Area B)*	4
PHYS 132, 133 General Physics II, III.....	4,4

PHYS 211 Modern Physics I	4
STAT 350 Probability and Random Processes for Engineers (B6)*	4
^{1,2,3} Approved engineering support electives	9
Select at least 3 courses from the following:	
BIO 111; BMED 212, 310, 450, 460;	
CHEM 125, 212, 216, 305, 313;	
CSC 141, 142, 341, 342, 343;	
CSC/CPE 102, 103, 315;	
IME 142, 143, 301, 314, 405, 407;	
MATE 210, 215, 232, 340, 430, 435;	
MATH 206, 304, 306, 406, 408, 409, 412, 413, 414, 418, 451, 452, 453;	
ME 211, 212, 302, 341, 343;	
PHYS 212, 310, 313, 315, 317, 322, 323, 340, 341, 342, 403, 405, 406, 408, 409, 412, 417, 423, 424, 452;	
STAT 426, 427	

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GENERAL EDUCATION (GE)

72 units required, 32 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support	0

Area B Science and Mathematics (no add'l units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support.....	0
Additional Area B units* 8 units in Support.....	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4

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FREE ELECTIVES

0

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¹ Consultation with advisor is recommended prior to selecting technical electives or approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² No course may be used to simultaneously satisfy both engineering support and technical elective requirements.

³ The number of units given for transfer credit will not exceed the number of units of the Cal Poly course.

[†] Four units max count toward technical electives

^{††} One unit max, with approval of department chair, as lab elective.

MS ELECTRICAL ENGINEERING

General Characteristics

The Master of Science program in Electrical Engineering has the following objectives:

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and managerial engineering;
- Updating and upgrading opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- A base which allows graduates to maintain currency in their fields.

Prerequisites

For admission as a classified graduate student, an applicant must hold a bachelor’s degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination. Foreign applicants must have satisfactory scores on the TOEFL and TWE exams. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Electrical Engineering Department.

Program of Study

Graduate students in this program must file a formal study plan with their advisor, department, college and university graduate studies office by no later than the end of the second quarter in the program. The formal program of study must include a minimum of 45 units (at least 28 of which must be at the 500 level and the remainder at the 400 level).

The broad curriculum requirements for the MS in Electrical Engineering are:

- a) core of 16 units;
- b) a minimum of 12 units of additional electrical engineering courses;
- c) at least 17 units of approved electives;
- d) at least 28 units of the 45 unit program at the 500 level.

Two program options are available for MS in Electrical Engineering students: a thesis program which requires coursework, a thesis and oral defense of thesis; *or* a nonthesis option which involves additional coursework and a comprehensive examination. The thesis option is strongly encouraged for all students.

Curriculum for MS Electrical Engineering

Units

Core Courses	16
EE 525 Stochastic Processes for Engineers (4)	
EE 563 Graduate Seminar (1) (1) (1)	
EE 599 Design Project (Thesis) (1-9) units of major field graduate level courses <i>and</i> a comprehensive written examination	
Additional Electrical Engineering Graduate Courses	12
<i>To be selected from the following list: Not all courses listed are offered each academic year. Consult the EE Department for current information on course offerings</i>	
EE 502 Microwave Engineering (4)	
EE 511 Electric Machines Theory (4)	
EE 513 Control Systems Theory (4)	
EE 514 Advanced Topics in Automatic Control (4)	
EE 515 Discrete Time Filters (4)	
EE 517 Information Theory (4)	
EE 518 Power System Protection (4)	
EE 519 Advanced Analysis of Power Systems (4)	
EE 520 Solar-Photovoltaic Systems Design (4)	
EE 521 Computer Systems (4)	
EE 522 Microproc-Based Digital Sys Design (4)	
EE 523 Digital Systems Design (4)	
EE 524 Solid State Electronics (3)	
EE 526 Digital Communications (4)	
EE 527 Advanced Topics in Power Electronics (4)	
EE 528 Digital Image Processing (4)	
EE 529 Microwave Device Electronics (3)	
EE 530 Fourier Optics (4)	
EE 533 Antennas (4)	
EE 541 Advanced Microwave Laboratory (2)	
EE 544 Solid-State Electronics Laboratory (1)	
Approved Technical Electives (400-500 level)	17
May be selected from the course list above and other advisor approved technical electives.	

45

Industrial & Manufacturing Engineering

Engineering IV Bldg. (192), Room 223
805 756-2341
www.ime.calpoly.edu

College of Engineering Advising Center
Engineering South (40), Room 114
805 756-1461

Department Chair, Jose Macedo

Sema E. Alptekin	A. Reza Pouraghabagher
Kurt Colvin	Paul E. Rainey
Tali Freed	Lizabeth Schlemmer
Roya Javadpour	Daniel J. Waldorf
Unny Menon	Donald E. White
Jianbiao Pan	Tao H. Yang

ACADEMIC PROGRAMS

Industrial Engineering – BS, MS
Manufacturing Engineering – BS

The mission of the Industrial Engineering and Manufacturing Engineering programs at Cal Poly is “to educate students for successful and distinguished careers in industrial engineering, manufacturing engineering, and related fields using a learn-by-doing approach that stresses integrated processes, appropriate technologies, and enterprise competitive advantage.”

The Department focuses on programs that integrate engineering with a real concern for people. Our students study topics that lead to satisfying and productive careers, and also provide strong preparation for graduate work in many fields. Programs reflect the traditional strengths of Cal Poly through close interaction between students and faculty in classroom, laboratory, and other activities. The programs use a project based learning approach where students work on multiple real life projects. Students often present results to industry representatives.

Department and university laboratories and computers are integrated into coursework to investigate, test, and apply theoretical principles learned in the classroom. The descriptions below provide details of the various programs.

BS Industrial Engineering

Industrial Engineering is the profession concerned with solving integrated engineering and management problems. The definition by the Institute of Industrial Engineers is as follows: “Industrial Engineering is concerned with the design, installation, and improvement of integrated systems of people, material, information, equipment, and energy by

drawing upon specialized knowledge and skills in the mathematical, physical, and social sciences, together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems.” Key objectives of industrial engineering are to improve the quality and productivity of creating and delivering goods and services and to act as the interface between technology and humans. Engineering methods and practical knowledge are used in formulating decision models for the optimum application of engineering and management principles.

The Bachelor of Science program in Industrial Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (see page 158). The following objectives have been set for students completing the Industrial Engineering program:

1. *Immediate Practice* – Graduates will make immediate contributions to the practice of industrial engineering or a related field by their demonstrated knowledge of contemporary issues and direct, hands-on experience with the modern tools and techniques of the discipline.
2. *Solid Engineering Foundations* – Graduates will have successful careers based on their ability to solve problems and make improvements through engineering design, experimentation, and application of scientific principles as well as their ability to analyze and critically evaluate solutions.
3. *Broad Education* – Graduates will have careers of distinction and leadership based on their ability to communicate effectively, to contribute meaningfully to a team effort, and to understand the economic, societal, and ethical impacts of their decisions.
4. *Life-Long Learning* – Graduates will demonstrate the ability and desire to follow a life-long pursuit of personal fulfillment through education.

To meet these objectives, students in the Industrial Engineering program must attain the general abilities expected of College of Engineering graduates listed on page 158, and must attain the ability to design, develop, implement and improve integrated systems that include people, materials, information, equipment and energy using appropriate analytical, computational, and experimental practices.

The Industrial Engineering program requires students to be “Multidisciplinary Certified” for graduation. This provides students an opportunity to practice skills associated with working on multidisciplinary teams. Such experience is important for practicing engineers, with the ever-increasing diversity of engineering science and applications. Please contact the IME Department office or visit the IME website for more information. Also see further discussion in the catalog under College of Engineering.

Our main focus is to prepare graduates for practice in professional engineering. Thus, our “learn by doing” philosophy is emphasized in the curriculum by the large

number of design-centered laboratories, integrating design throughout the curriculum, and the senior design project capstone design experience. In the required senior design project, which is completed in a two-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems. Graduates can choose from a challenging range of career activities: operations research and analysis, production planning and scheduling, plant design, management, human factors engineering design, data processing and analysis, measurement, quality control and reliability assurance, technical economic planning, resource conservation, productivity measurement, increasing productivity using computer integrated manufacturing techniques, robotics, and, in general, systems analysis and design. The physical, engineering, and social sciences form the broad base for these endeavors.

The program is oriented to provide graduates with the capability of producing results with a minimum of additional training. Computer and hi-tech firms, health care and biomedical industries, aerospace/defense, entertainment, retail chains, farms, airlines, automotive, as well as government, service firms, traditional manufacturing industries, and consulting firms all employ graduates of this discipline. Graduates also are well prepared for successful graduate study.

BS Manufacturing Engineering

Manufacturing Engineering is the profession that applies engineering analysis and methods to the production of all manufactured goods and services. The manufacturing engineer plans, develops, and optimizes the processes of production including methods of manufacture, and designs of tools and equipment for manufacturing. The emphasis is on both development and sustained operation of manufacturing systems, including computer-aided methods, automation, design for manufacture, production tooling, and material handling, as well as the processes and ancillary support systems of modern manufacturing.

The Bachelor of Science program in Manufacturing Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (see page 158). The following objectives have been set for students completing the Manufacturing Engineering Program at Cal Poly:

1. *Immediate Practice.* Graduates will make immediate contributions to the practice of manufacturing engineering or a related field by their demonstrated knowledge of contemporary issues and direct, hands-on experience with the modern tools and techniques of the discipline.
2. *Solid Engineering Foundations* – Graduates will have successful careers based on their demonstrated ability to solve problems and make improvements through engineering design, experimentation, and application of

3. scientific principles as well as their ability to analyze and critically evaluate their decisions.

4. *Broad Education* – Graduates will have careers of distinction and leadership based on their ability to communicate effectively, to contribute meaningfully to a team effort, and to understand the economic and ethical impacts of their decisions.

5. *Life-Long Learning* – Graduates will demonstrate the ability and desire to follow a life-long pursuit of personal fulfillment through education.

To meet these objectives, several specific outcomes have been identified for students in the Manufacturing Engineering Program in addition to the general abilities expected of College of Engineering graduates listed on page 158:

1. *Materials and Manufacturing Processes* – understanding of the behavior and properties of materials as they are altered and influenced by processing in manufacturing.
2. *Product, Assembly, and Product Engineering* – understanding of the design of products and the equipment, tools, and environment necessary for their manufacture; understanding of the analysis, synthesis and control of manufacturing operations using statistical and calculus based methods, simulation, and information technology.
3. *Manufacturing Systems Design* – understanding of the analysis, synthesis and control of manufacturing operations using statistical and calculus based methods, simulation, and information technology.
4. *Manufacturing Competitiveness* – understanding of the creation of competitive advantage through manufacturing planning, strategy, and control.
5. *Lab Experience* – ability to measure manufacturing process variables in a manufacturing laboratory and make technical inferences about the process.

The Manufacturing Engineering program requires students to be “Multidisciplinary Certified” for graduation. This provides students an opportunity to practice skills associated with working on multidisciplinary teams. Such experience is important for practicing engineers, with the ever-increasing diversity of engineering science and applications. Please contact the IME Department office or visit the IME website for more information. Also see further discussion in the catalog under College of Engineering.

In the required senior design project, which is completed in a two-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

Graduates typically work more directly with the manufacturing processes than do industrial engineers.

Emphasis is placed upon application of the basic sciences and engineering fundamentals. Knowledge of basic processes, tool design, automation, and computer-aided

manufacturing are applied directly to the problems of development and sustained operation of manufacturing systems.

Graduates are prepared for job-entry at the professional level in the areas of CAD/CAM, process engineering, automation, quality assurance, and production engineering. They also are well prepared for successful graduate study.

Blended BS+MS Engineering Program

Students must be prepared for engineering practice via the curriculum which culminates in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints, as listed in the ABET Engineering Criteria. Therefore, all “Blended BS + MS Program” students must have a master’s thesis with this major design experience requirement included in order to complete the undergraduate degree.

Students may be eligible to pursue the blended program toward the MS in Industrial Engineering or the MS Engineering with a specialization in Integrated Technology Management. Please refer to the MS Engineering section of this catalog for more information and page 60 for eligibility criteria for blended programs.

GRADUATE PROGRAMS

www.ime.calpoly.edu/programs/graduate/

The Industrial and Manufacturing Engineering Department participates in offering the following graduate programs:

- MS Industrial Engineering
- MS Engineering with specialization in Integrated Technology Management
- Joint MBA/MS Engineering with specialization in Engineering Management (details in College Section)

BS INDUSTRIAL ENGINEERING

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

IME 101 Intro Industrial & Manufacturing Engr.....	1
IME 140 Graphics Communication and Modeling	2
IME 141 Manufacturing Processes: Net Shape.....	1
IME 144 Intro Design and Manufacturing.....	4
IME 156 Basic Electronics Manufacturing or IME 157 Electronics Manufacturing	2
IME 223 Process Improvement Fundamentals.....	4
IME 239 Industrial Costs and Controls.....	3
IME 301 Operations Research I.....	4
IME 303 Project Organization and Management....	4
IME 312 Data Management and System Design	4
IME 314 Engineering Economics	3
IME 319 Human Factors Engineering	3
IME 326 Engineering Test Design and Analysis	4
IME 405 Operations Research II.....	4

IME 410 Production Planning/Control Systems.....	4
IME 417 Supply Chain and Logistics Management	4
IME 420 Simulation.....	4
IME 421 Manufacturing Organizations	3
IME 429 Ergonomics Lab.....	1
IME 430 Quality Engineering.....	4
IME 443 Facilities Planning and Design	4
IME 481, 482 Sr Project Design Laboratory I, II	2,3
^{1,2,3,4} Technical electives.....	14

Select 14 units from the following. At least 6 units must be upper level (300-level or above) engineering courses (AERO, BMED, CE, EE, IME, MATE, ME):

- CE 204, 207;
- BUS 310, 311, 346, 382, 402, 404, 488;
- BUS/AG/HUM/EDES/ENGR/SCM/UNIV 350;
- EE 361;
- IME 142, 241, 313, 335, 336, 341, 351, 352, 356, 401, 407, 408, 409, 411, 413, 416, 417, 418, 427, 428, 431, 435, 437, 441, 442, 455, 457, 470, 471, 541, 542, 543, 544, 545, 556, 577, 580;
- IME/AERO 510, 511;
- IME/MATE 458/CPE 488;
- IT 341, 406;
- ME 302, 305, 328, 341;
- MATE 210, 215;
- MATH 344, 350;
- PSY 350, 494

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SUPPORT COURSES

BIO 213 and ENGR/BRAE 213 (B2)*.....	2,2
CE 204 Mech Materials I/ME 341 Fluid Mech I.....	3
CHEM 124 Gen Chem for Engineering (B3/B4)*	4
CSC 232 Computer Programming/Scientists/Engrs	3
EE 201, 251 Electric Circuits Theory and Lab	3,1
EE 321 Electronics.....	3
ENGL 149 Technical Writing for Engineers (A3)*	4
MATH 141, 142 Calculus I, II (B1)*	4,4
MATH 143 Calculus III (Add'l Area B)*	4
MATH 241 Calculus IV.....	4
MATH 244 Linear Analysis I.....	4
ME 211 Engineering Statics	3
ME 212 Engineering Dynamics.....	3
ME 302 Thermodynamics I or MATE 210 Materials Engr and MATE 215 Materials Lab I	3

- ¹ IME 400 and IME 500 require a course substitution form and no more than 4 total units are allowed.
- ² The courses selected to satisfy this requirement may not be used to satisfy other major, support, or general education requirements (no double counting of coursework).
- ³ A maximum of 4 units of technical electives may be taken outside of the College of Engineering.
- ⁴ Consultation with advisor is recommended prior to selecting technical electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

PHYS 141 General Physics IA (Add'l Area B)*	4
PHYS 132, 133 General Physics II, III	4,4
PSY 201/202 General Psychology (D4)*	4
STAT 321 Prob/Stats for Engrs/Scientists (B6)*	4
	74

GENERAL EDUCATION (GE)

72 units required, 36 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support	0

Area B Science and Mathematics (no addl units reqd)

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support	0
Additional Area B units * 8 units in Support	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (12 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E) * 4 units in Support	0
	36

FREE ELECTIVES	0
	196

BS MANUFACTURING ENGINEERING

- 60 units upper division GWR
- 2.0 GPA USCP

* = Required in Support; also satisfies GE

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

MAJOR COURSES

IME 101 Intro Industrial and Manufacturing Engr	1
IME 140 Graphics Communication and Modeling	2
IME 141 Manufacturing Processes: Net Shape	1
IME 142 Manufacturing Processes: Matls Joining	2
IME 144 Intro Design and Manufacturing	4
IME 157 Electronics Manufacturing	4
IME 223 Process Improvement Fundamentals	4
IME 241 Process Design I.....	4
IME 314 Engineering Economics.....	3
IME 326 Engineering Test Design and Analysis	4
IME 335 Computer-Aided Manufacturing I.....	4
IME 341 Tool Engineering I	4
IME 342 Manufacturing Systems Integration	4

IME 352 Manufacturing Process Design II.....	4
IME 356 Manufacturing Automation.....	4
IME 417 Supply Chain and Logistics Management	4
IME 418 Product-Process Design	4
IME 430 Quality Engineering	4
IME 481, 482 Senior Project Design Lab I, II	2,3
^{1,2,3,4} Technical electives	12

Select 12 units from the following. All but 4 units must be upper level (300-level or above) engineering courses (AERO, BMED, CE, EE, IME, MATE, ME):

- AERO 300, 301, 302, 303, 304, 306, 320, 331, 401;
- BMED 212, 310, 410, 420, 425, 440;
- BUS 310, 311, 346, 488;
- BUS/AG/HUM/EDES/ENGR/SCM/UNIV 350;
- CE 207;
- EE 361;
- IME 301, 303, 312, 313, 319, 336, 351, 401, 405, 407, 408, 409, 410, 411, 413, 416, 420, 421, 427, 428, 429, 431, 435, 437, 441, 442, 443, 455, 457, 470, 471, 542, 545, 556, 577, 580;
- IME/MATE/HNRS 322;
- IME/MATE 458/CPE 488;
- IME/AERO 510, 511;
- IT 326, 329, 330, 336, 341, 371, 406, 407;
- MATE 310, 320, 330, 340, 350, 355, 360, 430, 435, 440, 445, 450, 460;
- MATH 344, 350;
- ME 305, 318, 326, 328, 329, 341, 343, 405, 406, 410, 412, 415, 416, 422, 423, 430, 431, 441, 446

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SUPPORT COURSES

BIO 213 and ENGR/BRAE 213 (B2)*	2,2
CE 204 Mechanics of Materials I	3
CHEM 124 Gen Chem for Engineering (B3/B4)*	4
CHEM 125 Gen Chem for Engineering	4
CSC 232 Computer Programming for Scientists and Engineers	3
EE 201 Electric Circuits Theory	3
EE 251 Electric Circuits Lab.....	1
EE 321 Electronics	3
ENGL 149 Technical Writing for Engineers (A3)*	4
MATE 210 Materials Engineering	3
MATE 215 Materials Laboratory I	1
MATH 141, 142 Calculus I, II (B1)*	4,4
MATH 143 Calculus III (Add'l Area B)*	4

¹ IME 400 and IME 500 require a course substitution form and no more than 4 total units are allowed.

² The courses selected to satisfy this requirement may not be used to satisfy other major, support, or general education requirements (no double counting of coursework).

³ A maximum of 4 units of technical electives may be taken outside of the College of Engineering.

⁴ Consultation with advisor is recommended prior to selecting technical electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

MATH 241 Calculus IV	4
MATH 244 Linear Analysis I.....	4
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics.....	3
ME 302 Thermodynamics I.....	3
PHYS 141 General Physics IA (Add'l Area B)*.....	4
PHYS 132, 133 General Physics II, III	4,4
STAT 321 Prob/Stats for Engrs/Scientists (B6)*	4
	<hr/>
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GENERAL EDUCATION (GE)

72 units required, 32 of which are specified in Support.
 →See page 39 for complete GE course listing.
 →Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support	0

Area B Science and Mathematics (no additional units required)

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support	0
Additional area units * 8 units in Support.....	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
	<hr/>
	40

FREE ELECTIVES	0
	<hr/>
	196

MS INDUSTRIAL ENGINEERING

General Characteristics

The Master of Science program in Industrial Engineering has the following objectives:

- To help California industries in meeting their needs with respect to processes of design, optimization, and re-engineering and in competing globally, by educating and training engineers with advanced practical knowledge in the field of Industrial Engineering.
- To attract undergraduate engineers of all majors and provide education in the planning, engineering,

optimization, and management of processes using the appropriate tools of Industrial Engineering.

- To further the mission and goals of the College of Engineering at Cal Poly with respect to graduate engineering education by maintaining a balance between undergraduate and graduate educational opportunities in engineering that optimally supports the health of California industry.

Each student is strongly encouraged to work with a particular faculty member in selecting a thesis topic which is of personal interest to the student and the faculty member, and to choose a substantial number of elective courses that supports the issues addressed in the thesis or project.

Prerequisites

Students with earned undergraduate degrees in any engineering major are eligible for admission. A minimum grade point average of 3.0 in the last 90-quarter units (60 semester units) is required for admission.

All candidates seeking admission to the MSIE program are required to secure a minimum score in the GRE - General Test, as prescribed by the IME Department.

Program of Study

Graduate students must file a formal study plan with their advisor, department, college and the university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed. The formal program of study must include a minimum of 45 units, of which a) at least 23 units must be at the 500 level; b) at least 24 units must be in the degree major with at least 18 units at the 500 level.

The broad curriculum requirements for the program are:

- a core of 16 units
- a comprehensive written examination (non-thesis option) or an oral defense examination (theses option)
- a minimum of 20 units of advisor approved electives

Curriculum for MS Industrial Engineering

	<i>Units</i>
Core Courses	25
IME 507 Graduate Seminar (2)(2)	
Select 3 courses from the following:	
IME 503 Applied Statistical Methods in Engineering (4)	
IME 541 Advanced Operations Research (4)	
IME 545 Advanced Topics in Simulation (4)	
IME 556 Technological Project Management (4)	
IME 580 Manufacturing Systems (4)	
IME 599 Design Project (Thesis) (9) <i>or</i> additional 9 units of advisor approved electives (non-thesis option) and Comprehensive Examination	

Advisor approved electives 20

Potential electives include:

- IME 409 Economic Decision Systems (3)
- IME 411 Production Systems Analysis (3)
- IME 417 Supply Chain and Logistics Management (4)
- IME 418 Product-Process Design (4)
- IME 427 Process Optimization through Designed Experiments (4)
- IME 430 Quality Engineering (4)
- IME 431 Supplier Quality Engineering (4)
- IME 458 Microelectronics and Electronics Packaging (4)
- IME 500 Individual Study (1-4)
(up to a maximum of 6 units)
- IME 503 Applied Stat. Methods in Engineering (4)
- IME 510 Systems Engineering I (4)
- IME 511 Systems Engineering II (4)
- IME 541 Advanced Operations Research (4)
- IME 542 Reliability Engineering II (4)
- IME 543 Advanced Human Factors (4)
- IME 544 Advanced Topics in Engineering Economy (4)
- IME 545 Advanced Topics in Simulation (4)
- IME 556 Technological Project Management (4)
- IME 560 Quality Engineering (4)
- IME 570 Selected Advanced Topics (1-4)
- IME 577 Engineering Entrepreneurship (4)
- IME 580 Manufacturing Systems (4)

Materials Engineering

Brown Engineering Bldg. (41), Rm 229
805 756-2568 FAX: 805 756-2299
www.mate.calpoly.edu
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College of Engineering Advising Center
Engineering South (40), Room 114
805 756-1461

Department Chair, Trevor S. Harding

Katherine C. Chen	Richard Savage
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ACADEMIC PROGRAM

Materials Engineering – BS

Materials engineering is a field in which engineers use their knowledge of the relationship between a material's structure and its properties to alter the material to get the performance needed. Materials engineers contribute their expertise in virtually all areas of technology: from the nano-sized materials found in biomedical and microelectronic applications to the large-scale composites found in aerospace applications.

Because engineered products are often limited by materials issues (such as performance and manufacturability), materials engineers play a vital role on engineering design teams, working closely with other engineers. As part of these teams, they apply their knowledge of science, engineering, and state-of-the-art analytical instruments.

The majority of our graduates find employment in the biomedical, electronic, aerospace and petroleum industries. Some work as consultants for large or small organizations. Others become executives. A significant number of materials engineers are involved in research and development. Some of our graduates are entrepreneurs who have started their own consulting or manufacturing companies. Others are attorneys or physicians. Because of our broad-based curriculum, our graduates are able to excel in professions of their choosing.

The curriculum in materials engineering emphasizes practical applications as well as principles. The laboratories are constantly evolving, and our students benefit from frequent exposure to a wide variety of materials testing and analysis equipment. The program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (see page 158). Our students have a reputation for being

immediately productive in industry, and they are also actively sought by graduate programs throughout the country.

Program Mission and Goals

The mission of the materials engineering program is to create and sustain an integrated, effectual engineering learning environment that develops students into educated and effective members of society.

Our primary goal is to provide students with a theoretically rigorous and "hands on" practice-oriented education that will enable graduates to be immediately productive in their careers. To attain this goal, the educational objectives of the program are to enable graduates to

1. Apply engineering principles and design to identify, analyze and confront global challenges.
2. Communicate and perform as effective professionals in both individual and team-based environments.
3. Develop intellectually through continuous learning.
4. Live in a socially and environmentally responsible manner.

The Materials Engineering program requires students to be "Multidisciplinary Certified" for graduation. The interdisciplinary nature of the materials field and our projects-based courses allows students to practice skills associated with working on multidisciplinary teams. Such experience is important for practicing engineers, with the ever-increasing diversity of engineering science and applications. Please contact the MATE Department Office or visit the MATE web site for more information. Also see further discussion in the catalog under College of Engineering.

Graduate Study

Graduates of the materials engineering program are qualified for admission to Cal Poly's Master's Degree Programs in Engineering with a Specialization in Materials. The opportunity also exists for advanced students to begin graduate study in these areas prior to completion of the BS degree, via a "blended 4+1" program. This opportunity provides a number of advantages to qualified students, and makes it possible for completion of both the BS and MS degrees in as little as 5 years. Materials engineering students participating in a blended 4+1 program are permitted to fulfill the materials senior project requirement with the master's degree thesis. Because of the design emphasis of the senior project, a master's thesis used to satisfy the senior project requirement must include a major engineering design experience. The thesis supervisor assists the student in ensuring that this requirement is met. Further details are provided in the graduate study sections for each of these programs.

BS MATERIALS ENGINEERING

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

MATE 110 Intro to Materials Engrg Design I.....	1
MATE 120 Intro to Materials Engrg Design II.....	1
MATE 130 Intro to Materials Engrg Design III.....	1
MATE 210 Materials Engineering <i>and</i> MATE 215 Materials Laboratory I.....	3,1
MATE 222 Materials Selection for the Life Cycle ..	4
MATE 225 Materials Laboratory II.....	1
MATE 232 Materials, Ethics, and Society.....	4
MATE 235 Materials Laboratory III.....	1
MATE 310 Noncrystalline Materials Systems.....	4
MATE 330 Hybrid Materials Systems.....	4
MATE 340 Electronic Materials Systems.....	4
MATE 350 Structural Materials Systems.....	4
MATE 360 Metallurgical Materials Systems.....	4
MATE 370 Process Design.....	4
MATE 481 Corporate Culture.....	1
MATE 482, 483, 484 Senior Project I, II, III.....	1,2,2
^{1,2} Technical electives.....	12
Select at least 3 courses from the following:	
MATE 401, 406, 425, 430, 435, 440, 445, 450, 460, 470, 471, 501, 504, 510, 520, 522, 525, 540, 545, 550, 560, 565, 570, 571, 580, 590, MATE/CHEM 446, MATE/IME 458/CPE 488, MATE/BMED 530, MATE/ME 555, PHYS 412, 413, CHEM 444.	
^{1,2} Approved electives/Technical Breadth electives	13
Select 13 units from the following:	
AERO/HNRS 310;	
BMED 310, 550; BMED/MATE 530;	
BRAE 239; BUS 207, 212, 488;	
CD/PSY 254; CE 207;	
CHEM 312, 316, 317, 318, 319, 444, 447;	
CHEM/MATE 446;	
CPE 488/IME/MATE 458;	
CSC/CPE 235;	
EE/PHYS 422;	
ECON 221;	
ENGR 451, 470, 471;	
ENGR 322/SCM 302;	
ERSC/GEOG 250;	
GEOL 201;	
HIST 410, 417;	
IME 223, 303, 421; IME/HNRS/MATE 322;	
IT 341;	
MATE 401, 406, 425, 430, 435, 440, 445, 450, 460, 470, 471, 504, 510, 540, 550, 570, 571, 580;	
ME 212, 341;	
NR/RPTA 203;	
PHYS 211, 412, 413;	
PSY 256, 305, 419;	
UNIV/HNRS 392, 424, 492; ZOO 331	

SUPPORT COURSES

CE 204 Mechanics of Materials I	3
CHEM 124 Gen Chem for Engrg I (B3/B4)*	4
CHEM 125 Gen Chem for Engineering II.....	4
CHEM 305 Physical Chemistry.....	4
CSC 231 Programming for Engineering Students or CSC 234 C and Unix	2
EE 201, 251 Electric Circuits Theory and Lab	3,1
ENGL 149 Technical Writing for Engineers (A3)*	4
IME 314 Engineering Economics (or IME 326).....	3
MATH 141, 142 Calculus I, II (B1) *	4,4
MATH 143 Calculus III (Add'l Area B)*	4
MATH 241 Calculus IV	4
MATH 244 Linear Analysis I.....	4
ME 211 Engineering Statics	3
ME 343 Heat Transfer <i>or</i> ME 302 Thermodyn. I ...	3
PHYS 141 General Physics IA (Add'l Area B)*	4
PHYS 132, 133 General Physics II, III.....	4,4
STAT 312 Statistical Methods for Engineers (B6)*	4
IME 144 Intro to Design and Manufacturing.....	4
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GENERAL EDUCATION (GE)

72 units required, 28 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support.....	0

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science.....	4
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support.....	0
Additional Area B units* 8 units in Support.....	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
	44

FREE ELECTIVES

0

190

¹ The courses selected to satisfy this requirement may not be used to satisfy other major, support, or general education requirements (no double counting of coursework).

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Mechanical Engineering

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805 756-1334
www.me.calpoly.edu
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Engineering South (40), Room 114
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Department Chair, Andrew I. Davol

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John Chen	Franklin C. Owen
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Stephen M. Klisch	Hemanth Porumamilla
Patrick Lemieux	John R. Ridgely
James G. LoCascio	Louis B. Rosenberg
Thomas J. Mackin	Peter J. Schuster
Jesse Maddren	Brian P. Self
G. Thomas Mase	Kim A. Shollenberger
James M. Meagher	Glen E. Thorncroft
Mason Medizade	Russell Westphal
Joseph D. Mello	James M. Widmann
Ronald S. Mullisen	Xi Wu
William R. Murray	Yuen Cjen Yong
Saeed B. Niku	

ACADEMIC PROGRAMS

Mechanical Engineering – BS, MS

Mission Statement

To impart knowledge in the art and science of mechanical engineering through a comprehensive curriculum true to the traditional Cal Poly learn-by-doing philosophy that produces mechanical engineers of high ethics and skill, fully prepared for entry into industry, government, graduate school and private enterprise.

Program Educational Objectives

A mechanical engineering graduate will:

- Be able to research, design, develop, test, evaluate, and implement engineering solutions to problems that are of a complexity encountered in professional practice.
- Be able to communicate and perform as an effective engineering professional in both individual and team-based project environments.
- Consider the ethical implications and societal impacts of engineering solutions.
- Continuously improve through lifelong learning.

Program Description

The profession of mechanical engineering is directed toward the design, manufacture, and system integration of a very wide variety of equipment ranging from manufacturing machinery and power generation equipment to consumer goods. Of central concern to mechanical engineers is the

sound application of basic principles of solid mechanics, fluid mechanics and thermal sciences in the design, manufacture, and application of this equipment. Mechanical Engineering graduates obtain employment primarily with manufacturers, energy companies, consultants, and government agencies. Types of work performed by graduates include product design, mechanical design, testing, engineering management, engineering sales, design of manufacturing systems, and development of maintenance procedures. Mechanical Engineering graduates also often enhance their careers through graduate study in engineering, and some students also study engineering to build a scientific and technical foundation as a prelude to enrollment in medical, law, and business schools.

The focus of the Cal Poly Mechanical Engineering program is on education based on our "learn by doing" educational philosophy. Thus, the curriculum includes a large number of hands-on laboratories, integration of design throughout, and a senior project requirement for all students. Students are enrolled in engineering laboratories in all years of the curriculum. The program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (see page 158).

The Mechanical Engineering Department is the home of the Donald E. Bently Center for Engineering Innovation. The center provides support for faculty, students, and visiting scholars for the advancement of research, education, and practice in mechanical engineering. A \$6 million endowment to fund three professorships supports the center.

Upper division students in the **General Concentration** can choose professional elective courses from such courses as turbomachinery, robotics, mechatronics, composite materials, rotor dynamics, advanced mechanics, solar systems, internal combustion engines, heat and mass transfer, and courses emphasizing the petroleum, air conditioning, ventilating, and refrigeration industries. Students in the **Mechatronics Concentration** are prepared for professional practice in the design of "intelligent" products for use in factory automation, robotics, hybrid vehicles, alternate energy, and many other fields. The **HVAC&R Concentration** prepares students for careers in the heating, ventilating, air-conditioning and refrigeration (HVAC&R) industry, with a focus on the design of mechanical systems for commercial and industrial buildings.

There are six organized student clubs associated with the Mechanical Engineering Department. These are student chapters of the American Society of Mechanical Engineers, Society of Petroleum Engineers, Society of Automotive Engineers, American Society of Heating, Refrigerating and Air Conditioning Engineers, Alternative Energy Club, and the Pi Tau Sigma honorary society. All of these clubs offer students active programs in professional and leadership activities.

Blended BS + MS Mechanical Engineering

The blended program provides motivated students with an accelerated route to the MS Mechanical Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status. Up to two technical electives can be taken as an undergraduate and counted towards the master's degree.

Eligibility

Students majoring in BS Mechanical Engineering may be eligible to pursue the blended program toward the MS Mechanical Engineering. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 2.5 required, 3.0 recommended. Students are recommended for admission by a faculty committee. Please see 80 for eligibility criteria.

Two program options are available: **Thesis option.** 36 units of advisor-approved coursework, 9 units of thesis research/design, and an oral thesis defense examination. **Non-thesis option.** 45 units of advisor-approved coursework and a written comprehensive examination.

BS MECHANICAL ENGINEERING

60 units upper division GWR
 2.0 GPA USCP

* = Required in Support; also satisfies GE

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

MAJOR COURSES

ME 134 Introduction to Mechanical Engineering ...	1
ME 151 Engineering Design Communication I	2
ME 152 Engineering Design Communication II	2
ME 211 Engineering Statics	3
ME 212 Engineering Dynamics.....	3
ME 234 Philosophy of Design.....	3
ME 236 Thermal Measurements.....	3
ME 251 Intermediate Solid Modeling.....	1
ME 302 Thermodynamics I.....	3
ME 303 Thermodynamics II.....	3
ME 318 Mechanical Vibrations.....	4
ME 326 Intermediate Dynamics.....	4
ME 328 Introduction to Design.....	4
ME 329 Intermediate Design.....	4
ME 341 Fluid Mechanics I.....	3
ME 343 Heat Transfer.....	4
ME 346 Thermal Science Laboratory.....	1
ME 347 Fluid Mechanics II.....	4
ME 422 Mechanical Control Systems.....	4
ME 440 Thermal System Design.....	4
Concentration (see below).....	21/22
	81/82

SUPPORT COURSES

BIO 213 Life Science for Engineers <i>and</i> ENGR/ BRAE 213 Bioengineering Fundamentals (B2)*	4
CE 204 Mechanics of Materials I.....	3
CE 207 Mechanics of Materials II.....	3
CHEM 124 Gen Chem for Engineering I (B3/B4)*	4
CHEM 125 Gen Chem for Engineering II.....	4
CSC 231 <i>or</i> CSC 234 <i>or</i> CPE/CSC 101	2
EE 201, 251 Electric Circuit Theory and Lab.....	3,1
EE 321, 361 Electronics and Lab.....	3,1
ENGL 149 Technical Writing for Engineers (A3)*	4
IME 142 Mfg Processes: Materials Joining	2
IME 143 Mfg Processes: Material Removal	2
MATE 210 Materials Engineering <i>and</i> MATE 215 Materials Laboratory I.....	3,1
MATH 141, 142 Calculus I, II (B1)*	4,4
MATH 143 Calculus III (Add'l Area B)*.....	4
MATH 241 Calculus IV.....	4
MATH 244 Linear Analysis I.....	4
MATH 344 Linear Analysis II (B6)*	4
PHYS 131 General Physics (Add'l Area B)*	4
PHYS 132, 133 General Physics II, III.....	4,4
Manufacturing Processes elective	1
(IME 141 or IT 341)	

77

GENERAL EDUCATION (GE)

72 units required, 32 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 8 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support.....	0

Area B Science and Mathematics (no add'l units reqd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course B5 (not required for Engineering students)	
B6 Upper-division Area B * 4 units in Support.....	0
Additional Area B units* 8 units in Support.....	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4

40

FREE ELECTIVES **0**

198-199

CONCENTRATIONS (select one)

General Concentration

ME 428, 429, 430 Sr. Design Project I, II, III	3,2,1
EE 255, 295 Energy Conversion Electromagnetics and Lab.....	3,1
^{1,2} Technical electives selected from emphasis area....	12
<i>Select at least 8 units of ME courses from:</i>	
ME 305, 359, 401, 402, 405, 410, 412, 415, 416, 423, 424, 431, 432, 434, 435, 436, 441, 443, 444, 445, 446, 450, 456, 457, 458, 488, 506, 507, 517, 518, 531, 540, 541, 542, 551, 552, 553, 554, 579;	
ME/CE 404, ME 501/CE 511, ME 503/CE 513, ME/CE 504, ME/CE 505;	
ME/MATE 555	
<i>Select up to 4 units of non-ME courses from:</i>	
Any upper division or graduate level course in the College of Engineering with the exception of GE Area F, senior project, thesis, special problems, and coop courses.	
	22

Heating, Ventilating, Air-Conditioning and Refrigerating Concentration (HVAC&R)

ME 359 Fundamentals of HVAC Systems.....	4
ME 456 HVAC Air and Water Distribution System Design.....	4
ME 457 Refrigeration Principles and Design.....	4
ME 458 Building Heating and Cooling Loads	4
ME 459, 460 HVAC Senior Design Project I, II.....	3,2
	21

Mechatronics Concentration

ME 305 Introduction to Mechatronics.....	4
ME 405 Mechatronics	4
ME 423 Robotics: Fundamentals and Applications	4
ME 428, 429, 430 Sr. Design Project I, II, III.....	3,2,1
³ CPE 336/IME 356/ME 506.....	4
	22

MS MECHANICAL ENGINEERING

General Characteristics

The Master of Science in Mechanical Engineering prepares students to design and develop advanced products and systems; to conduct research and analysis; to work in industry; or to continue study toward a Ph.D. Graduate students enjoy the same flavor of learn-by-doing as other Cal Poly students. Students may choose their technical electives in the area that interests them, including thermo-sciences, controls and robotics, mechanics and stress analysis, composite materials.

Prerequisites

For admission as a classified graduate student, in addition to the University requirements, an applicant should hold a BS degree in Mechanical Engineering with a grade point average of 3.0. Other closely related majors may be accepted as conditionally classified graduate students until they take necessary prerequisite mechanical engineering

courses as approved by the graduate advisor. For additional information on University requirements, please refer to the Graduate Programs of this catalog.

Two program options are available:

Thesis option. 36 units of advisor-approved coursework, 9 units of thesis research/design, and an oral thesis defense examination.

Non-thesis option. 45 units of advisor-approved coursework and a written comprehensive examination.

MS MECHANICAL ENGINEERING

	<i>Units</i>
Core Courses	17
ME 599 Design Project (Thesis) (9) <i>or</i> 9 units of approved technical electives <i>and</i> a comprehensive examination	
Approved MATH/STAT/CSC courses (8)	
Select a minimum of 12 units from the following:	12
ME 501 Continuum Mechanics and Elasticity (4)	
ME 503 Inelastic Stress Analysis (4)	
ME 504 Finite Element Analysis I (4)	
ME 506 System Dynamics (4)	
ME 507 Mechanical Control System Design (4)	
ME 517 Advanced Vibrations (4)	
ME 518 Machinery Vibration and Rotor Dynamics (4)	
ME 531 Acoustics and Noise Control (4)	
ME 540 Viscous Flow (4)	
ME 541 Advanced Thermodynamics (4)	
ME 542 Dynamics of Compressible Flow (4)	
ME 551 Mechanical Systems Analysis (4)	
ME 552 Advanced Heat Transfer I (4)	
ME 553 Advanced Heat Transfer II (4)	
ME 554 Computational Heat Transfer (4)	
ME 579 Fluid Power Control (4)	
Approved technical electives	16
(400 or 500-level ME or non-ME courses; maximum of 12 units of 400-level courses allowed)	
	45

¹ Consultation with advisor is recommended prior to selecting technical electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² Notes:
a) ME 470, 471, 570 and 571 are variable topics courses and may or may not count as ME electives. Please contact instructor for additional information.
b) ME 400 and ME 500 are independent study classes and may be acceptable for technical elective credit. A course substitution form is required.
c) Exceptions to this policy are possible through consultation with the department chair.

³ Elective based on interests of students.

Joint Undergraduate Programs

Academic Programs

Environmental Studies – Minor
Liberal Arts and Engineering Studies – BA

BA LIBERAL ARTS and ENGINEERING STUDIES

<http://laes.calpoly.edu>,
laes@calpoly.edu

David D. Gillette, Co-Director
805 756-2331; ddgillet@calpoly.edu

Michael L. Haungs, Co-Director
805 756-5531; mhaungs@calpoly.edu

The BA degree program in Liberal Arts and Engineering Studies (LAES) is jointly offered by the colleges of Liberal Arts and Engineering. This program prepares students for a wide range of innovative careers in emerging professional fields that combine skills and interests in the arts, technology and culture, and also prepares them for further study in graduate school. This program is open to all students at Cal Poly. This program is not intended to be an ABET-accredited engineering program.

The curriculum allows Liberal Arts and Engineering Studies students, in collaboration with students from all other Cal Poly majors, to participate in development teams working on national and international technology and cultural projects. To further prepare students for work with diverse teams that include participants from across the globe, the program requires students to spend three to six months studying and/or working abroad.

The BA in Liberal Arts and Engineering Studies leads to careers such as:

- audio technology
- digital media production and management
- digital publishing
- environmental technology education
- film and television production
- government policy making/analysis
- international technology management
- science education, such as science instrumentation and systems procurement
- sustainable community development
- technical communications
- technology services and management

Graduates of the Liberal Arts and Engineering Studies program receive a solid foundation in engineering and

scientific principles, as well as a cultural appreciation that supports them in careers requiring significant levels of technical and cultural fluency. To support these goals, the primary learning objectives are to:

- Have a working knowledge of the essential philosophical, ethical, aesthetic and expressive aspects of our culture and their historical development.
- Communicate effectively through a variety of media in diverse, multicultural contexts.
- Understand a technical system, component, or process.
- Function effectively as a member of an interdisciplinary and international team.
- Identify technical problems and use a multidisciplinary perspective to help formulate effective solutions.
- Possess a solid understanding of the ethical and professional responsibilities associated with the creation, use, and integration of new and existing technology.
- Understand the social, political, and historical impact of technical solutions on complex modern problems.
- Be able to continue asking questions and seeking interdisciplinary solutions to technological dilemmas.
- Understand their responsibilities as informed citizens in a technological society and therefore remain engaged in helping that society improve.

Concentrations

LAES students must select *one* concentration from Engineering and *one* from Liberal Arts. Students may choose to follow an individualized course of study constructed in consultation with LAES advisors.

Engineering

Computer Graphics
Culture, Society and Technology
Electrical Engineering (Power)
System Design

Liberal Arts

Interactive Communication–Cinema
Interactive Communication–Theatre
Publishing Technology
Technical Communication

BA LIBERAL ARTS and ENGINEERING STUDIES

60 units upper division GWR
 2.0 GPA USCP

* = Required in Major; also satisfies GE

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

MAJOR COURSES

CHEM 124 Gen Chem for Engineering (B3/B4)*...	4
ENGL 149 Technical Writing for Engineers (A3)*	4
LAES 301 Project-Based Learning in LAES.....	4
LAES 411 Collab. Global Partnerships in LAES	4

LAES 461 Senior Project (or other approved senior project course)	4
LAES 462 Capstone Senior Seminar in LAES	4
MATH 141, 142 Calculus I, II (B1)*	4,4
MATH 143 Calculus III (B5)*	4
MATH 241 Calculus IV	4
MATH 244 Linear Analysis I or advisor approved elective	4
PHYS 141 General Physics IA	4
PHYS 132, 133 General Physics II, III	4,4
STAT 312/321/350	4
Engineering concentration (minimum 8 units at 300-400 level)	34-35
Liberal Arts concentration (minimum 12 units at 300-400 level)	24
Study Abroad or Global Perspectives courses (300-400 level)	4,4
126-127	

GENERAL EDUCATION (GE)

72 units required, 20-32 of which are specified in Major, depending on concentration.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Major	0

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Major	0
B2 Life Science	4
B3 Physical Science * 4 units in Major	0
B4 One lab taken with either a B2 or B3 course	
B5 * 4 units in Major	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts * may be in Liberal Arts concentration	0-4
C4 Upper-division elective * may be in Liberal Arts concentration	0-4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) * may be in concentration

40-52

FREE ELECTIVES

1-14

180

ENGINEERING CONCENTRATIONS (select one)

Computer Graphics Concentration

CSC 123 Introduction to Computing	4
CSC 101 Fundamentals of Computer Science I	4
CSC 102 Fundamentals of Computer Science II	4
CSC 103 Fundamentals of Computer Science III	4
CSC 141 Discrete Structures I	4
CSC 225 Intro to Computer Organization	4
CSC 357 Systems Programming	4
CSC 471 Intro to Computer Graphics	4
Computer science electives (any additional CSC course)	2
34	

Electrical Engineering (Power) Concentration

EE 111, 151 Intro to Electrical Engineering, Lab	1,1
EE 112 Electric Circuit Analysis I	2
EE 211, 241 Electric Circuit Analysis II, Lab	3,1
EE 212, 242 Electric Circuit Analysis III, Lab	3,1
EE 255, 295 Energy Conver Electromag, Lab	3,1
EE 335, 375 Electromagnetics, Lab	4,1
EE 406 Power Systems Analysis I	4
EE 407, 444 Power Systems Analysis II, Lab	4,1
Advisor approved power technical elective	4
34	

System Design Concentration

IME 101 Intro Industrial & Manuf Engr	1
IME 223 Process Improvement Fundamentals	4
IME 239 Industrial Costs & Controls	3
IME 301 Operations Research I	4
IME 303 Project Organization & Management	4
IME 314 Engineering Economics	3
IME 320 Human Factors & Tech (Area F)*	4
IME 326 Engineering Test Design & Analysis	4
IME 420 Simulation	4
IME 443 Facilities Planning and Design	4
35	

Individualized Course of Study

34
Courses to be selected with program advisor.
Minimum 8 units at 300-400 level.

LIBERAL ARTS CONCENTRATIONS (select one)

Culture, Society and Technology Concentration

ES/WGS 350 Gender, Race, Science & Technology (Area F)* (USCP)	4
HUM 303/PHIL 341/PHIL 337 (C4)*	4
POLS 451 Technology & Public Policy	4
Approved electives. Select from	12
ANT 360; COMS 317; GEOG 318, 333; HIST 354, 359; JOUR 331, 470; PHIL 322, 340; POLS 328, 333, 346, 347, 470; PSY 311, 494	

24

Interactive Communication – Cinema**Concentration**

TH 210 Introduction to Theatre (C3)*	4
ENGL 371 Film Styles and Genres (C4)*	4
ENGL 411 New Media Arts I	4
<i>Approved electives. Select from:</i>	12
ENGL 210, 370, 372, 412, 416, 419; COMS 311, 385, 419; POLS 470	
	24

Interactive Communication – Theatre**Concentration**

TH 210 Introduction to Theatre (C3)*	4
TH 227/228 Theatre History	4
ENGL 411 New Media Arts I	4
<i>Approved electives. Select from:</i>	12
ENGL 210, 412; TH 220, 230/330, 310/320/360/390, 430, 434; HUM 320	
	24

Publishing Technology Concentration

GRC 101 Intro to Graphic Communication	3
GRC 201 Digital Publishing Systems	3
GRC 211 Substrates, Inks and Toners	4
HUM 303/PHIL 341/PHIL 337 (C4)*	4
<i>Approved electives. Select from:</i>	10
COMS 317; GRC 316, 328, 329, 402; PSY 494	
	24

Technical Communication Concentration

ENGL 317 Technical Editing.....	4
ENGL 319 Information Design & Production	4
COMS 317 Technology & Human Comm.....	4
<i>Approved electives. Select from:</i>	12
ENGL 210, 310, 418/420; HUM 303; PHIL 337/341; COMS 213, 301	
	24

Individualized Course of Study 24

Courses or a minor to be selected from College of Liberal Arts with program advisor approval.
Minimum 12 units at 300-400 level.

ENVIRONMENTAL STUDIES MINOR

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

College of *Liberal Arts*

Linda H. Halisky, Dean
Penny K. Bennett, Associate Dean
Debra L. Valencia-Laver, Associate Dean
Faculty Office Bldg. (47), Room 31
805 756-2359

ACADEMIC PROGRAMS

Agricultural Communication.....	<i>Minor</i>
Anthropology and Geography.....	<i>BS, Minor</i>
Art and Design	<i>BFA</i>
Art History	<i>Minor</i>
Asian Studies.....	<i>Minor</i>
Child Development	<i>BS, Minor</i>
Communication Studies	<i>BA, Minor</i>
Comparative Ethnic Studies	<i>BA</i>
Dance	<i>Minor</i>
English	<i>BA, MA, Minor</i>
Ethnic Studies	<i>Minor</i>
French	<i>Minor</i>
German.....	<i>Minor</i>
Gerontology	<i>Minor</i>
Global Politics.....	<i>Minor</i>
Graphic Communication	<i>BS, Minor</i>
History.....	<i>BA, MA, Minor</i>
Journalism	<i>BS</i>
Latin American Studies.....	<i>Minor</i>
Law and Society.....	<i>Minor</i>
Liberal Arts & Engineering Studies	<i>BA</i>
Linguistics.....	<i>Minor</i>
Media Arts and Technologies	<i>Minor</i>
Modern Languages & Literatures...	<i>BA</i>
Music.....	<i>BA, Minor</i>
Philosophy.....	<i>BA, Minor</i>
Photography	<i>Minor</i>
Political Science	<i>BA</i>
Psychology	<i>BS, MS, Minor</i>
Public Policy	<i>MPP</i>
Religious Studies.....	<i>Minor</i>
Sociology	<i>BA, Minor</i>
Spanish.....	<i>Minor</i>
Studio Art.....	<i>Minor</i>
Theatre Arts.....	<i>BA, Minor</i>
Values, Technology and Society	<i>Minor</i>
Western Intellectual Tradition.....	<i>Minor</i>
Women's and Gender Studies.....	<i>Minor</i>

The College of Liberal Arts (CLA) provides the opportunity to study in depth the record of imaginative and reflective human experience. Through papers, projects, and service, students are encouraged to develop the knowledge and skills to add to this record. As well, the college seeks to relate itself to the technological disciplines in a way that helps contribute to the solution of human problems from global and multidisciplinary perspectives. Accordingly, a wide range of

courses is offered to serve every thoughtful individual without regard to specialized professional interests.

Four broad areas of knowledge are represented: the fine and performing arts, communications, humanities, and social sciences. While the college has great breadth and diversity, unity is found in a study of the most engaging subject of all – human endeavor. Whether the focus is on imagination, politics, creativity, or rationality, there is a settled purpose: to help each student know herself or himself, to understand human values and human potential, and to understand our society and its institutions.

Study abroad opportunities are strongly supported, and CLA faculty regularly offer classes in programs such as Cal Poly's Summer Study in London, Thailand Study Program, Valladolid (Spain) Program, and Australia Abroad Program. The college is excited to be involved with the Peru Summer Study Program that complements the minor in Latin American Studies. These study abroad programs are administered by the International Education and Programs Office. For further information, see page 294.

The college also offers interdisciplinary and international courses through its Humanities Program as well as two interdisciplinary minors that explore technology and its influence. Many humanities classes fulfill Cal Poly's general education requirements. For more information, contact the Humanities Program Office (Bldg 47, Room 31, 805 756-2359).

The college's interdisciplinary major, Bachelor of Arts in Liberal Arts and Engineering Studies, allows students to combine coursework from the College of Liberal Arts and the College of Engineering to explore cutting-edge technologies and their applications to areas such as media arts, technology policy, and technical writing and communications. The degree is offered jointly by both colleges. For more information, see page 206 or 210.

The College of Liberal Arts offers a wide range of learn-by-doing opportunities. Students from all majors participate in the musical ensembles, theater productions, and dance performances. The college supports the Central Coast Center for Arts Education and the University Art Gallery. Students contribute to publications that showcase their accomplishments in their major, such as the English Department's *Byzantium*, the Ethnic Studies Department's *Osiyo*, and the History Department's *The Forum*. These publications are often printed by the student-run University Graphic Systems. Students also participate in co-curricular CLA activities, including KCPR Radio, *Mustang Daily*, Model United Nations, Mock Trial, and intercollegiate debate.

The college has a major responsibility for activities that enhance the cultural and intellectual life of the University and the community. The college sponsors the Spanos Theatre and Cal Poly Arts, offering a full range of cultural programs, including exhibits, concerts, literary presentations, and dramatic productions, while fostering artistic development and accomplishment across the campus.

Liberal Arts & Engineering Studies

<http://laes.calpoly.edu>,
laes@calpoly.edu

David D. Gillette, Co-Director
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Michael L. Haungs, Co-Director
805 756-5531; mhaungs@calpoly.edu

The BA degree program in Liberal Arts and Engineering Studies (LAES) is jointly offered by the colleges of Liberal Arts and Engineering. This program prepares students for a wide range of innovative careers in emerging professional fields that combine skills and interests in the arts, technology and culture, and also prepares them for further study in graduate school. This program is open to all students at Cal Poly. This program is not intended to be an ABET-accredited engineering program.

The curriculum allows Liberal Arts and Engineering Studies students, in collaboration with students from all other Cal Poly majors, to participate in development teams working on national and international technology and cultural projects. To further prepare students for work with diverse teams that include participants from across the globe, the program requires students to spend three to six months studying and/or working abroad.

The BA in Liberal Arts and Engineering Studies leads to careers such as:

- audio technology
- digital media production and management
- digital publishing
- environmental technology education
- film and television production
- government policy making/analysis
- international technology management
- science education, such as science instrumentation and systems procurement
- sustainable community development
- technical communications
- technology services and management

Graduates of the Liberal Arts and Engineering Studies program receive a solid foundation in engineering and scientific principles, as well as a cultural appreciation that supports them in careers requiring significant levels of technical and cultural fluency. To support these goals, the primary learning objectives are to:

- Have a working knowledge of the essential philosophical, ethical, aesthetic and expressive aspects of our culture and their historical development.

- Communicate effectively through a variety of media in diverse, multicultural contexts.
- Understand a technical system, component, or process.
- Function effectively as a member of an interdisciplinary and international team.
- Identify technical problems and use a multidisciplinary perspective to help formulate effective solutions.
- Possess a solid understanding of the ethical and professional responsibilities associated with the creation, use, and integration of new and existing technology.
- Understand the social, political, and historical impact of technical solutions on complex modern problems.
- Be able to continue asking questions and seeking interdisciplinary solutions to technological dilemmas.
- Understand their responsibilities as informed citizens in a technological society and therefore remain engaged in helping that society improve.

Concentrations

LAES students must select *one* concentration from Engineering and *one* from Liberal Arts. Students may choose to follow an individualized course of study constructed in consultation with LAES advisors.

Engineering

Computer Graphics
Culture, Society and Technology
Electrical Engineering (Power)
System Design

Liberal Arts

Interactive Communication–Cinema
Interactive Communication–Theatre
Publishing Technology
Technical Communication

BA LIBERAL ARTS and ENGINEERING STUDIES

60 units upper division GWR
 2.0 GPA USCP

* = Required in Major; also satisfies GE

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

MAJOR COURSES

CHEM 124 Gen Chem for Engineering (B3/B4)* ..	4
ENGL 149 Technical Writing for Engineers (A3)*	4
LAES 301 Project-Based Learning in LAES.....	4
LAES 411 Collab. Global Partnerships in LAES	4
LAES 461 Senior Project (or other approved senior project course).....	4
LAES 462 Capstone Senior Seminar in LAES.....	4
MATH 141, 142 Calculus I, II (B1)*	4,4
MATH 143 Calculus III (B5)*	4
MATH 241 Calculus IV	4
MATH 244 Linear Analysis I or advisor approved elective	4
PHYS 141 General Physics IA	4

PHYS 132, 133 General Physics II, III	4,4
STAT 312/321/350.....	4
Engineering concentration (minimum 8 units at 300-400 level).....	34-35
Liberal Arts concentration (minimum 12 units at 300-400 level).....	24
Study Abroad or Global Perspectives courses (300- 400 level).....	4,4
	126-127

GENERAL EDUCATION (GE)

72 units required, 20-32 of which are specified in Major, depending on concentration.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (8 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing * 4 units in Major	0

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Major	0
B2 Life Science	4
B3 Physical Science * 4 units in Major	0
B4 One lab taken with either a B2 or B3 course	
B5 * 4 units in Major.....	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts * may be in Liberal Arts concentration	0-4
C4 Upper-division elective * may be in Liberal Arts concentration	0-4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) *may be in concentration

.....	0-4
	40-52

FREE ELECTIVES.....

.....	1-14
	180

ENGINEERING CONCENTRATIONS (select one)**Computer Graphics Concentration**

CSC 123 Introduction to Computing.....	4
CSC 101 Fundamentals of Computer Science I.....	4
CSC 102 Fundamentals of Computer Science II.....	4
CSC 103 Fundamentals of Computer Science III.....	4
CSC 141 Discrete Structures I.....	4
CSC 225 Intro to Computer Organization.....	4
CSC 357 Systems Programming	4
CSC 471 Intro to Computer Graphics	4
Computer science electives (any additional CSC course)	2
	34

Electrical Engineering (Power) Concentration

EE 111, 151 Intro to Electrical Engineering, Lab	1,1
EE 112 Electric Circuit Analysis I.....	2
EE 211, 241 Electric Circuit Analysis II, Lab	3,1
EE 212, 242 Electric Circuit Analysis III, Lab.....	3,1
EE 255, 295 Energy Conver Electromag, Lab.....	3,1
EE 335, 375 Electromagnetics, Lab.....	4,1
EE 406 Power Systems Analysis I.....	4
EE 407, 444 Power Systems Analysis II, Lab	4,1
Advisor approved power technical elective	4
	34

System Design Concentration

IME 101 Intro Industrial & Manuf Engr	1
IME 223 Process Improvement Fundamentals.....	4
IME 239 Industrial Costs & Controls	3
IME 301 Operations Research I	4
IME 303 Project Organization & Management.....	4
IME 314 Engineering Economics.....	3
IME 320 Human Factors & Tech (Area F)*	4
IME 326 Engineering Test Design & Analysis	4
IME 420 Simulation	4
IME 443 Facilities Planning and Design	4
	35

Individualized Course of Study.....

.....	34
Courses to be selected with program advisor. Minimum 8 units at 300-400 level.	

LIBERAL ARTS CONCENTRATIONS (select one)**Culture, Society and Technology Concentration**

ES/WGS 350 Gender, Race, Science & Technology (Area F)* (USCP)	4
HUM 303/PHIL 341/PHIL 337 (C4)*	4
POLS 451 Technology & Public Policy	4
<i>Approved electives. Select from:</i>	12
ANT 360; COMS 317; GEOG 318, 333; HIST 354, 359; JOUR 331, 470; PHIL 322, 340; POLS 328, 333, 346, 347, 470; PSY 311, 494	
	24

Interactive Communication – Cinema Concentration

TH 210 Introduction to Theatre (C3)*.....	4
ENGL 371 Film Styles and Genres (C4)*	4
ENGL 411 New Media Arts I.....	4
<i>Approved electives. Select from:</i>	12
ENGL 210, 370, 372, 412, 416, 419; COMS 311, 385, 419; POLS 470	
	24

Interactive Communication – Theatre Concentration

TH 210 Introduction to Theatre (C3)*	4
TH 227/228 Theatre History	4
ENGL 411 New Media Arts I	4
<i>Approved electives. Select from:</i>	12
ENGL 210, 412; TH 220, 230/330, 310/320/360/390, 430, 434; HUM 320	
	24

Publishing Technology Concentration

GRC 101 Intro to Graphic Communication	3
GRC 201 Digital Publishing Systems	3
GRC 211 Substrates, Inks and Toners.....	4
HUM 303/PHIL 341/PHIL 337 (C4)*	4
<i>Approved electives. Select from:</i>	10
COMS 317; GRC 316, 328, 329, 402; PSY 494	
	24

Technical Communication Concentration

ENGL 317 Technical Editing.....	4
ENGL 319 Information Design & Production	4
COMS 317 Technology & Human Comm.....	4
<i>Approved electives. Select from:</i>	12
ENGL 210, 310, 418/420; HUM 303; PHIL 337/341; COMS 213, 301	
	24

Individualized Course of Study 24

Courses or a minor to be selected from College of Liberal Arts with program advisor approval.
Minimum 12 units at 300-400 level.

Art & Design

Dexter Bldg. (34), Room 169
805 756-1148
<http://artdesign.calpoly.edu>

Department Chair, Sky Bergman

Elizabeth Adan	Eric B. Johnson
Enrica Lovaglio Costello	Mary LaPorte
Daniel Dove	Charmaine Martinez
Giancarlo Fiorenza	Kathryn McCormick
Tera Galanti	Michael Barton Miller
Robert Howell	Jean Wetzel
George D. Jercich	

ACADEMIC PROGRAMS

Art and Design – BFA
Art History – Minor
Photography – Minor
Studio Art – Minor

The Bachelor of Fine Arts degree program in Art and Design offers a major with concentrations in graphic design, photography, and studio art. The BFA in Art and Design is accredited by the National Association of Schools of Art and Design.

The department has made a commitment to cultural diversity. Wherever possible, this commitment is evidenced by the inclusion of material which identifies significant multicultural influences on the content of the courses in our curriculum. Courses are available for all students to enrich their creativity, understanding, appreciation, and practical skills in art.

Admission/acceptance to the Bachelor of Fine Arts degree program in Art and Design requires a demonstrated ability in the chosen concentration in art through the presentation of a representative portfolio, outlined in the department's submission guidelines. Submission of portfolio is by invitation only; the department will contact students with information regarding submitting the appropriate materials in a timely manner.

The department operates the University Art Gallery, located in the Dexter Building (34), room 171. The gallery is a venue that serves the University, the city of San Luis Obispo, and the surrounding areas. It showcases nationally and internationally-known artists, as well as student, alumni and faculty artwork. The gallery creates an environment for learning and discussion of ideas critical to art and society.

CONCENTRATIONS

All three concentrations support creative and aesthetic growth and require the development of technical skills as a foundation for personal direction and enrichment. Through

team projects, students have the unique opportunity to experience the interaction and relationship of graphic design, photography, and studio art.

Graphic Design¹. Principles of basic design, typography and design history, with specialized courses in such topics as corporate identity, packaging graphics, web site design, advertising, editorial design and illustration. Emphasis is placed on the development of visual problem-solving methodology and acquisition of skills needed in the design profession. Coursework in computer imaging and interactive design allows for an exploration of new technology. The program culminates in the study of professional practices and the preparation of a professional portfolio.

Photography. A diversified and commercially oriented program stressing preparation for careers in advertising and illustration, portraiture, corporate and editorial photography, digital image making, and photographic history. Creative problem solving is stressed within the context of a variety of expressive projects, including studio and location lighting, traditional photographic processes, digital image making, large format photography, video and multimedia production, and advertising illustration. The program culminates in the creation of a professional portfolio and discussion of current professional practices.

Studio Art. A selective program designed for students seeking a broad based undergraduate education in the visual arts. The program is distinctive for its depth of required coursework in both two- and three-dimensional media. The upper division curriculum allows students to specialize in preparation for pursuit of advanced degrees and/or careers in the visual arts. In addition to becoming a practicing artist, some of the many career possibilities for our graduates include positions in industry, education, entertainment, illustration, and museum/gallery management. Cal Poly, with its learn-by-doing philosophy and its commitment to both the liberal arts and technology, provides a unique setting for studying the visual arts. Within this context, the students in this concentration are presented with an environment where imagination, intellectual rigor, self expression and skill development are expected and valued.

¹ The Art and Design Department's Graphic Design concentration focuses on creative problem-solving and development of design and layout skills. The Graphic Design concentration leads to positions such as graphic designer, web 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 for reproduction in print and digital media. The concentration focuses on printing, web development, publishing, packaging, digital imaging, computer graphics, and related areas of mass media preparation and production.

BFA ART AND DESIGN

- ☐ 60 units upper division ☐ GWR
 ☐ 2.0 GPA ☐ USCP
 * = Required in Major; also satisfies GE

MAJOR COURSES

ART 101 The Fundamentals of Drawing (C3)*	4
ART 105 Foundation: Color Theory	4
ART 106 Foundation: 2-Dimensional Design.....	4
ART 107 Foundation: 3-Dimensional Design.....	4
ART 182 Photographic Manipulation and Design ...	4
ART 203 Art Theory and Practice.....	4
ART 209 Beginning Painting	4
ART 211 Art History: Ancient-Renaissance <i>or</i>	
ART 212 Art History: Renaissance-Baroque	4
ART 222 Black and White Photography	4
ART 260 Critique and Discourse	4
ART 312 Art History-Modern Art, 1900-1945 <i>or</i>	
ART 315 Art History-Art Since 1945.....	4
<i>Art History</i> . Select two courses from the following	
upper division art history courses not already	
required in major core or concentration.....	4,4
ART 310, 311, 312, 313, 314, 315, 316, 317,	
318, 370, 371, 410	
ART 360 Professional Practices.....	2
ART 462 Senior Portfolio Project.....	2
Concentration courses (see below).....	60
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GENERAL EDUCATION (GE)

- 72 units required, 4 of which are specified in Major.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (20 units)

B1 Mathematics/Statistics	8
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5)...	4

Area C Arts and Humanities (12 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts *4 units in Major.....	0
C4 Upper-division elective (No ART courses)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

**Area F Technology Elective (upper division)
(4 units)**

.....	4
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FREE ELECTIVES

.....	0
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	184

CONCENTRATIONS (select one)**Graphic Design Concentration**

ART 183 Digital Illustration and Design.....	4
ART 184 Digital Book Making and Design	4
ART 201 Intermediate Drawing.....	4
ART 237 Graphic Design I.....	4
ART 238 Typography I	4
ART 313 Design History	4
ART 337 Graphic Design II	4
ART 338 Typography II	4
ART 380 Design Principles for the Web	4
ART 437 Graphic Design III.....	4
ART 438 Typography III.....	4
ART 468 Portfolio Production.....	1
Select at least one of the following courses:.....	4
ART 302, 330, 334, 384, 388, 432, 434, 439,	
488, 489	

Select from any ART courses not already
 required in the major core, GRC 101, GRC
 203, and GRC 337 (*At least 3 units must be
 upper division*)

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60

Photography Concentration

ART 224 Introduction to Artificial Lighting for	
Photography.....	4
ART 227 Lifestyle Photography.....	4
ART 314 History of Photography	4
ART 324 Photographic Expression	4
ART 325 Advanced Camera Techniques	4
ART 329 Editorial Photography.....	4
ART 383 Digital Video	4
ART 427 Advertising Photography	4
ART 468 Portfolio Production.....	1
ART 486 Photography: Image and Idea	4
GRC 331 Color Management.....	4
Any ART courses not already required in the	
major core	19
	<hr/>
	60

Studio Art Concentration

ART 148 Beginning Sculpture	4
ART 201 Intermediate Drawing	4
ART 211 Art History-Ancient to Renaissance <i>or</i> ART 212 Art History-Renaissance through Ba- roque Era (whichever not taken in major core)	4
ART 245 Ceramics I <i>or</i> ART 348 Intermediate Sculpture.....	4
ART 301 Advanced Drawing	4
ART 302 Life Drawing I.....	4
ART 309 Intermediate Painting	4
ART 312 Art History-Modern Art, 1900-1945 <i>or</i> ART 315 Art History-Art Since 1945 (whichever not taken in major core).....	4
Select 12 units (300-400 level) from these Studio Art courses:	12
ART 336, 341, 345, 348, 353, 402, 406, 409, 440, 448	
Any ART course not already required in the major core (See course descriptions for repeatable units). <i>At least 4 units must be upper division</i>	<u>16</u> 60

ART HISTORY MINOR

Courses consist of a required core and approved electives. The courses include art and architectural history. Students, working with an advisor, select their area(s) of interest. Advisors are: Elizabeth Adan, Giancarlo Fiorenza, or Jean Wetzel.

	<i>Units</i>
<i>Select one survey course in Art History</i>	4
ART 112 Survey of Western Art (C3)	
ART 211 Art History–Ancient to Renaissance	
ART 212 Art History–Renaissance through Baroque Eras	
<i>Select one survey course in Architecture</i>	4
ARCH 217 History of World Architecture: Prehistory–Middle Ages (C3)	
ARCH 218 History of World Architecture: Middle Ages–18 th Century (C3)	
ARCH 219 History of World Architecture: 18 th Century–Present (C3)	
<i>Select one 300-level Non-Western Course</i>	4
ART 317, 318 (C4), ARCH 320 (C4) (depending on topic)	
<i>Select one 300-level Western Course</i>	4
ART 310, 311 (C4), 312, 315, 370, 371 (C4), ARCH 320 (C4) (depending on topic), ART/WGS 316	
<i>One 400-level Art History Methods/Research Course</i>	4
ART 410 Art History Methodologies and Research	
Approved Electives	8
Western or non-Western, architecture or art history classes, at the 300-400 level: ART 310, 311 (C4), 312, 315, 316, 317, 318, 370 (C4), 371 (C4); ARCH 320, 420	
	<u>28</u>

PHOTOGRAPHY MINOR

Courses consist of a required core and approved electives. Students, working with an advisor, select their area(s) of interest. Admission to the minor is contingent upon a departmental review of a portfolio as specified on the minor curriculum sheet. Advisors are: Sky Bergman, Robert Howell, and Eric Johnson.

	<i>Units</i>
Select three courses from the following:	12
ART 121 Basic Digital Photography (4)	
ART 182 Photographic Manipulation & Design (4)	
ART 222 Black and White Photography (4)	
ART 224 Introduction to Artificial Lighting (4)	
ART 227 Lifestyle Photography (4)	
ART 314 History of Photography (C4) (If selected, course may not be selected again below) (4)	
Select three courses from the following:	12
ART 314 History of Photography (C4) (4)	
ART 324 Photographic Expression (4)	
ART 325 Advanced Camera Techniques (4)	
ART 329 Editorial Photography (4)	
ART 383 Digital Video (4)	
ART 427 Advertising Photography (4)	
ART 484 Animation, Video, and Interactive Design (4)	
ART 486 Photography: Image and Idea (4)	
	<u>24</u>

STUDIO ART MINOR

Courses consist of a required core and approved electives. The electives include courses in 2D, 3D studio, and art history. Students, working with an advisor, select their area(s) of interest. Advisors are: Daniel Dove, Tera Galanti, or Michael Barton Miller.

	<i>Units</i>
Required Core	
ART 101 The Fundamentals of Drawing (C3)	4
ART 148 Beginning Sculpture (C3)	4
ART 312 Art History–Modern Art, 1900-1945 <i>or</i> ART 315 Art History–Art Since 1945	4
ART approved electives	
<i>Select a minimum of 4 units from:</i>	4
ART 201, 203, 209, 222, 241, 245, 260	
<i>Select a minimum of 12 units from:</i>	12
(see course descriptions for repeatable units)	
ART 301, 302, 309, 311 (C4), 316, 334, 336, 341, 345, 348, 353, 400, 402, 406, 409, 440, 448	
	<u>28</u>

Communication Studies

Faculty Office Bldg. (47), Room 33
805 756-2553

Department Chair, Terrence C. Winebrenner

Richard Besel	Michael L. Fahs
Jnan Blau	Jennie M. Hwang
James R. Conway	Lorraine D. Jackson
Bernard K. Duffy	Steven T. McDermott

ACADEMIC PROGRAMS

Communication Studies – BA, Minor

Understanding the process of communication is no less important in today's Information Age than it was during the Golden Age of Athens, when skill in oral communication determined one's success in life. The study of the human capacity for speech as a means of influence, entertainment, and information was at the foundation of Western Civilization. A course of study in communication, always one that required a knowledge of many cognate fields such as psychology and logic, is still interdisciplinary in nature. Faculty in communication studies teach aesthetic, historical, critical and empirical methods for understanding communication.

The aims of the discipline are both conceptual and practical. The study of communication embodies the concerns of rhetoric, one of the three original liberal arts. In broad terms, students who enroll in a liberal arts curriculum do so to develop the ability to analyze and reason critically, write and speak effectively, and appreciate the influences of culture upon their lives. The first goal of the department is to advance these objectives.

Courses in the modern discipline of communication studies focus on the history and theory of communication. The field embraces communication in all contexts: political, organizational, debate, small group, intercultural, instructional, mass media, and performance of literature. The emphasis on developing theoretical insights unites these various fields.

The department offers fully articulated major and minor programs. Through the use of approved electives, the major can be shaped to assist students in preparing for their educational and career objectives. Students use a communication studies major to prepare for careers in business, advertising and public relations, theatre, law, education, the mass media, and the clergy. In addition to providing students with an option to select from a broad range of internships and the opportunity to participate in the Teaching Credential Program, the department houses an extensive program in competitive debate. It also offers individual and sequenced courses to develop practical skills

in oral composition, critical thinking, and effective human communication.

COMMUNICATION STUDIES MINOR

A 28-unit minor is available for students who desire documented competency in Communication Studies. After completing the core courses listed below, students may select the remainder of their courses from an approved list. Copies of the list and further information and application forms are available in the Communication Studies Department office.

	<i>Units</i>
Required courses	
COMS 212 Interpersonal Communication	4
COMS 311 Communication Theory	4
COMS 322 Persuasion.....	4
COMS 330 Classical Rhetorical Theory <i>or</i> COMS 331 Contemporary Rhetorical Theory	4
Approved Electives	12
12 units of Communication Studies courses, of which at least 8 units must be 300–400 level.	
	28

BA COMMUNICATION STUDIES

- 60 units upper division GWR
- 2.0 GPA USCP

* = Required in Support; also satisfies GE

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

MAJOR COURSES

Take one of the following courses:.....	4
COMS 201 Advanced Public Speaking	
COMS 208 Performance of Literature	
COMS 226 Applied Argumentation	
COMS 212 Interpersonal Communication	4
COMS 213 Organizational Communication.....	4
COMS 217 Small Group Communication.....	4
COMS 250 Forensic Activity	2
COMS 311 Communication Theory.....	4
COMS 312 Communication Research Methods.....	4
COMS 322 Persuasion.....	4
COMS 330 Classical Rhetorical Theory	4
COMS 331 Contemporary Rhetorical Theory <i>or</i> COMS 435 American Political Rhetoric.....	4
COMS 332 Rhetorical Criticism	4
COMS 350 Advanced Forensic Activity	2
COMS 385 Media Criticism <i>or</i> COMS 419 Media Effects.....	4
COMS 460 Undergraduate Seminar	1
COMS 461 Senior Project	3
COMS electives (300–400 level).....	16
<i>Only 4 units of supervised instruction, including COMS 400, COMS 450, and COMS 485, may be counted here.</i>	

SUPPORT COURSES

Upper division writing intensive class	4
Choose from the following:	
ENGL 302, 310, 386	
Modern language 103 (FR, GER, CHIN, ITAL, JPNS, MLL, SPAN) or demonstration of comparable level of proficiency	4
HIST 110 Western Civilization: Ancient to Renaissance	4
HIST 111 Western Civilization: Reformation to the Present	4
PSY 201 <i>or</i> PSY 202 General Psychology (D4)*	4
STAT 217 Intro to Statistical Concepts and Methods (B1)*	4
	24

GENERAL EDUCATION (GE)

72 units required, 8 of which are specified in Support.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (16 units)

B1 Mathematics/Statistics * 4 units in Support plus	4
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5)...	4

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective (Not COMS)	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E) * 4 units in Support	0
D5 Upper-division elective	4

Area F Technology Elective (upper division)

(4 units)	4
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64**FREE ELECTIVES..... 24****180**

English

Faculty Office Bldg. (47), Room 32-E
805 756-2596

Department Chair, Kathryn Rummell

Regulus Allen	Robert L. Inchausti
Mary A. Armstrong	David J. Kann
John Battenburg	Douglas Keeseey
Brad Campbell	Carol MacCurdy
Kevin Clark	Paul Marchbanks
William Fitzhenry	Marnie Jo Petray
Sophia Forster	Todd J. Pierce
David Gillette	Johanna E. Rubba
Megan Guise	Debora Schwartz
Linda H. Halisky	Paul Dustin Stegner
John C. Hampsey	Patricia Troxel
Brenda Helmbrecht	Catherine Waitinas

ACADEMIC PROGRAMS

English – BA, MA, Minor

Linguistics – Minor

Teaching English/Second Language – Certificate

Technical Communication – Certificate

The English Department offers Bachelor of Arts and Master of Arts programs, minors in English and Linguistics, and certificates in Teaching English as a Second Language and Technical Communications. Additionally, in cooperation with the School of Education, the department prepares undergraduates and graduates for careers in secondary school teaching. Finally, the English Department provides a wide array of general education courses in composition, literature, film, and creative writing.

An English major or minor is valuable preparation for any career in which critical thinking, nuanced analysis, and clear communication are essential. Many of our majors pursue graduate study in English, education, creative writing, or law; the major provides an excellent foundation for all of these fields. First and foremost, however, students of English are humanists, deeply concerned about the welfare of others. Through imaginatively inhabiting the worlds writers create, English students gain empathy, tolerance, and perspective, habits of mind that will benefit them throughout their lives.

BA ENGLISH

- 60 units upper division GWR
 2.0 GPA USCP

* = Required in Major; also satisfies GE

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

MAJOR COURSES

ENGL 202 Introduction to Literary Studies	4
ENGL/HNRS 251 Great Books of World Literature: Classical and Ancient World (C1)*	4

ENGL 203 Core I: 450–1485	4
ENGL 204 Core II: 1485–1660	4
ENGL 205 Core III: 1660–1789	4
ENGL 290 Introduction to Linguistics	4
ENGL 303 Core IV: 1789–1861	4
ENGL 304 Core V: 1861–1914	4
ENGL 305 Core VI: 1914–Present	4
ENGL 345, 346, 347, 349, 381, or 382 (all USCP)	4
ENGL 300-level electives	12
(see Upper-Division ENGL Units, below)	
ENGL 461 Senior Project (in conjunction with a designated 400-level ENGL course)	1
ENGL 400-level electives (minimum 12 units in literature) (see Upper-Division ENGL Units, below)	20
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SUPPORT COURSE

Foreign language (121 or 122) or demonstration of a comparable level of proficiency	4
	4

GENERAL EDUCATION (GE)

72 units required, 4 of which are specified in Major.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (20 units)

B1 Mathematics/Statistics	8
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5) ...	4

Area C Arts and Humanities (12 units)

C1 Literature *4 units in Major	0
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective (not ENGL)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division)

(4 units)	4
	68

FREE ELECTIVES

35

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Upper-Division ENGL Units

English majors are encouraged to use their upper-division ENGL electives to pursue their interests, including literature, creative writing, linguistics, and/or rhetoric and writing.

Students interested in creative writing may use 17 of their upper-division ENGL units to pursue a fiction- or poetry-writing emphasis. Examples are:

Fiction Writing Emphasis:

- ENGL 387 Fiction Writing (4)
- ENGL 487 Adv. Creative Writing: Fiction (4) (4)
- ENGL 400-level literature course in modern or contemporary fiction (4)
- ENGL 461 Senior Project (1) in conjunction with ENGL 487

Poetry Writing Emphasis:

- ENGL 388 Poetry Writing (4)
- ENGL 488 Adv. Creative Writing: Poetry (4) (4)
- ENGL 400-level literature course in modern or contemporary poetry (4)
- ENGL 461 Senior Project (1) in conjunction with ENGL 488

ENGLISH MINOR

Required Courses	<i>Units</i>
ENGL 253 Great Books III	4
ENGL 302 Writing: Advanced Composition <i>or</i> ENGL 326 Literary Criticism	4
ENGL 339 Introduction to Shakespeare	4
ENGL 390 Linguistic Structure of Modern English <i>or</i> ENGL 395 History of the English Language ...	4
British Literature. <i>Select one of the following</i>	4
ENGL 330, 331, 332, 333, 334, 335 (C4)	
American Literature. <i>Select one of the following</i>	4
ENGL 340, 341, 342, 343, 346, 347 (C4)	
<i>Select one of the following courses</i>	4
ENGL 350, 351, 352 The Modern Novel, Poetry <i>or</i> Drama (C4)	
	28

LINGUISTICS MINOR

Required Courses	<i>Units</i>
ENGL 290 Introduction to Linguistics	4
ENGL 391 Topics in Applied Linguistics	4
ENGL 395 History of the English Language	4
Approved Electives. May include:	16
ENGL 390 Linguistic Structure of Modern English (4) <i>or</i> ENGL 392 English Grammar for Writers and Teachers (4)	
ENGL 495 Topics in Applied Language Study (4)	
ENGL 497 Theories of Language Learning and Teaching (4)	
COMS 416 Intercultural Communication (4) (USCP)	
	28

CERTIFICATE PROGRAMS

Teaching English as a Second Language (TESL).

Provides individuals with specialized training to teach successfully in a wide variety of ESL programs. Both undergraduate and graduate students currently enrolled in any degree program at Cal Poly may pursue this certificate.

The 30-unit TESL program provides a solid background in theoretical and applied linguistics, cross-cultural communication, second language acquisition, and methods of TESL. The program is designed for two career options:

- (1) The Post-Secondary/Adult option prepares individuals to teach in college level and adult education programs. Those wishing to teach at the college level are advised that an MA in English or a related field is the usual minimum requirement for full-time positions.
- (2) The K-12 option prepares individuals having a single or multiple subject credential to teach ESL in elementary and secondary schools.

Technical Communication. Commercial, academic and governmental organizations employ technical communicators as writers, editors, public relations experts, information designers, documentation and project managers, and as mixed media creators. The technical communicator is, first and foremost, an accomplished writer who produces clear, precise, timely, and effective prose. However, technical communicators also are adept at integrating texts and images into cohesive creations that exist equally well on paper and on the computer screen. Technical communicators write online and print computer documentation, create and manage complex sets of technical specifications, write overviews of scientific and technical processes, and produce a diverse range of documents that are used both by the expert and by the layperson. Technical communicators often serve as translators, interpreting the continually changing language of advanced technology into a language we can all easily understand.

The technical communication program is designed for women and men who desire careers in writing, editing, information design, publications management, and media development. The certificate program is available to Cal Poly students who are enrolled in an undergraduate or graduate degree program and is also available through Open University, offered by Cal Poly Continuing Education. This program requires the completion of approximately 30 units of work – roughly the same number of credits required for most minors. A current course list and more information about our program are available in the English Department office and at the Technical Communications Program website:
<http://www.cla.calpoly.edu/techcomm>.

MASTER OF ARTS DEGREE IN ENGLISH**General Characteristics**

This program includes the study of literature, literary criticism, linguistics, and theory of composition. It is designed to provide students with the knowledge and command of English that prepares them specifically for:

- teaching English at the secondary or community college levels;
- further graduate work at other institutions.
- employment in business, industry, and government service where effective communication skills are demanded;
- self-directed development in writing;

Prerequisites

Students admitted to the English MA Program must have a major or minor in English from an accredited institution (or the equivalent, as determined by the English Graduate Committee), have maintained a grade point average of 3.0 for the last 90 quarter units (60 semester units), and a writing sample submitted to the English Graduate Advisor. Non-native speakers should also submit TOEFL scores (Test of English as a Foreign Language). Students without an English major or minor may apply and be admitted conditionally, requiring them to take certain prerequisites prior to taking English graduate classes.

Program of Study

- 48 units of graduate work approved by the English Graduate Coordinator and the Graduate Committee;
- a grade point average of 3.0 or better in all courses taken subsequent to admission;
- two years of a foreign language (e.g., French, Spanish, German) or certification of the equivalent;
- a comprehensive examination at the end of 48 units of study.

All other requirements must be satisfied before the comprehensive examination is taken. Students elect an emphasis within the Master of Arts program: literature, linguistics, or composition.

Application

Application for admission and requests for further information should be directed to the Admissions Office. All applications should include a writing sample (a critical essay on a work of literature) and three letters of recommendation.

MA ENGLISH*Units*

Required Courses	36
ENGL 501 Techniques of Literary Research (4)	
ENGL 502 Seminar in Critical Analysis Historical and Contemporary (4,4)	
ENGL 503 Graduate Introduction to Linguistics (4)	
ENGL 505 Seminar in Composition Theory (4)	
ENGL 511 Seminar in American Literary Periods (4,4)	
ENGL 512 Seminar in British Literary Periods (4,4)	
English Electives	12
Additional ENGL 400-and 500-level courses, to be selected from one of three emphasis areas: literature, composition or linguistics.	
	48

Ethnic Studies

Department Office
Math and Science Bldg. (38), Room 136
805 756-1707

Acting Department Chair, Donald H. Ryujin

Denise A. Isom Elvira Pulitano
Jane L. Lehr Victor Valle
Kathleen J. Martin Grace I. Yeh

ACADEMIC PROGRAMS

Comparative Ethnic Studies – BA
Ethnic Studies – Minor

The Ethnic Studies Department uses inter- and multi-disciplinary approaches to study the lives of Indigenous, African, Latino/a, and Asian peoples in the United States within a global and postcolonial context. The Ethnic Studies curriculum provides students with unique forms of critical inquiry that advance their analysis of race, ethnicity, and cultural difference in an increasingly heterogeneous and complex world. Courses in Ethnic Studies examine how social hierarchies frame access to political power, allocate economic resources, and influence cultural expression. By critically exploring such issues, students develop not only a greater understanding of the legacy of racism, discrimination, and injustices in the United States, but also a greater appreciation for new and emerging knowledge about diverse American peoples and their global and transnational connections.

Housed in the College of Liberal Arts, the Ethnic Studies Department at Cal Poly encourages critical dialogue about race, ethnicity, postcoloniality, and transnationalism across the entire university curriculum, with special focus on concepts that integrate the arts, humanities, and social sciences, as well as the sciences and technology. The department offers a number of courses that fulfill both general education and United States Cultural Pluralism requirements. A minor in Ethnic Studies is open to all majors and provides a useful complement to the differing types of inquiry used in the wide variety of disciplines throughout the University.

ETHNIC STUDIES MINOR

An Ethnic Studies minor provides students with special competence in the histories and experiences of diverse communities and the critical skills with which to understand complex social issues. Students majoring in subjects across the university curriculum find Ethnic Studies useful, particularly when their interests require a deeper understanding of race, ethnicity, and diversity in the United States and beyond. The minor prepares students for careers in education, government, and community organizations; for entrance to professional schools in areas such as law, social work, and health; and for graduate studies in all areas of the arts and sciences.

	<i>Units</i>
Core courses (12)	
ES 112 Race, Culture and Politics in the U.S. (D1) (USCP).....	4
ES 212 Global Origins of U.S. Cultures (D3) (USCP).....	4
ES 320 African American Cultural Images (D5) (USCP) or ES 321 Native American Cultural Images (D5) (USCP) or ES 322 Asian American Cultural Images (D5) (USCP) or ES 323 Mexican American Cultural Images (D5) (USCP).....	4
Approved electives	12
Electives reinforce and enhance student understanding of issues of culture, race, and gender. A minimum of 8 units must be 300–400 level. (See list of approved electives, below, for Comparative Ethnic Studies majors)	
24	

BA COMPARATIVE ETHNIC STUDIES

60 units upper division GWR
 2.0 GPA USCP

* = Required in Major/Support; also satisfies GE
Note: No major or support courses may be taken as credit/no credit.

MAJOR COURSES

ES 112 Race, Culture and Politics in the U.S. (D1)*(USCP)	4
Choose any 3 courses (D3)*(USCP)	12
ES 241 Survey of Indigenous Studies (4)	
ES 242 Survey of Africana Studies (4)	
ES 243 Survey of Latino/a Studies (4)	
ES 244 Survey of Asian American Studies (4)	
ES 350 Gender, Race, Science & Technology (Area F)* (USCP)	4
ES 390 Research Methodology in Comparative Ethnic Studies	4
ES 450 Fieldwork in Comparative Ethnic Studies ..	4
ES 461 Senior Project.....	4
ES electives	20
<i>(Minimum 12 units must be 300-400 level courses offered by the Ethnic Studies Department)</i>	

^{1,2} Approved Electives	24
<i>(Minimum 12 elective units must be 300-400 level. These 24 elective units can be chosen from any unused ES prefix or from the Ethnic Studies related courses listed below. Courses not on the list may still be chosen, but are subject to department approval.)</i>	
AG/BUS/EDES/ENGR/HUM/SCM/UNIV 350;	
AGB 370, 401;	
ANT 201, 325, 415, 433;	
ARCH 320;	
ART 317, 318	
BUS 402, 403, 407, 433, 446;	
CD/EDUC 207;	
COMS 416;	
CRP 334;	
DANC 321;	
ECON 330;	
ECON/HNRS 303;	
EDES 406	
ENGL 345, 346, 349;	
ENGL/HNRS 347	
ERSC/GEOG 325;	
ES/HNRS 212;	
ES/NR 308, 360;	
GEOG 150, 300, 308, 340, 370;	
HIST 206, 214, 310, 314, 339, 340, 341, 405,	
406, 410, 414, 416, 417, 418, 429, 430, 443;	
HIST/HNRS 207, 223;	
HIST/WGS 434, 435;	
HUM 312;	
JOUR 401;	
KINE 255;	
MU 121, 221, 229, 325, 336;	
PHIL 320;	
POLS 225, 229, 310, 320, 324, 325, 328, 339,	
343, 419, 420, 427;	
POLS/UNIV 333;	
PSY 465;	
RELS 302, 306, 307;	
RELS/WGS 370;	
SOC 110, 218, 309, 315, 316, 323, 350, 351;	
SPAN 233, 305, 340, 350, 351, 410;	
TH 320, 390;	
WGS 301, 320, 450	

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SUPPORT COURSES

Language other than English (<i>all 8 units must be in the same language</i>).....	8
STAT 217 Introduction to Statistical Concepts and Methods (B1)*	4
	12

GENERAL EDUCATION (GE)

72 units required, 16 of which are specified in Major/Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (16 units)

B1 Mathematics/Statistics *4 units in Support plus	4
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	

Area B elective (select one course from B1-B5) ... 4

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective (not ES courses).....	4

Area D/E Society and the Individual (12 units)

D1 The American Experience (40404) *4 units in Major	0
D2 Political Economy	4
D3 Comparative Social Institutions *4 units in Major	0
D4 Self Development (CSU Area E)	4
D5 Upper-division elective (not ES courses).....	4

Area F Technology Elective (upper division)

* 4 units in Major..... 0

56**FREE ELECTIVES****36**

Some free electives may need to be 300-400 level to ensure completion of the required minimum of 60 units upper division. Consult college advisor for additional information.

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¹ Be aware that some courses on this list may have prerequisites and that these prerequisites may need to be used as free electives.

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Graphic Communication

Graphic Arts Bldg. (26), Room 201
805 756-1108, FAX 805 756-7118

Head, Harvey Robert Levenson

Penny K. Bennett	Malcolm G. Keif
Michael L. Blum	Brian P. Lawler
Kevin Cooper	Kenneth L. Macro
Lorraine D. Donegan	Xiaoying Rong

ACADEMIC PROGRAMS

Graphic Communication – BS, Minor

The Graphic Communication Department offers a curriculum leading to the Bachelor of Science degree, yet the discipline is both an art and a science. It appeals to students having an interest in creativity, science, technology, and management.

The field of graphic communication represents a large profession, one of the largest in the world. The profession embraces change, requiring those pursuing graphic communication careers to learn new and diverse skills. Graphic communication includes electronic and traditional printing, publishing, packaging, digital imaging, computer graphics, website development, digital photography, printable electronics, and related areas. The discipline includes media and mass communication involving the creation, production, management, and distribution of advertising, marketing, websites, books, magazines, newspapers, catalogs, packages, and other media in printed and digital form. Graduates are in high demand by leading national and international corporations in the graphic communication field.

Beyond acquiring a foundation in graphic communication, students select a specialization among the department's concentrations of design reproduction technology, web and digital media, graphic communication management, packaging graphics, and individualized study in graphic communication.

The Bachelor of Science program in Graphic Communication is accredited by the Accreditation Council for Collegiate Graphic Communications, Inc. (ACCGC), an independent body dedicated to the improvement and recognition of collegiate level curricula in graphic communication. The Graphic Communication Department receives support from an advisory board comprised of industry leaders representing major graphic communication companies.

The Graphic Communication Department occupies 33,000 square feet of laboratories in the Graphic Arts Building. Theory and practice are taught in modern classrooms incorporating the latest in teaching techniques. Fourteen well-equipped laboratories provide students with diverse experiences in the practical aspects of the industry. The

department also houses the Graphic Communication Institute at Cal Poly, providing students with the opportunity to participate in industry research and testing while interacting with industry professionals.

CONCENTRATIONS

Majors select one of the following concentrations based upon their interests and career goals.

Design Reproduction Technology¹. Emphasis on design and technology for print and web. Coursework includes typography, branding, color theory, and design for packaging and for the publication of books, magazines, newspapers, and web sites.

Web and Digital Media. Emphasis on the latest trends in web development and the production and distribution of digital media. In addition to major requirements, coursework includes the study of web technology and design, digital audio, animation, photography, interactive entertainment, and video. The concentration leads to careers in web development, digital media production and management, and opportunities with hardware and software manufacturers that service the graphic communication industry.

Graphics for Packaging. Designed for students who desire a career in the growing field of package graphics and printing. This program provides students with the opportunity to learn all components of graphic preparation for packaging, print reproduction and conversion while also providing aspects of structural design and food packaging. Consumer and industrial print packaging is addressed.

Graphic Communication Management. A flexible program for students interested in management careers in the graphic communication industry. In addition to the major requirements in graphic communication, coursework includes multiple business management related disciplines. Graduates are in high demand throughout the country from publishing, design, printing, packaging, and web-based commerce firms, including their customers and suppliers.

Individualized Course of Study. An opportunity to pursue a course of study that meets a student's individual needs and interests. This concentration consists of 29 units; a minimum of 18 units must be upper division and a minimum of 8 units must be Graphic Communication. The student selects the courses in consultation with the

¹ The Graphic Communication Department's Design Reproduction Technology concentration focuses on the technical and electronic aspects of transforming design for reproduction in print and digital media. The concentration focuses on printing, web development, publishing, packaging, digital imaging, computer graphics, and related areas of mass media preparation and production.

The Art and Design Department's Graphic Design concentration focuses on creative problem-solving and development of design and layout skills. The Graphic Design concentration leads to positions such as graphic designer, web designer, art director and creative director for advertising agencies, design studios and corporate design departments.

concentration coordinator and department head, and provide written justification for the courses and the way they constitute a cohesive, integrated program of study. The list of courses serves as a contract between the student and the Graphic Communication Department.

MBA, Graphic Communication Document Systems Management Specialization

In cooperation with the Orfalea College of Business, a student can earn an MBA with a graphic communication emphasis in document systems management. This program is designed to prepare professionals having diverse backgrounds with a strong and advanced business orientation along with a grounding in graphic communication.

BS GRAPHIC COMMUNICATION

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

* = Required in Support; also satisfies GE

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

MAJOR COURSES

GRC 101 Introduction to Graphic Communication	3
GRC 201 Digital Publishing Systems	3
GRC 202 Digital Photography	3
GRC 203 Digital File Preparation and Workflow	3
GRC 204 Intro to Contemporary Print Mgmt/Mfg.	4
GRC 211 Substrates, Inks and Toners	4
GRC 218 Digital Typography	4
GRC 316 Flexographic Printing Technology	3
GRC 320 Managing Quality in Graphic Comm	4
GRC 324 Binding, Finishing and Distrib Processes	3
GRC 328 Sheetfed Printing Technology	4
GRC 329 Web Offset and Gravure Printing Tech.	3
GRC 338 Digtl Content Mgmt/Variable Data Pub.	4
GRC 361 Marketing and Sales Management for Print/Digital Media	4
GRC 402 Digital Printing and Emerging Technologies in Graphic Communication	3
GRC 403 Estimating for Print/Digital Media	4
GRC 411 Strategic Trends and Costing Issues in Print and Digital Media	4
GRC 422 Human Resource Management Issues for Print/Digital Media	4
GRC 460 Research Methods in Graphic Comm	2
GRC 461 Senior Project	3
GRC 472/GRC 473/GRC 485	4
Concentration courses (see below)	29
	102

SUPPORT COURSES

PSC 101/PHYS 104/PHYS 121 (Area B)*	4
CHEM 110 World of Chemistry <i>or</i> CHEM 111 Survey of Chemistry (B3&B4)*	4/5
MATH 118 Pre-Calculus Algebra (B1)* (MATH 116 & MATH 117 substitute)	4
STAT 217 Intro to Stat Concepts/Methods (B1)*	4
	16/17

GENERAL EDUCATION (GE)

72 units required, 16 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science	4
B3 Physical Science * 4 units in Support	0
B4 One lab taken with B3 course	
B5 elective * 4 units in Support (Area B)	0

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

(Not GRC)	4
	56

FREE ELECTIVES	5-6
	180

CONCENTRATIONS (select one)

Design Reproduction Technology Concentration

ART 105 Foundation: Color Theory	4
ART 106 Foundation: 2-Dimensional Design	4
GRC 337 Consumer Packaging	3
GRC 339 Web Design and Production	4
GRC 439 Book Design Technology	4
GRC 440 Magazine and Newspaper Design Tech.	4
Select 6 units from the following	6
GRC 322 Advanced Digital Typography (3)	
GRC 331 Color Management and Quality Analysis (4)	
GRC 429 Digital Media (3)	
GRC 451 Mgmt Topics in Graphic Comm. (3)	
GRC 452 Emerging Technologies in Graphic Communication (3)	
GRC 453 Design Reproduction Topics in Graphic Communication (3)	
Other courses as approved by academic advisor	
	29

Graphics for Packaging Concentration

GRC 331 Color Management & Quality Analysis	4
GRC 337 Consumer Packaging	3
GRC 357 Specialty Printing Technologies	3
GRC 421 Production Mgmt for Print/Digital Media	4
FSN 230 Elements of Food Processing	4

FSN 354 Packaging Function in Food Processing ...	3
IT 330 Fundamentals of Packaging	4
Approved elective. <i>Select one course from:</i>	4
FSN 335 Food Quality Assurance (4)	
IT 341 Plastic Processes and Applications (4)	
IT 408 Paper and Paperboard Packaging (4)	
IT 409 Machinery for Packaging (4)	
IT 435 Package Development (4)	
IT 457 Radio Frequency Identification (4)	
IT 475 Packaging Performance Testing (4)	
Other courses as approved by academic advisor	
	29

Graphic Communication Management Concentration

GRC 421 Production Mgmt for Print/Digital Media	4
BUS 207 Legal Responsibilities of Business	4
BUS 212 Financial Accounting for Non-business Majors.....	4
BUS 382 Organizations, People and Technology	4
COMS 213 Organizational Communication	4
Select 9 units from the following:	9
GRC 337 Consumer Packaging (3)	
GRC 451 Management Topics in Graphic Communication (3)	
GRC 452 Emerging Technologies in Graphic Communication (3)	
BUS 303 Intro to International Business (4)	
BUS 310 Introduction to Entrepreneurship (4)	
Other courses as approved by academic advisor	
	29

Web and Digital Media Concentration

CSC 171 Introduction to Interactive Entertainment	4
GRC 331 Color Management & Quality Analysis...	4
GRC 339 Web Design and Production.....	4
GRC 429 Digital Media	3
Approved electives Set 1	6
<i>Select 6 units from the following:</i>	
CSC courses (any, up to 6 units)	
GRC 400 Special Probs/Adv Undergrads (1-2)	
GRC 451 Management Topics in GRC (3)	
GRC 452 Emerging Technologies in GRC (3)	
GRC 453 Design Repro Topics in GRC (3)	
Approved electives Set 2	8
<i>Select 8 units from the following:</i>	
ART 121 Basic Digital Photography (4)	
ART 383 Digital Video (4)	
ART 388 Web Design (4)	
ART 484, Animation, Video, and Interactive Design (4)	
ART 488 Advanced Web Design (4)	
ENGL 411 New Media Arts I (4)	
ENGL 412 New Media Arts II (4)	
MU 311 Sound Design: Technologies (4)	
MU 312 Sound Design: Recording (4)	
	29

Individualized Course of Study

A minimum of 18 units must be upper division and a minimum of 8 units must be Graphic Communication. The student selects the courses in consultation with concentration coordinator and department head, and provide written justification for the courses and the way they constitute a cohesive, integrated program of study. 29

GRAPHIC COMMUNICATION MINOR

A minor in Graphic Communication benefits students interested in pursuing careers in graphic communication or who anticipate using graphic communication in another career. Students in the minor have a competitive edge when applying for many jobs by understanding concepts, and gaining knowledge and skills in web and print media. Additionally, students develop an understanding of the interface between design and technology, web site and document preparation, typography, and specifying the processes and materials for a broad range of printing, web, digital media, and publishing applications. Information and application forms for this minor are available in the Graphic Communication Department office.

Units

Core Courses

GRC 101 Intro. to Graphic Communication	3
GRC 202 Digital Photography.....	3
GRC 212 Substrates, Inks and Toners: Theory	3
GRC 218 Digital Typography	4
GRC 325 Binding and Finishing Processes: Theory	2
GRC 328 Sheetfed Printing Technology	4
GRC 377 Web and Print Publishing (Area F)	4
Approved Electives	3

Select 3 units from the following:

GRC 331 Color Management and Quality Analysis (4)	
GRC 337 Consumer Packaging (3)	
GRC 357 Specialty Printing Technologies (3)	
GRC 388 Sustainable Communication Media (4)	
GRC 451 Management Topics in Graphic Communication (3)	
GRC 452 Emerging Technologies in Graphic Communication (3)	
GRC 453 Design Reproduction Topics in Graphic Communication (3)	
GRC 472 Applied Graphic Communication Practices (2) (repeatable)	

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History

Faculty Office Bldg. (47), Room 27C
805 756-2543

Department Chair, Andrew D. Morris

Lewis W. Call	Matthew Hopper
George Cotkin	Molly J. Loberg
Robert C. Detweiler	Kathleen S. Murphy
Christina E. Firpo	John Oriji
Manzar Foroohar	Joel J. Orth
Craig Harlan	James Tejani
Paul Hiltbold	Tom R. Trice

ACADEMIC PROGRAMS

Asian Studies – Minor

History – BA, MA, Minor

Historians study the past in its variety and complexity. With such an analysis, students of history gain multiple perspectives on the present and an aptitude to plan intelligently for the future. Although the lessons to be learned from the past are rarely simple, solutions to present-day problems rest on comprehension of historical forces and events. History deepens our understanding of other peoples and cultures. All courses offered in the History Department seek to examine the issues of race, gender, class, and cultural diversity.

A degree in history is excellent preparation for students interested in a teaching career, the legal profession, or advanced work in the discipline. Students wishing to become business executives, administrators, and public servants profit immensely by gaining the methodological skills of the historian. Historians learn to gather, synthesize, analyze, and interpret evidence; they become skilled in presenting their conclusions to a general audience in a lucid and logical manner.

The study of history and its method prepares students for a wide range of careers while also sensitizing them to the complexity and diversity of the past and present. History is an excellent foundation for a broadly based education in the liberal arts.

ASIAN STUDIES MINOR

Provides interdisciplinary understanding of Asia – particularly its rich and varied histories, arts, languages, philosophies, religions and social patterns. Details and application forms are available from the History Department.

Required Courses	Units
HIST 310/HIST 316/HIST 319 (D5).....	4
PHIL 320 Asian Philosophy (C4) <i>or</i> RELS 301 Religions of Asia (C4).....	4
CHIN 103 Elementary Chinese III <i>or</i> JPNS 103 Elementary Japanese III.....	4
Approved Electives	16
(minimum 8 units upper-division)	
<i>Lower Division:</i>	
ANT 201 (D3); ES 244 (D3); GEOG 150 (D3); HIST 221 (D3), 222 (D3), 223 (D3); LA 211 (C3); CHIN 121, 122; POLS 225	
<i>Upper Division:</i>	
ARCH 320 (C4); ART 317, ART 318 Asian Art Topics (C4) (Topics: Buddhist Art, Early Chinese Art, Technology and Mythology); ES 322 (D5); HIST 416, 417, 418, 419, 422, 423; HUM 310 Humanities in World Cultures (C4) (Topics: China, Japan, Thailand); POLS 328 Politics of Developing Areas (Topic: East Asia); RELS 306 (C4), 307 (C4); SOC 350	

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HISTORY MINOR

Students choosing to add a strong historical dimension to their major field may enroll in the minor program in history. The curriculum stresses reading and writing skills as well as the ability to weigh evidence and think critically. Details and application forms are available from the History Department.

Required Courses	Units
HIST 303 Research and Writing Seminar	5
Select from the following lower-division courses: ..	12
American History (D1): HIST 206, 207 Political Economy (D2): HIST 213, 214 World History – Early (D3): HIST 210, 221 World History – Modern (D3): HIST 222, 223 Western Civ – Ancient to Renaissance: HIST 110 Western Civ – Reformation to Present: HIST 111	
History electives	12
Select from 300–400 level History courses	

29

BA HISTORY

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

* = Required in Major; also satisfies GE
 Note: No major or support courses may be taken as credit/no credit.

MAJOR COURSES

HIST 100 Introduction to the Study of History.....	2
HIST 110 Western Civ: Ancient to Renaissance.....	4
HIST 111 W. Civ: Reformation to the Present.....	4
HIST 206 American Cultures or HIST 207 Freedom and Equality in American History (D1)* (USCP)	4
HIST 213 Mod Political Econ or HIST 214 Political Econ of Latin America & Middle East (D2)*.....	4
World History: Select 4 units from the following:	
HIST 221, 222, 223 (D3)*.....	4
HIST 303 Research and Writing Seminar in History	5
HIST 304 Historiography.....	4
HIST 460 Senior Project I.....	2
HIST 461 Senior Project II.....	2
History electives.....	24
<i>Select 24 units upper division HIST courses, minimum 12 units at the 400 level (excluding HIST 400, 467, 468, 485, 495) and minimum 12 units to be selected from the following Non-U.S., Non-European courses:</i>	
HIST 308, 309, 310, 314, 316, 317, 319, 339, 340, 341, 414, 416, 417, 418, 419, 420, 421, 422, 423, 429, 430, 442, 443, 444, 445, 459.	
Foreign language requirement, select one: FR 121, CHIN 121, GER 121, SPAN 121, MLL 121 (or equivalent).....	4
	<hr/>
	63

SUPPORT COURSES

¹ Any upper division courses (300-400, including History).....	24
	<hr/>
	24

GENERAL EDUCATION (GE)

72 units required, 12 of which are specified in Major.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing.....	4
A2 Oral Communication.....	4
A3 Reasoning, Argumentation, and Writing.....	4

Area B Science and Mathematics (20 units)

B1 Mathematics/Statistics.....	8
B2 Life Science.....	4
B3 Physical Science.....	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5)...	4

Area C Arts and Humanities (16 units)

C1 Literature.....	4
C2 Philosophy.....	4
C3 Fine/Performing Arts.....	4
C4 Upper-division elective.....	4

Area D/E Society and the Individual (8 units)

D1 The American Experience (40404) * 4 in Major	0
D2 Political Economy * 4 in Major.....	0
D3 Comparative Social Institutions * 4 in Major..	0
D4 Self Development (CSU Area E).....	4
D5 Upper-division elective (Not HIST courses)....	4

Area F Technology Elective (upper division) (4 units) 4
60

¹ FREE ELECTIVES..... 33

Upper division GE courses taken for a letter grade satisfy support course requirements which would cause free electives to become 45 rather than 33 units. Consult college advisor for additional information.

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MASTER OF ARTS DEGREE IN HISTORY

General Characteristics

The program in history emphasizes concentrated study in area specialties, with students gaining a thorough grounding in the latest historiography. In addition, the program maintains that historical study must be predicated upon sustained research, engagement with historical problems, and written communication. Completion of the MA program in history will allow students the following options:

- Teach history at the elementary, secondary, or community college level.
- Give students the critical skills and knowledge to enter into the worldwide information economy.
- Allow community members to expand their historical knowledge.
- Prepare students for transfer to Ph.D. programs at other universities.

Prerequisites

Admission to the MA program requires:

1. Possession of an undergraduate degree from an accredited college or university.
2. An overall grade point average of 3.0 for the last 90 units of their undergraduate work.
3. Submission of a writing sample, in the form of a senior project or upper division paper.
4. Related undergraduate coursework. Students without an undergraduate degree in history are required to demonstrate adequate preparation for graduate study in history, as determined by the Graduate Coordinator.

Program of Study

- 48 units of graduate work in areas specified (49 units for those students writing a MA Thesis).
- a grade point average of at least 3.0 after 12 units of graduate coursework.
- MA Thesis or Comprehensive Examinations in two distinct areas of study.

¹ If upper-division GE courses are used to satisfy Major or Support requirements, additional units may be required to complete the 180 total unit requirement.

Foreign Language Study

Students are encouraged to learn and use foreign languages in the MA program. Students who plan further graduate study in history are particularly encouraged in this direction since proficiency in two foreign languages is usually required in doctoral programs.

Applications

Applications for admission and requests for further information should be directed to the Admissions Office or the Graduate Coordinator of the MA History program. All applications should include a writing sample (preferably an extended research paper) and undergraduate transcripts.

MA HISTORY

There are two options for the MA degree in History, Comprehensive Exam or Thesis.

	<i>Units</i>
Required Courses	
HIST 504 Graduate Study in History	4
History Seminars	20
<i>Select 5 courses from the following. Each is repeatable up to 12 units.</i>	
HIST 505 Grad. Sem. in U.S. History (4-12)	
HIST 506 Grad. Sem. in Modern European History (4-12)	
HIST 507 Grad. Sem. in East Asian History (4-12)	
HIST 508 Grad. Sem. in Latin American History (4-12)	
HIST 509 Grad. Sem. in African History (4-12)	
HIST 510 Grad. Sem. in Comparative History (4-12)	
HIST electives (400-500 level)	16
<i>400-level courses include extra work for graduate students. (All courses must be taken after under-graduate degree has been awarded. Undergraduate courses or their equivalent may not be repeated.)</i>	
Culminating Experience	8/9
Comprehensive Exam Option (total 48 units)	
HIST 512 Supervised Reading for Comprehensive Exams (2) (2)	
400-500 HIST electives (4)	
Thesis Option (total 49 units)	
HIST 599 Thesis (3) (3) (3)	
	48/49

Humanities

Faculty Office Building (Bldg. 47), Room 31
805 756-2359

Interim Coordinator, Debra Valencia-Laver

ACADEMIC PROGRAMS

Media Arts and Technologies – Minor
Values, Technology and Society – Minor

The Humanities Program offers interdisciplinary and international classes in a wide variety of subject areas, from applied practice in media arts and technologies, to the study of ethical issues involved in technology, to courses that examine various cultures such as China, Japan, and South Africa. International courses complement Cal Poly-sponsored study abroad programs in London, Spain, Thailand, and Latin America. Many humanities classes satisfy University general education and breadth requirements.

The program also offers two interdisciplinary minors that allow students to actively engage in the study of technology: the Media Arts and Technologies Minor and the Values, Technology and Society Minor. Both minors are available to students throughout the University, regardless of students' technical backgrounds.

MEDIA ARTS AND TECHNOLOGIES MINOR

The Media Arts and Technologies Minor recognizes that today's students are citizens of the information age. The purpose of the minor is to introduce and develop ways students can analyze, critique, historicize, invent, think and use various electronic media, thus encouraging a bridge between theory and practice. By taking a multidisciplinary approach, Cal Poly students learn to analyze, construct and understand media; acquire teamwork skills across disciplines; and practice the leadership, problem solving, collaboration, critical thinking and communication skills that help prepare them for a broad range of academic or professional careers.

The minor allows students to select from among courses that emphasize technical design and narrative construction. The minor includes a three-course core; within that core is a two-course capstone experience that builds upon students' foundational knowledge and skills, providing them with the opportunity to collaborate on the creation of a project in both pre-production and production phases. Students practice professional techniques for building an interactive narrative designed for different forms of presentation. Students also learn how to succeed in professional collaborative, results-based development and production processes.

Required Courses	<i>Units</i>
HUM 240 Intro to Media Arts & Technologies.....	4
HUM 340 Media Arts & Tech: Storytelling.....	4
HUM 341 Media Arts & Tech: Cinematic Process	4
Approved Electives:	16
Select 16 units from one or more of the following categories; at least 8 units must be upper division	
<i>Technical Design:</i>	
ARCH 460;	
ART 101 (C3), 105, 106, 121, 182, 183, 324, 380, 383, 388, 439, 484, 489;	
CSC 171 <i>or</i> CSC/CPE 123;	
CSC/CPE 471, 473, 476, 478;	
GRC 202, 218, 338, 339, 429, 452;	
ENGL 210, 411, 412;	
MU 311, 312, 352;	
TH 230, 430, 434	
<i>Narrative Construction/Film & Media Studies:</i>	
ART 314 (C4);	
COMS 317, 385, 419;	
ENGL 370 (C4), 371 (C4), 372 (C4), 411, 412;	
ES 340 (C4);	
HIST 418, 422;	
HUM 320 (C4);	
JOUR 203, 285, 302, 303, 390;	
MLL/CHIN/FR/GER/SPAN 470 Special Topics:	
Film Topics;	
POLS 347;	
TH 210 (C3);	
WGS/ART 316	

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VALUES, TECHNOLOGY AND SOCIETY MINOR

The purpose of the Values, Technology and Society Minor is to increase students' understanding of how technology shapes and influences modern life. Students develop an increased understanding of the social, environmental, economic and political implications of technology in the twenty-first century. They are able to think critically about the intellectual, moral and historical issues that technological developments pose for the future of humankind.

The courses in the minor provide an overview of technological issues, with an emphasis on the impacts technology has on organizations and society. Technology's impact on society is examined from a values and public policy perspective. Students are able to tailor their minor program to focus on specific issues through the selection of electives in technology, society and values areas.

Required Courses	<i>Units</i>
ENGR 302 Transportation and Manufacturing in the Twenty-First Century (F).....	4
HUM 303 Values and Technology (C4).....	4
PHIL 321 Philosophy of Science (C4)	4
IME 320 Human Factors and Technology (F).....	4

Approved Elective Courses: 12

Select 12 units, at least one course from each category

Technology:

- AERO 310 (Area F);
- BRAE 348 (Area F);
- CSC 302 (Area F);
- HIST 354 (Area F);
- ME 321 (Area F);
- PSC 307 (Area F), 320 (Area F);

Society:

- ANT 360 (D5);
- CRP 211;
- NR 141;
- POLS 451;
- PSY 311 (D5), 494

Philosophy and Values:

- ENVE 330;
- GEOG 333;
- HIST 359 (Area F);
- HUM 302 (Area F);
- PHIL 339 (C4), 340 (C4)

Journalism

Graphic Arts Bldg. (26), Room 228
805 756-2508

Department Chair (Interim), Harvey Robert Levenson

Teresa Allen
Bill Loving

George Ramos
Brady Teufel

ACADEMIC PROGRAM

Journalism – BS

The Journalism Department offers a professional program leading to the Bachelor of Science degree in Journalism. All majors must complete the basic journalism core courses in addition to a sequence of courses selected from an identified track and a list of electives from which they must choose in consultation with an academic advisor.

Of the 180 units required for a bachelor's degree, 116 quarter units must be taken in courses outside the major area of journalism/mass communication/communication. Each student is strongly encouraged to take a modern language to satisfy his or her elective units. For media-related courses offered outside the major, students are required to consult with their academic advisor before enrolling in these classes.

All journalism majors are expected to serve as staff members of departmental communications media, including *Mustang Daily*, the student newspaper; CCPR, the student-run public relations firm; KCPR, the FM-stereo radio station; or the news and programming operations of CPTV, Cal Poly's TV station. They are also expected to participate in professional and scholarly organizations in their interests, in addition to applying acquired skills and developing professional abilities in an approved media internship. The department sponsors student chapters of the Society of Professional Journalists, Radio-Television News Directors Association, and the Public Relations Student Society of America.

BS JOURNALISM

- 60 units upper division
- 2.0 GPA

- GWR
- USCP

MAJOR COURSES

JOUR 203 News Reporting and Writing.....	4
JOUR 219 Multicultural Society and the Mass Media (USCP)	4
JOUR 285 Introduction to Web-Based Journalism	4
JOUR 302 Mass Media Law	4
JOUR 401 Global Communication	4
JOUR 402 Journalism Ethics	4
JOUR 444 Media Internship.....	3
JOUR 460 Senior Project	3

Follow one of the following tracks	18
Broadcast Track (18)	
JOUR 333 (4), 346 (4), 348 (4), 353 (3)	
News Editorial Track (18)	
JOUR 233 (4), 304 (4), 352 (3), 407 (4)	
Public Relations Track (18)	
JOUR 312, 333 or 304, 342, 413, 415	
JOUR electives.	
Maximum 4 units of lower division.	
a. Media Technologies. Select 8 units from	
JOUR 303, 390, 410	
b. Select 8 units from	
JOUR 201, 205, 331, 470.....	16
	64

SUPPORT COURSES

Students are strongly encouraged to take modern language courses as part of their non-journalism electives. These can be in any acceptable language discipline. No journalism or mass communication courses.....	20
Department-approved upper division electives	24
At least 12 units must be in the College of Liberal Arts and/or College of Science and Mathematics. All courses must have a lecture component. Courses must be approved by your academic advisor and department chair.	
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GENERAL EDUCATION (GE)

- 72 units required.
- See page 39 for complete GE course listing.
- Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (20 units)

B1 Mathematics/Statistics	8
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5) ...	4

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

	4
	72

FREE ELECTIVES

	0
	180

Modern Languages & Literatures

Faculty Office Bldg. (47), Room 28
805 756-1205

Department Chair (Interim), John J. Thompson

Sophia Chen Karolin Machtans
Kevin Fagan Karen Muñoz-Christian
Brian Kennelly Gloria Velásquez

ACADEMIC PROGRAMS

French – Minor
German – Minor
Modern Languages and Literatures – BA
Spanish – Minor

The Modern Languages and Literatures Department offers coursework in French, German, Spanish, and beginning and intermediate Mandarin Chinese, as well as elementary Italian and Japanese. Instruction at all levels emphasizes communicative competence to prepare students for cultural, educational, literary and professional needs in California, throughout the United States and abroad. Audiovisual components are used in the classroom as well as in the language laboratory.

Students who wish to enroll in Spanish courses for the first time at Cal Poly, numbered 101 through 124, must take the Spanish Placement Examination prior to enrolling. Students who have never studied Spanish are exempt. Students should contact the Modern Languages and Literatures Department for test dates. The department strongly encourages students to follow its placement formula: one year of high school French, German, Italian, Mandarin Chinese or Japanese is equivalent to one quarter at Cal Poly.

The department supports the concept of international education and encourages students to investigate all opportunities for overseas study. The department works closely with the CSU's International Programs to insure that all courses taken in an overseas experience count toward either major, support, minor, general education and/or free electives. The department also sponsors summer and single term (fall quarter) experiences abroad. Students interested in studying abroad should consult with the International Education and Programs Office and their assigned academic advisor.

The department is active in training students who wish to obtain a bilingual teaching credential. It administers the Bilingual Proficiency Examination in Spanish.

The department also supports such student clubs as C.U.L.T.U.R.E., the French Club, the German Club, the Circolo Italiano, the Latin American Studies Association,

MEXA (Movimiento Estudiantil Xicano de Aztlán), and Tomo Dachi Kai.

The PolyLingual International Resource Center (PIRC) is the department's digital language laboratory and multimedia production facility. Students and faculty members use the Center for class activities and presentations, and for drop-in language practice and curriculum development. The PIRC also houses the College of Liberal Arts Multi-Media Center (CLAMM), where students and faculty may create a cadre of projects for professional and academic development.

The curriculum for the Bachelor of Arts degree provides strong preparation for a career in single-subject teaching, multiple-subject teaching, business, government, and international affairs; it also provides preparation for graduate study in business administration, Chicano/Latino studies, comparative literature, ethnic studies, languages, Latin American studies, and other fields in the humanities social sciences, and various service areas.

FRENCH MINOR

Required courses	Units
FR 122 Intermediate French	4
FR 233 Critical Reading in French Literature (C1)	4
¹ FR 301 Adv. French Composition and Grammar <i>or</i>	
¹ FR 302 Adv. French Conversation/Grammar	4
Approved electives, chosen from the following:	12
FR 301, 302, 305 (C4) (repeatable to 8 units),	
350 (C4), 470 (repeatable to 8 units);	
FR/FSN 322;	
HUM 310 (French) (C4);	
MLL 400, 470	
	24

GERMAN MINOR

Required courses	Units
GER 122 Intermediate German	4
GER 233 Critical Reading-German Literature (C1)	4
¹ GER 301 Adv. German Composition/Grammar <i>or</i>	
¹ GER 302 Adv. German Conversation/Grammar	4
Approved electives, chosen from the following:	12
GER 301, 302, 305 (C4) (repeatable to 8 units),	
350 (C4), 470 (repeatable to 8 units);	
HUM 310 (German) (C4);	
MLL 400, 470	
	24

SPANISH MINOR

Required courses	Units
SPAN 122 Fundamentals of Spanish <i>or</i>	
SPAN 123 Spanish for Heritage Speakers	4
SPAN 124 Composition in Spanish	4
SPAN 233 Intro. to Hispanic Readings (C1)	4

¹ Not repeatable as elective units.

Approved electives, chosen from the following: 12

SPAN 301, 302, 303, 305 (C4) (repeatable to 8 units), 340 (C4) (USCP), 350 (C4), 351 (C4) (USCP), 390, 402, 410, 416, 470;

HUM 310 (Spain, Mexico or Latin America) (C4), 312 (C4) (USCP);

MLL 400, 470

24

BA MODERN LANGUAGES & LITERATURES

- 60 units upper division GWR
- 2.0 GPA USCP

* = Required in Major; also satisfies GE

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

MAJOR COURSES

Primary Language

SPAN 121 Fundamentals of Spanish I.....	4
SPAN 122 Fundamentals of Spanish II or SPAN 123 Spanish for Heritage Speakers.....	4
SPAN 124 Composition in Spanish	4
SPAN 205 Introduction to Spanish Linguistics	4
SPAN 233 Intro. to Hispanic Readings (C1)*.....	4
SPAN 301 Advanced Composition in Spanish	4
SPAN 305 Significant Writers in Spanish	4
SPAN 402 Advanced Linguistics in Spanish	4
SPAN 410 Advanced Literature in Spanish	4
SPAN 416 Don Quixote.....	4
MLL 210 Intro. to Research Methods	4
MLL 460 Senior Project.....	4
Primary language/culture electives (300-400 level)	12

Select 12 units from the following:

- AG/BUS/EDES/ENGR/HUM/SCM/UNIV 350;
- AGB 318;
- ANT 325, 330, 360, 401, 415;
- ART 311, 312, 313, 315, 318;
- ART/WGS 316;
- BUS 402, 403, 410;
- CD 350; CD/PSY 306;
- COMS 308, 311, 315, 416, 421;
- DANC 321;
- ECON 330; ECON/HNRS 303;
- EDUC 423, 433;
- ENGL 301, 302, 326, 346, 390, 391, 459, 495, 497, 498, 499, 503;
- ENGL/HNRS 380;
- ES 300, 321, 322, 323, 326, 330, 340, 380;
- ES/NR 360;
- FR 301[†], 302[†], 305^{††}, 350^{††}, 470^{††};
- FR/FSN 322;
- GEOG 308, 360, 370;
- GER 301[†], 302[†], 305^{††}, 350^{††}, 470^{††};
- HIST 306, 310, 314, 316, 319, 323, 339, 340, 341, 416, 417, 418, 420, 437, 451, 452, 454;
- HUM 310^{††}, 312, 318; HUM/UNIV 361;
- LS 310;
- MLL 470^{††};
- PHIL 312, 313, 315, 320, 336, 350, 423;

- POLS 310, 322, 324, 325, 339, 346, 429;
- PSY 315, 458; PSY/WGS 314;
- RELS 304, 306, 307, 310, 311;
- RELS/WGS 370;
- RPTA 314;
- SOC 309, 313, 315, 316, 350, 431;
- SOC/WGS 311;
- SPAN 302, 305^{††}, 340, 350^{††}, 410^{††}, 470^{††};
- TH 350, 390;
- WGS 320, 450; WGS/ES 350

Secondary Language Concentration

Select secondary language in either French, German or other language as approved by Department Chair.

Introductory courses (101, 102, 103).....	12
Intermediate courses (121, 122, 233).....	12
¹ Advanced language course (300-400 level)	4
	88

GENERAL EDUCATION (GE)

72 units required, 4 of which are specified in Major.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (20 units)

B1 Mathematics/Statistics	8
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5)...	4

Area C Arts and Humanities (12 units)

C1 Literature *4 units in Major.....	0
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective (Not SPAN, FR, GER).....	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division)

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² FREE ELECTIVES

24

(minimum 8 units must be 300-400 level)

180

[†] May be used as an elective, if not being used as part of required courses. May not be counted twice.

^{††} May be counted multiple times if taken with different subtitles.

¹ Advanced language course (300-400 level) or HUM 310 Humanities in World Cultures (either "Culture of France" or "Culture of Germany").

² If upper-division GE courses are used to satisfy Major or Support requirements, additional upper division coursework may be required to satisfy the University's 60-unit upper division requirement.

Music

Davidson Music Center (45), Room 129
805 756-2406 FAX 805 756-7464
www.music.calpoly.edu
email: music@calpoly.edu

Department Chair, W. Terrence Spiller

David Arrivé	Kenneth S. Habib
Antonio G. Barata	Alyson McLamore
Meredith Brammeier	Andrew McMahan
Thomas H. Davies	Paul Rinzler
India D'Avignon	Craig H. Russell

ACADEMIC PROGRAMS

Music – BA, Minor

The Bachelor of Arts in Music introduces a student to the role of music in today's world, helps form personal goals, and provides the discipline, skills and knowledge to accomplish those goals. The program develops musical skills, encourages creativity, and cultivates vision for the future. The University's polytechnic emphasis also provides an excellent opportunity to explore music in conjunction with a wide range of other fields. Graduates are prepared to begin specialized study at the graduate level and to enter a wide variety of professional careers.

The Music Department is a valuable resource for the non-music major. Its courses and performing ensembles are open to all students who wish to enrich their lives through music. Qualified students may explore the subject in depth by minoring in music.

The Music Department also serves as a cultural center for both the university and the community through a program of public performances by student and faculty groups and through clinics, workshops, concerts, and lectures by outstanding individuals from outside the university.

Acceptance into the music major program requires a demonstrated ability on an instrument, in voice, or talent through other musical media, plus the ability to read music at a fundamental level.

Department Requirements

1. All new students will take placement examinations in piano skills, music theory, and musicianship. Students who audition in person for the major will take the placement exams at the time of their audition. Students who submit a recording with their application will need to contact the Music Department to schedule the placement examinations before their first term of enrollment. Separate auditions are required for assignment to performing ensembles. Students who

wish to take piano, theory, or musicianship courses beyond the beginning level must pass the appropriate placement test. Regardless of courses taken prior to coming to Cal Poly, students are required to remedy deficiencies before enrolling in advanced music theory or music history courses.

2. Each music major enrolled in at least 6 units of music courses must include a performance ensemble each quarter in order to qualify for applied study of voice or instruments. (See the Department for details regarding appropriate ensembles and applied study policies.) Each student enrolled in private instruction must take an applied music jury at the end of Spring Quarter.
3. Each student is required to attend a minimum of 6 concerts per quarter.
4. At the end of the sixth quarter of enrollment (third quarter of enrollment for transfer students) a student must take a mid-point evaluation to verify progress and potential in music. This test includes the following:
 - private performance skills (should be at the MU 250 level; tested through a jury)
 - musicianship skills up through the level of Musicianship III
 - knowledge of music theory up through the level of Theory II
 - piano proficiency (see No. 5 below)
5. Each student must pass examinations in six areas of piano proficiency (repertoire, sightreading, transposition, harmonization of a melody, accompanying, score-reading) as part of the mid-point evaluation.
6. Use of Music Department instruments, scheduled practice rooms, electronic studio, or lockers requires a Music Use Fee. See the Music Department Office for details.
7. It is important that each student stay closely in touch with his/her advisor in order to progress through the music major program in the most efficient manner.
8. The Music Department is not able to offer the full complement of performing ensembles and private instruction during the Summer Quarter; it is important to take this into consideration when planning coursework for completion of the major.

A music major handbook giving complete details of the program, policies and forms is available from the Music Department.

BA MUSIC

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

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

MAJOR COURSES

MU 103 Music Theory I: Diatonic Materials	4
MU 104 Musicianship I	2
MU 105 Music Theory II: Chromatic Materials	4
MU 106 Musicianship II	2
MU 108 Musicianship III	2
MU 121 Introduction to Non-Western Music	4
MU 303 Music Theory III: Adv. Chromaticism	4
MU 305 Music Theory IV: Contemporary Practices	4
MU 311 Sound Design: Technologies	4
MU 320 Music Research and Writing	4
MU 325 (USCP)/MU 326/MU 336/MU 470	4
MU 331 Music Middle Ages and Renaissance	4
MU 332 Music Baroque and Early Classic Eras	4
MU 431 Music of the Classic and Romantic Eras ...	4
MU 432 Music of the Modern Era	4
MU 461 Senior Project	3
¹ Approved music lecture courses (300–400 level)....	12
<i>Select from:</i> MU 301, 312, 324, 325, 326, 328, 335, 336, 340, 341, 342, 352, 360, 365, 411, 412, 465, 466, 470	
Major Ensemble at 100-level	6
<i>Select from:</i> MU 170, 171, 172, 173, 174, 175, 177, 181, 183, 185, 186, 187	
Major Ensemble at 300-level	3
<i>Select from:</i> MU 370, 371, 372, 373, 374, 375, 377, 381, 383, 385, 386, 387	
Applied Study	9
<i>Select from:</i> MU 150, 250, 350, or 450	

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GENERAL EDUCATION (GE)

- 72 units required.
- See page 39 for complete GE course listing.
- Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (20 units)

B1 Mathematics/Statistics	8
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5)...	4

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective (not in Music)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4

D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4
Area F Technology Elective (upper division)	4
	72
FREE ELECTIVES	21
	180

MUSIC MINOR

A minor is available to students who desire documented competency in music. An individualized curriculum (incorporating theory, history, and performance) based on the following guidelines is developed in consultation with a member of the music faculty. Students must complete one academic music lecture course at Cal Poly, such as MU 101 or MU 120, before applying for the minor. Information and application forms for the declaration of a Music minor are available in the Music Department Office, as well as online at www.music.calpoly.edu.

Required Courses

Select one music theory course:	4
MU 101 Introduction to Music Theory (C3)	
MU 103 Music Theory I: Diatonic Materials	
Select one music theory <i>or</i> music history course: ...	4
Theory courses: MU 103, 105, 114,	
History courses: MU 120, 121, 221, 229	
Select 4 units from theory <i>or</i> history <i>or</i>	
performance courses:	4
Theory courses: MU 105, 114;	
History courses: MU 120, 121, 221, 229;	
Performance courses:	
<i>musicianship:</i> MU 104, 106, 108;	
<i>class voice:</i> MU 154, 252;	
<i>class piano:</i> MU 151, 152, 153, 253;	
<i>class guitar:</i> MU 155, 255; or	
any lower-division ensemble	

Upper division electives 12

- Choose from 300–400 level Music courses, with the following stipulations:
- 1) If NO lower-division units were in history, then at least 4 units must be in an upper-division history course (MU 324, 325, 328)
 - 2) If NO lower-division units were in performance, then at least 2 units must be in upper-division ensembles (up to a maximum of 4 units)
 - 3) No more than 2 units in the minor may be satisfied by MU 400
 - 4) No more than 4 units in the minor may be satisfied by upper-division performance courses

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¹ MU 325/326/336/470 can satisfy this requirement if not previously used to satisfy another required music course.

Philosophy

Faculty Office Bldg. (47), Room 37-B
805 756-2041

Department Chair, Tal Scriven

Stephen W. Ball	Devin Kuhn
D. Kenneth Brown	Stephen Lloyd-Moffett
Francisco Fernflores	Todd Long
Rachel Fernflores	Joseph Lynch
Charles T. Hagen	Paul S. Miklowitz

ACADEMIC PROGRAMS

Philosophy – BA, Minor
Religious Studies – Minor

The Philosophy department at Cal Poly is one of the largest in the CSU system. It prides itself on excellence in teaching and the high standards met by its students. A degree in philosophy is one of the best preparations for graduate or professional school and the evidence for this is substantial. Nationally, philosophy majors outscore everyone but majors in mathematics and physics on the Law School Admissions Test (LSAT). Similar trends are also seen for scores in all sections of the Graduate Record Exam (GRE) and on the Graduate Management Admission Test (GMAT), the exam required by most MBA programs.

The reason for this is unsurprising. The study of philosophy requires the meticulous development of general analytical reasoning skills. Even students not planning to go on to graduate or professional school are well served by the analytical and verbal skills developed by the study of philosophy. The ability to communicate clearly and forcefully is increasingly rare and, as a result, increasingly sought after in the job market.

Students can pursue a curriculum leading to a Bachelor of Arts degree in Philosophy, including an optional concentration in Ethics and Society, and a curriculum leading to a minor in Philosophy. The department also offers courses and a minor in Religious Studies. An unusually large number of courses is offered in the history of philosophy, as well as courses in specific areas of philosophy (logic, ethics, metaphysics, epistemology), and courses that deal with the philosophical issues arising in other disciplines (e.g., philosophy of art and philosophy of science).

CONCENTRATIONS

Students may choose to complete 20 units of 300-400 level philosophy courses *or* the concentration.

Ethics and Society. Designed for students with an interest in pursuing professional careers in which they will need to address practical ethical issues, especially careers in business, medicine, politics and law.

Philosophy Electives. 20 units of 300-400 level philosophy courses. At least 12 units must be 400 level.

PHILOSOPHY MINOR

The minor program in Philosophy is designed for students who want to add to their education an understanding of the history of philosophy and of philosophical issues relevant to their major field of study. It consists of 24 units (12 specified, 12 chosen from an approved list). Interested students are invited to contact the Philosophy Department Office for more information and application forms.

Required courses	Units
PHIL 101 Introduction to Philosophy	4
<i>Select one of the following:</i>	4
PHIL 230 Philosophical Classics: Knowledge and Reality (4) (C2)	
PHIL 231 Philosophical Classics: Ethics and Political Philosophy (4) (C2)	
Approved electives, chosen from the following:	16
<i>Select two of the following:</i>	
PHIL 311 Greek Philosophy (4) (C4)	
PHIL 312 Medieval Philosophy (4) (C4)	
PHIL 313 Early Modern Rationalism (4) (C4)	
PHIL 314 Early Modern Empiricism (4) (C4)	
PHIL 315 Kant and 19 th Century European Philosophy (4) (C4)	
<i>Additional courses may be chosen from PHIL 241 or any upper division Philosophy course, for a total of 8 units</i>	

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RELIGIOUS STUDIES MINOR

The Religious Studies minor program is designed for students who want to enhance their understanding of the great religious traditions of the contemporary world and some of the social issues involving these religions. The minor consists of 24 units. Interested students are invited to contact the Philosophy Department Office for more information and application forms.

Required courses	Units
RELS 201 Religion, Dialogue and Society (D3).....	4
<i>Select two of the following</i>	8
ENGL 354 The Bible as Literature and in Literature and the Arts (4) (C4)	
RELS 205 Jesus (4)	
RELS 301 Religions of Asia (4) (C4)	
RELS 302 Monotheisms: Judaism, Christianity, and Islam (4) (C4)	
RELS 304 Judaism (4) (C4)	
RELS 306 Hinduism (4) (C4)	
RELS 307 Buddhism (4) (C4)	
RELS 310 Christianity (4) (C4)	
RELS 311 Islam (4) (C4)	

<i>Select one of the following</i>	4
PHIL 320 Asian Philosophy (4) (C4)	
PHIL 342 Philosophy of Religion (4) (C4)	
PSY 339 Psychology of Religion (4)	
RELS 344 Religious Studies: The Making of a Discipline (4) (D5)	
SOC 377 Sociology of Religion (4) (D5)	
<i>Select one of the following</i>	4
RELS/WGS 370 Religion, Gender and Society (4) (C4) (USCP)	
RELS 372 Spiritual Extremism: Asceticism, Mysticism and Madness (4) (C4)	
RELS 374 Religion and Violence (4) (C4)	
RELS 378 Religion and Contemporary Values (4) (C4)	
RELS/POLS 380 Religion and Politics in the Israeli-Palestinian Conflict (4)	
RELS 400 Special Problems for Advanced Undergraduates (1-2)	
RELS 470 Special Topics in Religious Studies (1-4)	
<i>Approved Electives (any additional RELS course)</i>	4
	<u>24</u>

BA PHILOSOPHY

- 60 units upper division GWR
 - 2.0 GPA USCP
- * = Required in Major; also satisfies GE

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

MAJOR COURSES

PHIL 101 Introduction to Philosophy	4
PHIL 230 Philosophical Classics: Knowledge and Reality (C2)*	4
PHIL 231 Philosophical Classics: Ethics and Political Philosophy.....	4
PHIL 241, 242 Symbolic Logic I, II.....	4,4
PHIL 321 Philosophy of Science	4
PHIL 331 Ethics	4
PHIL 411 Metaphysics.....	4
PHIL 412 Epistemology.....	4
PHIL 460 Senior Project I.....	2
PHIL 461 Senior Project II.....	2
History of philosophy electives	16
<i>Select four of the following:</i>	
PHIL 311 Greek Philosophy (4)	
PHIL 312 Medieval Philosophy (4)	
PHIL 313 Early Modern Rationalism (4)	
PHIL 314 Early Modern Empiricism (4)	
PHIL 315 Kant and 19 th Century European Philosophy (4)	
PHIL 316 20 th Century European Philosophy (4)	
PHIL 317 History of Analytic Philosophy (4)	
Concentration (see below) or 300–400 level PHIL electives	20
(At least 12 units must be 400 level)	
	<u>76</u>

GENERAL EDUCATION (GE)

72 units required, 4 of which are specified in Major.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (20 units)

B1 Mathematics/Statistics	8
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5) ...	4

Area C Arts and Humanities (12 units)

C1 Literature	4
C2 Philosophy * 4 units in Major	0
C3 Fine/Performing Arts	4
C4 Upper-division elective (not in PHIL)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective (not PHIL courses)	4

Area F Technology Elective (upper division) (4 units)

4

FREE ELECTIVES

68
36
180

CONCENTRATION OR ELECTIVES

Select either the following concentration or 20 units of 300–400 level PHIL electives.

Ethics and Society Concentration

20

Select five of the following courses:

- PHIL 322 Philosophy of Technology (4)
- PHIL 332 History of Ethics (4)
- PHIL 333 Political Philosophy (4)
- PHIL 334 Philosophy of Law (4)
- PHIL 335 Social Ethics (4) (USCP)
- PHIL 336 Feminist Ethics, Gender and Society (4) (USCP)
- PHIL 337 Business Ethics (4)
- PHIL 339 Biomedical Ethics (4)
- PHIL 340 Environmental Ethics (4)
- PHIL 341 Professional Ethics (4)
- PHIL 439 Selected Problems in Ethics and Political Philosophy (4)

Approved Philosophy Electives

300–400 level PHIL electives..... 20
 (At least 12 units must be 400 level)

Political Science

Faculty Office Bldg. (47), Room 14-A
805 756-2984

Department Chair, Craig Arceneaux

Chris Den Hartog	Elizabeth A. Lowham
Ronald Den Otter	Matthew J. Moore
Elif Erisen	Allen K. Settle
Shelley L. Hurt	Jean M. Williams
Michael Latner	Ning Zhang
Anika C. Leithner	

ACADEMIC PROGRAMS

- Global Politics – Minor
- Law and Society – Minor
- Political Science – BA
- Public Policy – MPP

The Political Science Department offers instruction leading to the Bachelor of Arts degree in Political Science and a Master of Public Policy degree. Through the required and elective courses, the department prepares students to become informed active citizens. Undergraduate and graduate programs emphasize the comprehension of political thinking, the application of communication, and analytical skills, and prepare students for careers in research and survey analysis, administration, teaching, business, graduate studies, or leadership positions in the public, private, and nonprofit sectors.

In addition to the undergraduate major and the graduate program, the department offers minors in Global Politics and Law and Society. General Education courses in the department expose students to political thought, the fundamentals of U.S. politics, global issues, and the politics of foreign countries. The department supports internship opportunities in local, state, and federal agencies in addition to applied public policy research opportunities through the Cal Poly Institute for Policy Research.

CONCENTRATIONS

American Politics. Study of American governmental institutions, campaigns and elections, parties, public policy, and social movements. Provides students with a broad knowledge of the American political system that can prepare them for careers in government employment at the local, state, or national level, campaign advising, policy analysis, urban and regional planning, or leadership positions in advocacy groups.

Global Politics. Study of international and comparative politics, politics of developing areas, and U.S. foreign policy. Prepares students for careers in the diplomatic corps, foreign policy analysis, transnational nongovernmental organizations, intelligence analysis, or international business.

Pre-Law. Study of American constitutional law, civil liberties, civil rights, jurisprudence and judicial process. Prepares students for careers in law. Some students may apply to law school to continue their preparation for the legal profession. Others may seek careers in law-related professions such as law enforcement, judicial administration and legal assistance.

Individualized Course of Study. As an option to one of the concentrations, students with varying backgrounds and interests may pursue a course of study which meets their individual needs and interests. A minimum of 28 units of coursework are selected by the student and approved by the student's academic advisor. 20 of these must be at the 300–400 level and 16 units must carry a POLS prefix.

GLOBAL POLITICS MINOR

The minor consists of required coursework and approved electives. Details are available from the Political Science Department.

Required courses

POLS 225 Introduction to International Relations	4
POLS 229 Introduction to Comparative Politics	4
Choose four of the following:.....	16
POLS 308 Pol. Violence/Conflict Resolution (4)	
POLS 320 Comparative Political Analysis (4)	
POLS 321 Comparative Political Culture (4)	
POLS 322 International Political Activism (4)	
POLS 324 International Relations Theory (4)	
POLS 328 Politics of Developing Countries (4)	
POLS 381 Peace and War (4)	
POLS 382 Comparative Foreign Policy (4)	
POLS 383 Politics of the European Union (4)	
POLS 426 Internatl. Organizations and Law (4)	
POLS 427 Politics of the Global Economy (4)	
POLS 428 Issues and Topics in Comparative Politics (4)	
POLS 429 Issues and Topics in International Relations (4)	

Approved electives	<u>4</u>
	28

LAW AND SOCIETY MINOR

The minor consists of required coursework and approved electives. Details are available from the Political Science Department.

Required courses

POLS 245 Judicial Process.....	4
POLS 341 American Constitution	4
Select two from the following:	8
POLS 334 Jurisprudence (4)	
POLS 340 American Judicial Politics (4)	
POLS 343 Civil Rights in America (4)	
POLS 344 Civil Liberties (4)	

Approved electives	<u>12</u>
	28

BA POLITICAL SCIENCE

- 60 units upper division GWR
- 2.0 GPA USCP

* = Required in Support; also satisfies GE

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

MAJOR COURSES

POLS 112 American and California Govt (D1)*	4
POLS 180 Political Inquiry	4
POLS 225 Introduction to International Relations ...	4
POLS 229 Introduction to Comparative Politics	4
POLS 230 Basic Concepts of Political Thought	4
POLS 359 Research Design.....	4
POLS 361 Quantitative Methodology	4
POLS 481 Senior Project Seminar <i>or</i>	
POLS 461, 462 Senior Project I, II.....	4
Political science electives (300–400 level).....	20
(4 units maximum of POLS 386)	
Concentration courses <i>or</i>	
individualized course of study	28
	80

SUPPORT COURSES

Select one of the following:.....	4
HIST 110, 111, 222, 223; ANT 201; GEOG 150	
STAT 217 Intro to Statistical Concepts and	4/5
Methods (B1)* <i>or</i> STAT 221 Intro to Probability	
and Statistics (B1)*	
	8/9

GENERAL EDUCATION (GE)

72 units required, 8 of which are specified in Major and Support
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (16 units)

B1 Mathematics/Statistics * 4 units in Support plus	4
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5)...	4

Area C Arts and Humanities (16 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4

Area D/E Society and the Individual (16 units)

D1 American Exp. (40404) * 4 units in Major.....	0
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective (Not POLS courses) ..	4

Area F Technology Elective (upper division)

4

FREE ELECTIVES.....

27/28

180

CONCENTRATIONS (select one)

Select a concentration or individualized course of study.

American Politics Concentration

POLS 315 The American Presidency	4
POLS 319 United States Congress	4
POLS 341 Constitutional Law.....	4
Choose any three of the following.....	12
POLS 316 Political Participation (4)	
POLS 317 Campaigns and Elections (4)	
POLS 348 Early American Political Thought <i>or</i>	
POLS 349 Contemp. Amer. Political Thought (4)	
POLS 375 California Politics (4)	
POLS 419 Social Movements and Political	
Protest (4)	
POLS 431 Issues/Topics in Amer. Politics (4)	
POLS 471 Urban Politics (4)	
¹ Approved elective. <i>Select one course from:</i>	4
POLS 386 (4 units maximum), 451, 456, 459 <i>or</i>	
any unused course in this concentration	
	28

Global Politics Concentration

POLS 308 Political Violence and Conflict	
Resolution <i>or</i> POLS 381 Peace and War	4
POLS 320 Comparative Political Analysis	
<i>or</i> POLS 324 International Relations Theory	4
POLS 328 Politics of Developing Countries <i>or</i>	
POLS 383 Politics of the European Union	4
POLS 382 Comparative Foreign Policy <i>or</i> POLS	
420 Contemporary U.S. Foreign Policy	4
POLS 322 International Political Activism <i>or</i>	
POLS 426 International Organizations and Law	
<i>or</i> POLS 427 Politics of the Global Economy	4
POLS 428 Issues and Topics in Comparative	
Politics <i>or</i> POLS 429 Issues and Topics in	
International Relations	4
¹ Approved elective. <i>Select one course from:</i>	4
POLS 285, 321, 380, 386 (4 units maximum), <i>or</i>	
any unused course in this concentration	
	28

Pre-Law Concentration

POLS 245 Judicial Process.....	4
POLS 341 American Constitutional Law	4
POLS 334 Jurisprudence	4
POLS 343 Civil Rights in America	4
POLS 344 Civil Liberties	4
¹ Approved electives. <i>Select two courses from:</i>	8
BUS 207, 308, 409, 410, 473;	
ES 380; JOUR 302; LS 214; NR 404; PHIL 334;	
POLS 295, 340, 386 (4 units maximum), 426;	
PSY 375; SOC 402, 406, 412	
	28

Individualized Course of Study.....

28

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

MASTER OF PUBLIC POLICY

General Characteristics

The Master of Public Policy degree program (MPP) is professionally oriented, and open to students who wish to pursue analytic careers in government and nonprofit organizations or in organizations related to public policy regulations. The program is structured to prepare graduates with competence to function in a general context of policy, as well as in analysis. The core courses cover public policy, public policy analysis, quantitative methods, leadership, policy internship, and graduate seminar.

The MPP program is designed to meet the needs of those who have earned baccalaureate degrees in a variety of disciplines, including, but not limited to, economics, history, political science, social sciences, psychology, city and regional planning, business administration, education, environmental studies, and natural resource management.

The program is two years in duration for students taking 8 or more units per term. It consists of 60 approved units (not including courses necessary to compensate for deficiencies). Because of the sequencing of courses, students admitted to the program are expected to begin study in the fall quarter. In their second year, students undertake the development, presentation, and discussion of individual research projects in a two-term seminar (POLS 590). After the completion of POLS 590, students are required to pass a comprehensive exam. The program offers students opportunities to develop close working relationships with faculty. Self-directed study, tailored to student interest and needs, is encouraged.

Prerequisites

Students entering the program are expected to bring with them backgrounds in certain basic subject areas or to make up deficiencies in these areas after admission. These include the following Cal Poly course or its equivalent: STAT 221 Introduction to Probability and Statistics.

Admission Requirements

1. Possession of a baccalaureate degree from an accredited college or university;
2. A grade point average of not less than 3.00 in all undergraduate coursework;
3. Related undergraduate coursework or work experience;
4. The quality of previous educational and professional experiences measured by:
 - a. Biographical and career data (resumes, examples of reports, letters of recommendation, etc.),
 - b. Professional training in fields such as budgeting, management, and supervision in the public, health, or nonprofit sectors, and

c. A personal statement describing a student’s experience and reasons for applying to the program.

5. For applicants whose preparatory education is principally in a language other than English, a TOEFL score of 550 or higher (or 213 on the new conversation scale for the computer-based TOEFL exam).

Program of Study

Graduate students must file a formal study plan with their major professor, graduate committee, department, college and university graduate studies office no later than the end of the quarter in which the twelfth unit of approved courses is completed. The formal program of study must include a minimum of 60 units (at least 50 of which must be at the 500 level). Core courses in the Political Science Department must be taken on a graded basis unless specified in the course catalog as credit/no credit (CR/NC).

	<i>Units</i>
Required Courses	40-44
POLS 510 Research Design (4)	
POLS 515 Public Policy (4)	
POLS 518 Public Policy Analysis (5)	
POLS 540 Leadership and Management in Public Policy (4)	
POLS 550 Regulatory and Economic Policy (4)	
POLS 560 Quantitative Methods (5)	
POLS 586 Policy Internship (4-8)	
POLS 590 Graduate Seminar (8)	
POLS 595 Directed Readings for MPP Comprehensive Exams (2)	
Approved Electives	16-20
Additional 400 and 500-level courses, to be selected with graduate advisor’s approval. <i>At least 6 units must be at the 500 level.</i>	

Psychology & Child Development

Faculty Office Bldg. (47), Room 24
805 756-2033

Department Chair, Gary D. Laver

Shawn M. Burn	Daniel J. Levi
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Laura A. Freberg	Ned W. Schultz
Julie A. Garcia	Michael J. Selby
Jennifer Jipson	Lisa I. Sweatt
Jasna Jovanovic	Debra L. Valencia-Laver
Linda Lee	Jason A. Williams
Carrie A. Langner	

ACADEMIC PROGRAMS

Child Development – BS, Minor

Gerontology – Minor

Psychology – BS, MS, Minor

The department consists of faculty with degrees in psychology, family studies, human development and education who direct programs leading to BS Child Development, BS Psychology, MS Psychology, and minors in Child Development, Psychology and Gerontology.

In addition, courses are offered which fulfill general education requirements, support other programs and serve as a personal development resource for all university students. These courses are designed to acquaint students with the facts, theories and contemporary trends in psychology and child development and how these principles can be incorporated into a more meaningful understanding of oneself and of one's interactions with others. The department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see the Study Abroad programs.

CHILD DEVELOPMENT MINOR

The minor is designed to give students in Liberal Studies and other majors a broad knowledge base in child development. Biological, cognitive, social, and emotional development are examined with opportunities to explore development in the contexts of family and culture. The minor builds upon students' critical thinking skills by stressing the research base of the current knowledge in the field. This minor complements one's training in majors such as Liberal Studies, Psychology, or Recreation Administration by its emphasis on approaching child development as a coherent whole and as a scientific area of

study. An application form must be approved by a Child Development Minor advisor.

Required Courses	Units
CD/EDUC 207 The Learner's Development, Culture and Identity in Educational Settings or PSY 256 Developmental Psychology	4
Select two of the following.....	8
CD 304 Infant & Toddler Development	
CD 305 Early & Middle Childhood Developmt CD/PSY 306 Adolescence	
CD 350 Developmental Issues in Education	4
CD 424 Children's Learning in Families and Communities.....	4
PSY 201 or PSY 202 General Psychology (D4).....	4
Approved Elective	4
PSY 413, 419, 420, 421, 456, 460	
	28

GERONTOLOGY MINOR AND CERTIFICATE PROGRAM

An interdisciplinary minor that prepares students in various majors whose careers will be directly or indirectly related to gerontology. The certificate program is available to upgrade the skills and increase the knowledge of persons already in the field of gerontology. Coursework includes the psychological, biological, and social aspects of aging; changing roles; stress-related problems; and an understanding of the impact of an aging population on social, economic, and political institutions. *Among the requirements for admission to the program is a minimum GPA of 3.00. All applicants are reviewed by the program coordinator.*

Required core	Units
KINE 408 Exercise/Health Promotion for Sr Adults	4
PSY 318 Psychology of Aging (D5).....	4
SOC 326 Sociology of the Life Cycle	4
FSN 315 Nutrition in Aging	4
Approved electives (choose two)	8
May be selected from: ANT 344; BIO 302, 305; COMS 418; FSN 210 or PSY 256; PHIL 339; PSY 310, 317, 459	
Gerontology-related Fieldwork	4
May be fulfilled as an elective in the student's major or may be challenged due to previous work.	
	28

PSYCHOLOGY MINOR

The minor provides students with a broad background in the principles of psychology in order to develop an appreciation of the human element in the world around them, complement their professional training, and enhance their personal development and interpersonal effectiveness. Students whose primary job responsibilities will require dealing with people should find employment opportunities increased and career advancement enhanced. Interested students are encouraged to contact the Psychology and Child

Development Department for information and application forms. An application form must be approved by a Psychology Minor advisor. *Minimum of 16 units 300-400 level courses required.*

Required courses	Units
PSY 201/202 General Psychology (D4).....	4
STAT 217/221/251 (B1) or STAT 321 (B6).....	4-5
Select two of the following	8
PSY 252/PSY 254/PSY 256 (4) (only one can be counted in the minor)	
PSY 305 Personality (4)	
PSY 340 Biopsychology (4) (B5)	
PSY 405 Abnormal Psychology (4)	
Approved PSY elective courses (300–400 level) ...	12
	28-29

BS CHILD DEVELOPMENT

The Child Development major is designed for students who are interested in professions involving children and adolescents in a variety of settings. The major provides the scientific base for understanding development from birth through adolescence. The program emphasizes the ecological contexts in which development occurs, including family, school, technology, community, and culture. Graduates often continue studies in related graduate and credential programs, and pursue a range of careers in areas such as early childhood education, educational resource development, and human service professions.

The Child Development major is designed to enable students to develop a program of study suited to meet their individual needs. After completing major courses in child development, they will, with the assistance of an advisor, develop a personal program of study by selecting advisor approved electives, free electives, two internships, and a senior project and become part of a learning community of faculty and students engaged in a collaborative learning process. Each student graduates with a BS in Child Development and a minor in Psychology with the filing of a minor application form.

Goals of the Child Development major are for students to:

- Learn about concepts and research that have helped us to understand how children develop physically, emotionally, socially, and intellectually.
- Study how children affect and are affected by the formal and informal environments in which they grow.
- Gain experience working with children of different ages and backgrounds in various settings.
- Develop expertise in the use of digital technologies to access, create, and disseminate information related to children’s learning and development.
- Develop an understanding of multicultural and anti-discrimination issues and how to lead children into an appreciation of diversity and cultural pluralism.

- Develop skills in leadership, effective communication, and community building.

BS CHILD DEVELOPMENT

- 60 units upper division GWR
- 2.0 GPA USCP

* = Required in Support; also satisfies GE

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

MAJOR COURSES

CD 102 Orientation to the Child Dev. Major	2
CD 131 Observing and Interacting with Children ...	4
CD 230 Preschool Laboratory	4
CD/PSY 254 Family Psychology	4
PSY 256 Developmental Psychology	4
CD 304 Infant and Toddler Development	4
CD 305 Early/Middle Childhood Development	4
CD/PSY 306 Adolescence.....	4
PSY 323 The Helping Relationship.....	4
CD 329 Research Methods-Child Development.....	4
CD 330 Supervised Internship.....	4
CD 350 Developmental Issues in Education	4
CD 401 Perspectives on Child/Adolescent Dev	4
CD 413 Children, Adolescents and Technology.....	6
CD 424 Children’s Learning in Families and Communities	4
CD 430 Advanced Internship or CD 432 Research Internship	4
CD 431 Assessing Children’s Dev. and Envmts	4
CD 461 Senior Project Seminar.....	2
CD 462 Senior Project.....	2
	72

SUPPORT COURSES

* = Satisfies General Education requirement

BIO 302 Human Genetics (B5)*	4
PSY 201/PSY 202 General Psychology (D4)*	4
Select one of the following:	
PSY 413/419/420/421/456/460.....	4
Select one of the following:	
PSY 350/351/465/472.....	4
STAT 217 Intro to Statistical Concepts and Methods (B1)*	4
Approved electives	16
	36

GENERAL EDUCATION (GE)

72 units required, 12 of which are specified in Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (12 units)

B1 Mathematics/Statistics * 4 units in Support plus	4
---	---

B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5) * 4 units in Support.....	0
Area C Arts and Humanities (16 units)	
C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area D/E Society and the Individual (16 units)	
D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E) * 4 units in Support	0
D5 Upper-division elective (not PSY courses).....	4
Area F Technology Elective (upper division) (4 units)	4
	60
FREE ELECTIVES	12
	180

BS PSYCHOLOGY

The Psychology major offers a broad preparation in the science of psychology, with concentrations in Applied Social Psychology, Counseling and Family Psychology, and Developmental Psychology. Theoretical approaches, research techniques, laboratory experiences and internships are hallmarks of the psychology program.

Graduates often pursue careers in mental health programs, social services agencies, public health settings, education institutions, and personnel-related settings. Many majors go on to graduate work in such fields of psychology as: counseling, developmental, family, social, clinical or experimental.

CONCENTRATIONS

Applied Social Psychology. The application of social-psychological theory and methodology to business, the environment, health, conflict resolution, and law. Prepares for careers in government, business and social activism. Many students go on to pursue graduate study in social psychology, human resource management, public health, law, and related disciplines.

Counseling and Family Psychology. Interdisciplinary study that provides knowledge and experience necessary for a variety of careers in family, social, educational, clinical, and other health-related service agencies in the public and private sectors. Appropriate for students who wish to work in such settings, and who desire an applied approach to understanding and modifying individual, interpersonal, and family systems. Students are prepared for

graduate study in clinical psychology, counseling psychology, social work, and marriage and family counseling.

Developmental Psychology. Prepares students for careers in human service agencies, health care settings, and special needs programs. Students study the nature of human development throughout the life span and learn to use psychological and developmental principles to assess and analyze behavior and to implement behavior change. Students are prepared for graduate study in psychology and related fields.

Individualized Course of Study. Permits students to pursue a course of study which meets their individual needs and interests. Courses are selected by the student with the advice and approval of the student's academic advisor and department chair.

BS PSYCHOLOGY

- 60 units upper division GWR
- 2.0 GPA USCP

* = Required in Major/Support; also satisfies GE

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

MAJOR COURSES

PSY 201/PSY 202 General Psychology (D4)*	4
PSY 252 Social Psychology	4
PSY 256 Developmental Psychology	4
PSY 305 Personality	4
PSY 323 The Helping Relationship.....	4
PSY 329 Research Methods in Psychology.....	4
PSY 333 Quant. Research Meth.-Behavioral Sci. ...	3
PSY 340 Biopsychology (B5)*	4
PSY 405 Abnormal Psychology	4
<i>Supervised Fieldwork and/or Research Internship.</i> Select two courses from the following:	
PSY 448, 449, 453, 454	5,5
PSY 457 Memory and Cognition	4
PSY 458 Learning	4
PSY 461 Senior Project Seminar	1
PSY 462 Senior Project	3
PSY 472 Multicultural Psychology and Diversity (USCP).....	4
PSY electives (300-400 level)	12
Concentration or individualized course of study	28
	101

SUPPORT COURSES

BIO 302 Human Genetics	4
STAT 217/STAT 251/STAT 252 (B1)*	4/5
	8/9

GENERAL EDUCATION (GE)

72 units required, 12 of which are specified in Major/Support.
→See page 39 for complete GE course listing.
→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (12 units)	
B1 Mathematics/Statistics * 4 units in Support plus	4
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5)	
* 4 units in Major	0
Area C Arts and Humanities (16 units)	
C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area D/E Society and the Individual (16 units)	
D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E) * 4 units in Major	0
D5 Upper-division elective (Not PSY courses).....	4
Area F Technology Elective (upper division) (4 units)	4
	60
FREE ELECTIVES	10/11
	180

CONCENTRATIONS OR ELECTIVES (select one)**Applied Social Psychology Concentration**

PSY 360 Applied Social Psychology	4
Select two of the following:	8
PSY 302, 311, 317, 350/351, 352, 359	
Select one of the following.....	4
PSY 314, 318, 465;	
ES 320, 321, 322, 323, 380, 381;	
WGS 301, 320, 350, 370	
Approved concentration electives	12
	28

Counseling and Family Psychology Concentration

PSY 370 Intro. Clinical & Counseling Psychology	4
Select two of the following:	8
PSY 325, 330, 350/351, 375, 413, 432, 450, 456, 460	
Select one of the following.....	4
PSY 314, 315, 318, 465;	
ES 320, 321, 322, 323, 380, 381;	
WGS 301, 320, 340, 370	
Approved concentration electives	12
	28

Developmental Psychology Concentration

PSY 419 Self and Identity	4
PSY 420 Social and Emotional Development.....	4
PSY 421 Language and Cognitive Development	4

Select one of the following:.....	4
PSY/CD 431, PSY 310, 318, 413, 422, 456, 459, 460	
Approved concentration electives.....	12
	28

Individualized Course of Study..... 28

Courses are selected by the student with the approval of the student's academic advisor and the department chair. The ICS may include a Cal Poly minor, course prerequisites for graduate study, foreign language courses, and/or a coherent group of courses including a minimum of two upper division psychology courses and no more than nine units of lower division courses.

MS IN PSYCHOLOGY**General Characteristics**

The Master of Science in Psychology is a 90-quarter unit professional degree program designed to provide the state of California with highly competent master-level clinicians who are academically prepared to obtain the marriage and family therapy (MFT) license. The program places a heavy emphasis on clinical skill training and applied experience that begins early in the program and culminates with an intensive supervised internship in a community mental health setting.

Admission to the Program

In addition to the general requirements of the University, specific requirements for admission to classified graduate standing are:

- an acceptable baccalaureate degree from an institution accredited by a regional association;
- a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted;
- satisfactory performance on the General Tests (Verbal, Quantitative, Analytical) of the Graduate Record Examination (GRE); the GRE Advanced Test in Psychology is not required;
- four letters of recommendation;
- autobiographical information;

Related work or volunteer experience is highly desirable as is having received professional counseling.

Prerequisites. Coursework in abnormal psychology, lifespan theories, personality, introductory statistics, and research methods in psychology (or related discipline). Completion of these prerequisites is necessary for admission to the program.

Classified Standing. For admission as a classified graduate student, a student shall have a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted and shall have earned an acceptable baccalaureate degree from an institution accredited by a regional association. Additionally, the student must have satisfactorily met the professional, personal, scholastic, and

other standards for graduate study, including qualifying examinations, as the appropriate university authorities may prescribe. Only those applicants who show promise of success and fitness are admitted, and only those who continue to demonstrate a satisfactory level of scholastic competence and who possess appropriate personal qualities are eligible to continue in the program.

Conditionally Classified Standing. The student may enroll in a graduate degree curriculum if in the opinion of the M.S. Program Committee the student can remedy any deficiencies by additional preparation.

Advancement to Candidacy. Advancement to master's degree candidacy requires completion of a minimum of 30 quarter units of required courses in residence, specified in a formal program of study, with a minimum grade point average of 3.0, fulfillment of the Graduation Writing Requirement, and the formal recommendation of the M.S. Program Committee. Students must maintain a minimum GPA of 3.0 in all coursework completed subsequent to admission to the program.

PROGRAM OF STUDY

The student must maintain a grade point average of 3.0 (B) or better in all courses taken subsequent to program admission. Calculation of the grade point average includes all grades, though only the units in courses with grades of A, B, or C are 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 are allowed if acceptable for master's degree credit at the offering institution and approved by the M.S. Program Committee.

The Master of Science degree in Psychology requires a culminating experience that includes either the completion of a thesis or the supervised comprehensives. Each candidate must file a formal program of study by the end of the first quarter as a classified graduate student. The professional and personal growth of each graduate student is of major importance; consequently, candidates are encouraged to seek the experience of personal therapy. Students must be very aware of course prerequisites and check the catalog carefully to assure enrollment in required courses.

MFT LICENSING

The Master of Science in Psychology is designed to meet the educational requirements for the Marriage and Family Therapist license (MFT) in the State of California. Students are advised to acquire and read the laws governing MFT licensure from the Board of Behavioral Science Examiners, 1625 North Market Blvd., Suite S-200, Sacramento, CA 95834. See the program coordinator for the procedure required for application for this license. State documents

must be filed by the applicant within 30 days of program graduation.

Grades. If a candidate for University recommendation for MFT licensure has more than one grade of C or lower among the courses to be verified for the Board of Behavioral Sciences, that form will not be approved by the Chief Academic Officer Designee of Cal Poly.

Field Experience. Field experience or internship courses represent the student's demonstration of the clinical skills basic to marriage, family and child counseling. A student who receives a grade of NC in field experience is on probation regarding continuation in the program. A second grade of NC disqualifies the student from the program and University recommendation for the license. Further candidates may be disqualified from this program for academic-related actions judged by the M.S. Program Committee to reflect unethical, unprofessional or incompetent clinical skills.

CURRICULUM FOR MS PSYCHOLOGY

PSY 450 Family Intervention.....	4
PSY 456 Behavioral Disorders in Children	4
PSY 504 Psychopharmacology	4
PSY 555 Counseling and Communication	4
PSY 556 Multicultural Counseling & Psych.....	4
PSY 560 Individual Therapy: Theory & Applic.	4
PSY 564 Ethics and the Law: MF Therapy	4
PSY 565 Diagnosis/Treatment Psychopathology	4
PSY 566 Group Therapy: Theory and Application	4
PSY 569 Counseling Clinic Practicum	3,3
PSY 570 Selected Topics in Psychology and Human Development	4
PSY 571 Family Therapy: Theory and Application....	4
PSY 572 Child/Adolescent Therapy: Theory & Appl.	4
PSY 574 Psychological Assessment	4
PSY 575 Gender, Couple & Sexual Dysfunc.Therapy	4
PSY 576 Traineeship: Marital & Family Counseling	16
PSY 585 Research Methods-Counseling Psychology	4
PSY 588 Substance Abuse	4
¹ PSY 599 Thesis <i>or</i> approved electives <i>and</i> written comprehensive examination	<u>4</u>
	90

¹ Must register for thesis credit each quarter of advisement.

Social Sciences

Faculty Office Bldg. (47), Room 13-C
805 756-2260

Department Chair, Terry L. Jones

Anthropology:

Terry L. Jones
Dawn Neill
Stacey L. Rucas

Geography:

Gregory S. Bohr
James R. Keese
William L. Preston
Benjamin F. Timms

Sociology:

Christopher Bickel
James W. Coleman
Harold R. Kerbo
Leo W. Pinard II
Maliha Zulfacar

ACADEMIC PROGRAMS

Anthropology and Geography – BS, Minor
Latin American Studies – Minor
Sociology – BA, Minor

The Social Sciences Department provides a broadly based, multicultural and multidisciplinary perspective on humanity, society, the environment and development

In addition, the department offers general education courses that provide an understanding of the complexity and diversity of the world's peoples and their problems. Courses have an American and international orientation and address issues such as class, race, ethnicity, gender, religion, past and present diversity of world societies, political economy, physical environments, and environmental sustainability.

BS ANTHROPOLOGY and GEOGRAPHY

The Anthropology and Geography major provides students with the skills for understanding and examining patterns of human activity and resource utilization across space and time, as well as the interactions between humans and the natural environment. Interdisciplinary in nature, this program focuses on the applied areas of cross-cultural studies, international development, ecological research design and method, the evolution of humans, environmental assessment, and sustainability. Courses in Anthropology and Geography train students to examine human ecology from the ancient past to the modern present through courses in biological evolution, cultural adaptations, behavioral ecology, environmental impacts, and the ecology of human health and disease. In addition, students gain an understanding of the physical environment in which humans are placed, through courses in physical geography, resource management, biogeography, and climatology. Students are trained in relevant skills, including Geographic Information Systems, remote sensing, and quantitative methods.

Students interested in this major should be curious about the relationships between humans and the environment

(including biology, behavior, climate and landscapes) from a broad hands-on perspective. Our students typically have particular interest in study abroad and involvement in international opportunities.

The program offers a four-year curriculum leading to a BS degree that prepares students for careers in environmental and regional planning, cultural resources management, archaeology, international development, climatology, science education, international health research, and federal government work in behavioral analysis.

Internship or Study Abroad Requirement. As a means of promoting relevant job skills, hands-on learning, and field experience, majors are required to complete either an approved internship or study abroad program. Students who do an internship will receive a minimum of 4 units of credit (ANT 465 *or* GEOG 465 Internship). The department will assist students in identifying suitable internships. However, students are encouraged to explore options for themselves based on their interests. In place of an internship, students may choose to participate in a study abroad program. Four units of approved coursework taken while studying abroad will be substituted for the internship course.

CONCENTRATIONS

Students may select one of the following concentrations or the individualized course of study.

Cross-Cultural Studies and International Development.

Provides students with the theoretical knowledge and applied skills necessary for the study and practice of international development in cross-cultural settings. Students attain an in-depth knowledge of the social, political, economic, and ecological dimensions of international development and gain practical skills through research projects, international study, and applied internships. The concentration provides expertise and training for internationally-focused careers including public and private development institutions, the Peace Corps, the public health field, education, and numerous careers where cross-cultural understanding is essential.

Environmental Studies and Sustainability. Provides students with an understanding of human environmental relationships, resource utilization, and the human impact on the Earth. Current environmental issues are explained and evaluated in a global and historical context. Students learn the importance of sustainable land use practices and techniques for their successful implementation. Applied and technical skills important to assessing the environment and promoting sustainability are emphasized.

Human Ecology. Students learn about the natural environment, human behavioral and cultural systems, and the complex interrelationships between the three. Major concepts and practice emphasize broad spatial and temporal perspectives. Students acquire knowledge and skills related to global and regional climate and physical geography, human evolution, cultural ecology, behavioral ecology, prehistoric and recent environmental change, indigenous

cultures of the new world, methods for analyzing climate change and related human responses in the past and present.

Individualized Course of Study. An opportunity to pursue a course of study which meets a student’s individual needs and interests. It consists of 28 units at the 300–400 level that are selected by the student in consultation with an advising faculty member. The student must also provide a written justification for the courses and the way they constitute a cohesive, integrated course of study. The list of courses is a contract between the student and the Department.

Teaching. With additional coursework as prescribed by the College of Education, students may pursue the Multiple Subject Credential (for elementary school teachers) or the Single Subject Credential (for secondary school social science teachers of anthropology, economics, geography, government, history, political science, psychology, or sociology). This concentration prepares a candidate for Subtest I of the CSET Multiple subjects exam and strengthens a candidate’s knowledge in all 16 History-Social Science Content Standards established by the California State Board of Education. For more information regarding teacher credential programs, please see the College of Education section.

Other Concentrations. With prior approval of the Social Sciences Department and the Political Science Department, students may select one of the following concentrations: Pre-Law, or Global Politics.

BA SOCIOLOGY

Sociology explores the nature and dynamics of human society and the interrelationship between individuals and their social groups. The goal of sociological study at Cal Poly is twofold. The first objective is to develop a sociological imagination that enables students to see their personal circumstances and problems in context of the broader, local, national, and global forces that shape their lives. The second objective is to prepare students for graduate studies and careers in such fields as criminal justice, law, social services, complex organizations, and teaching. Sociology also offers general education courses that provide an understanding of the complexity and diversity of the world’s peoples and their problems. Some courses focus on American society, emphasizing issues of class, race, ethnicity and gender. Other courses have a global orientation dealing with both the past and present diversity of the world’s societies, economies, politics and religions.

Internship Requirement. As a means of promoting relevant job skills, hands-on learning, and field experience, majors who select the criminal justice or social services concentrations are required to complete an approved internship. Majors who select the organizations concentration will be encouraged to complete an internship, but will not be required to do so. These internships in criminal justice or social services will be up to one year,

but with a minimum of two quarters, and count for 8 to 12 units of credit (SOC 440). The department will assist students in identifying suitable internships. However, students are encouraged to explore options for themselves based upon their interests.

CONCENTRATIONS

Students are required to take one of the following concentrations or the individualized course of study.

Criminal Justice. Prepares students for careers in law, law enforcement, corrections, detention, probation, parole and other criminal justice agencies.

Individualized Course of Study. An opportunity to pursue a course of study which meets a student’s individual needs and interests. It consists of 28 units at the 300–400 level that are selected by the student in consultation with an advising faculty member. The student must also provide a written justification for the courses and the way they constitute a cohesive, integrated course of 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 business, government or non-governmental organizations.

Social Services. Provides the general principles of human social behavior and specialized professional courses to prepare for careers in the helping professions such as social work and counseling.

Other Concentrations. With prior approval of the Social Sciences Department and the Political Science Department, students may select one of the following concentrations: Pre-Law, or Global Politics.

BS ANTHROPOLOGY and GEOGRAPHY

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

* = Satisfies General Education requirement

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

MAJOR COURSES

ANT 201 Cultural Anthropology (D3)*	4
ANT 202 World Prehistory	4
ANT 250 Biological Anthropology (B2)*	4
ANT 360 Human Cultural Adaptations	4
GEOG 150 Intro. to Cultural Geography	4
GEOG 250 Physical Geography	4
GEOG 308 Global Geography.....	4
GEOG 318 Applications in GIS	4
GEOG 333 Human Impact on the Earth.....	4
ANT/GEOG 455 Anthropology-Geography Research Design and Methods.....	4
ANT/GEOG 464 Professional Preparation for Anthropologists/Geographers	1
ANT 465/GEOG 465 Internship.....	3
(or approved study abroad course)	

Methodological elective (select one):..... 4
 ANT 310, 311;
 GEOG 328, 440
Regional Geography elective (select one):..... 4
 GEOG 300, 340, 360, 370
 ANT electives (300-400 level)..... 8
 GEOG elective (300-400 level)..... 4
 Concentration or individualized course of study
 (at least 16 units 300-400 level)..... 28
 STAT 217/221 Intro. Statistics (B1)* 4/5
 ANT 461 and ANT 462 Senior Project I, II or
 GEOG 461 and GEOG 462 Senior Project I, II.... 2,2

100/101

GENERAL EDUCATION (GE)

72 units required; 12 units are in Major.
 →See page 39 for complete GE course listing.
 →Minimum of 12 units required at the 300-400 level.

Area A Communication (12 units)

A1 Expository Writing 4
 A2 Oral Communication 4
 A3 Reasoning, Argumentation, and Writing 4

Area B Science and Mathematics (12 units)

B1 Mathematics/Statistics * 4 units in Major plus
 B2 Life Science * 4 units in Major..... 0
 B3 Physical Science 4
 B4 One lab taken with either a B2 or B3 course
 B5 elective 4

Area C Arts and Humanities (16 units)

C1 Literature 4
 C2 Philosophy 4
 C3 Fine/Performing Arts 4
 C4 Upper-division elective 4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404) 4
 D2 Political Economy 4
 D3 Comparative Social Institutions * 4 units in
 Major 0
 D4 Self Development (CSU Area E) 4
 D5 Upper-division elective (Not ANT or GEOG
 courses)..... 4

Area F Technology Elective (upper division) 4

60

FREE ELECTIVES.....19/20

180

CONCENTRATION OR INDIVIDUALIZED COURSE OF STUDY (select one)

Cross-Cultural Studies and International Development Concentration

GEOG 408 Geography of Development 4
 SOC 309 The World System and Its Problems 4
 ANT 401 Culture and Health 4
 ANT 402 Nutritional Anthropology..... 4

Problems and Issues courses to be selected from: ... 12
 ANT 320, 325, 330, 344; BUS 302; CRP 334
 (D5); GEOG 301, 328, 370, 440; HIST 314, 417
 or 316, 430; HUM 310 (C4); POLS 325 (D5) or
 POLS 328, 333 (Area F); SOC 431; WGS 320
 (D5); foreign language (121) or credit for a
 comparable level of proficiency (4 units max)

28

Environmental Studies and Sustainability Concentration

GEOG 301 Geography of Resource Utilization 4
 GEOG 325 Climate and Humanity..... 4
 GEOG 328 Applications in Remote Sensing..... 4
 GEOG 414 Global and Regional Climatology 4
Any two of the following specialized electives:..... 8
 BIO 113 (B2&B4), 114 (B2&B4); BRAE 415,
 ERSC 202, 223, 323; GEOG 415, GEOL 201,
 203 (B5), 204, 205 (B3); LA 221; PSC 201 (B5);
 SS 121 (B5)
Any one of the following approved electives: 4
 AG 360 (F); ANT 312; BIO 112 (B5), 227 (B2);
 BRAE 348 (F); CRP 336, EDES 406; ENVE 330;
 ES/NR 308 (D5); ME 321 (F) or PSC 320 (F)

28

Human Ecology Concentration

ANT 345 Human Behavioral Ecology..... 4
 ANT 401 Culture and Health..... 4
 GEOG 325 Climate and Humanity..... 4
Applications and Issues courses to be selected from: 16
 ANT 309, 310, 311, 312, 320, 325, 330, 344, 402,
 415 (USCP); GEOG 301, 340, 370, 408, 414, 415,
 440 28

Teaching Concentration

EDUC 300 Introduction to Teaching..... 3
 ANT/GEOG 400 Special Problems 1
Two of the following: 8
 GEOG 300, 340, 360, 370
One of the following: 4
 PSY 306, SOC 306, 316 (USCP), 406
Any three of the following approved electives: 12
 ANT 330, 415 (USCP); ECON 304; HIST 320,
 321, 322; POLS 343 (USCP)

28

Individualized Course of Study..... 28

BA SOCIOLOGY

- 60 units upper division GWR
- 2.0 GPA USCP

* = Satisfies General Education requirement

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

MAJOR COURSES

SOC 110 Comparative Societies (D3)* 4
 SOC 111 Social Problems..... 4
 SOC 218 International Political Economy (D2)* 4

SOC/WGS 311 Sociology of Gender	4
SOC 315 Global Race and Ethnic Relations.....	4
SOC 316 American Ethnic Minorities (USCP)	4
SOC 323 Social Stratification.....	4
SOC 354 Qualitative Research Methods	4
SOC 355 Quantitative Research Methods	4
SOC 421 Social Theory.....	4
SOC 461 Senior Project.....	2
SOC 462 Senior Project.....	2
Sociology electives (300-400 level)	12
STAT 217 Intro. to Stat. Concepts/Methods (B1)* ..	4
GEOG 150 Intro. To Cultural Geography	4
ANT 201 Cultural Anthropology.....	4
Concentration <i>or</i> individualized course of study	28
	96
GENERAL EDUCATION (GE)	
72 units required; 12 units are in Major.	
→See page 39 for complete GE course listing.	
→Minimum of 12 units required at the 300-400 level.	
Area A Communication (12 units)	
A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4
Area B Science and Mathematics (16 units)	
B1 Mathematics/Statistics * 4 units in Major	4
B2 Life Science.....	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	4
Area C Arts and Humanities (16 units)	
C1 Literature	4
C2 Philosophy.....	4
C3 Fine/Performing Arts.....	4
C4 Upper-division elective	4
Area D/E Society and the Individual (12 units)	
D1 The American Experience (40404)	4
D2 Political Economy * 4 units in Major.....	0
D3 Comparative Social Institutions * 4 units in	
Major.....	0
D4 Self Development (CSU Area E)	4
D5 Upper-division elective (Not SOC courses).....	4
Area F Technology Elective (upper division) (4 units)	4
	60
FREE ELECTIVES	24
	180

CONCENTRATION OR INDIVIDUALIZED COURSE OF STUDY (select one)

Criminal Justice Concentration	
SOC 402 Crime and Violence	4
SOC 406 Juvenile Delinquency.....	4
SOC 412 Criminal Justice	4
SOC 440 Internship	8
<i>Applications and Issues courses, to be selected from:</i>	
POLS 245, 344, 351;	
PSY 352, 375, 460;	
SOC 301, 395, 413, 440 (<i>internship units not to exceed 12 in concentration</i>)	8
	28

Organizations Concentration	
<i>Select 20 units from the following courses:</i>	
SOC 310 Self, Organizations and Society (4)	
SOC 350 Social Organization of Modern Japan (4)	
SOC 395 Sociology of Complex Organizations (4)	
SOC 440 Internship (4)	
BUS 382 Organizations, People and Technology (4)	
BUS 384 Human Resource Management (4)	
BUS 387 Organizational Behavior (4) <i>or</i>	
PSY 302 Behavior in Organizations (4)	
¹ Approved electives.	8
<i>Select 8 units from the following:</i>	
BUS 207, 382, 404, 407, 472, 473, 478;	
POLS 351; SOC 412	
	28

Social Services Concentration	
SOC 301 Social Work and Social Welfare Inst.....	4
SOC 413 Methods of Social Work	4
SOC 440 Internship	8
¹ Approved electives.	12
<i>Select 12 units from the following:</i>	
ES 340, ES/WGS 350;	
POLS 310, 343, 419, 459, 471;	
POLS/UNIV 333;	
PSY 310, 318, 330;	
PSY/CD 306;	
SOC 306, 309, 310, 402, 406, 412;	
WGS 301, 401; WGS/RELS 370	
	28
Individualized Course of Study.....	28

300-400 level courses selected in consultation with advising faculty. A written justification for the courses selected and the way they constitute a cohesive, integrated study is required. One-half of the units must be courses from the department.

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

ANTHROPOLOGY and GEOGRAPHY MINOR

The minor develops broad spatial and cultural knowledge of our world. The program consists of foundation courses and directed electives that allow flexibility for students to tailor the program to meet their individual interests and goals. The objectives of the minor are to increase student awareness of the: (1) cultural and ecological diversity of the Earth's surface; (2) inter-relationships between peoples of varying cultures; (3) interactions of different cultures with their resource habitats and environmental alteration; and (4) methodologies and technologies used to evaluate cultures and environments. The goal is to instill a respect for cultural diversity and environmental sustainability. A minimum of 14 units must be upper division and taken at Cal Poly.

Foundation Courses

ANT 250 Biological Anthropology (B2).....	4
GEOG 250 Physical Geography.....	4
<i>Select one:</i>	4
ANT 201 (D3), ANT 202 (D3), GEOG 150 (D3)	

Ecological Courses (select one)..... 4

ANT 360 (D5); GEOG 301 (D5), 325, 333

Global and Regional Courses (select one)..... 4ANT 320, 325 (D5), 330 (D5), 415 (USCP);
GEOG 300 (D5), 308 (D5), 340, 360, 370 (D5)**Special Topics (select one).....** 4ANT 309, 310, 311, 344 (D5), 345 (D5), 401;
GEOG 414, 415**Technical Skills (select one).....** 4

GEOG 318, 328, 440

28

LATIN AMERICAN STUDIES MINOR

Latin America is a region of critical importance to the United States, and California in particular. Students gain an interdisciplinary understanding of Latin America, as well as its cultural, political, and economic connections to California and the United States. This knowledge is increasingly important for a number of careers. The minor also promotes critical thinking skills and enhances the appreciation of diversity as students confront issues relevant to Latin America and US-Latin American relations.

Required courses

Units

ES 243 Survey of Latino/a Studies (D3) <i>or</i>	
SPAN 233 Intro to Hispanic Readings (C1)	4
GEOG 370 Geography of Latin America (D5).....	4
SPAN 121 Fundamentals of Spanish.....	4
<i>Select one:</i>	4
ANT 325 Pre-Columbian Mesoamerica (D5)	
ANT 330 Indigenous South Americans (D5) (4)	
GEOG 308 Global Geography (D5) (4)	
HIST 340 History of Modern Latin America (4)	
HUM 310 Humanities in World Cultures (subtitles: Culture of Latin America <i>or</i> Mexico) (C4) (4)	
POLS 328 Politics of Developing Areas (4)	

Approved Electives..... 8A minimum of 12 units at the 300-400 level
required in the minor.

24

SOCIOLOGY MINOR

The minor provides students with a broad understanding of contemporary society with a focus on the analysis of social change. The objectives of the program are to increase awareness of the: (1) nature of international social, economic and political structures and their consequences; (2) social results of emerging technology; (3) changes in family life, especially the role of women; and (4) changing ethnic mix in California and the United States and its implications. Coursework includes the study of the shifting demographic patterns in society, emerging life styles, the increase in the percentage of elderly in the population, and the nature of specific subculture influences.

Required courses

Units

SOC 110 Comparative Societies (D3).....	4
SOC 111 Social Problems	4
SOC 309 World Systems and Its Problems	4
SOC 315 Global Race & Ethnic Relations (D5) <i>or</i>	
SOC 316 American Ethnic Minorities (USCP)	4
SOC 323 Social Stratification.....	4

Approved Electives..... 8

(At least 4 units at 300-400 level)

28

Theatre & Dance

Davidson Music Center (45), Room 104
805 756-1465

Department Chair, Timothy J. Dugan

Virginia Anderson Joshua T. Machamer
Thomas J. Bernard Alvin J. Schnupp
Susan Duffy Diana L. Stanton
Maria L. Junco

ACADEMIC PROGRAMS

Theatre Arts – BA
Theatre – Minor
Dance – Minor

The courses offered by the Theatre and Dance Department provide students with well-balanced programs of study, integrating practical production work with classes that examine the principles, theoretical aspects, and historical development of theatre and dance.

Students who major in theatre study dramatic literature, technical theatre, design, playwriting, acting, and directing. Participation in main-stage productions, as actors and members of the production staff, is a major aspect of each student's training. In addition, the department offers general education courses in introductory theatre, theatre history and literature, and specialized study of theatre such as Women's Theatre, Theatre in the United States, Global Theatre and Performance and Topics in Diversity on the American Stage.

A full range of studio dance courses are offered. They include ballet, modern, jazz, ballroom, and folk. Composition and dance production are available, as well as courses designed for future elementary and secondary teachers of dance. The department also provides general education and breadth courses in the areas of dance history and dance appreciation.

The department also acts as a cultural focus for the campus and community. An annual dance concert is presented under the auspices of the Orchesis Dance Company. Every spring a student-directed dance concert is also produced. Each quarter the department presents three main-stage theatre productions. Recent performances include: *The Bald Soprano*, *Julius Caesar*, *The Phantom Tollbooth*, *Blood Wedding (Bodas de sangre)*, *The Arabian Nights*; *Animal Farm*; *The Beauty Queen of Leenane*; *One Flew Over the Cuckoo's Nest*. The department also produces original works; sponsors guest lecturers and career days; and manages a program of student-directed works, field trips and internships.

BA THEATRE ARTS

- ☐ 60 units upper division
 - ☐ 2.0 GPA
 - ☐ GWR
 - ☐ USCP
- * = Required in Major; also satisfies GE

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

MAJOR COURSES

TH 210 Introduction to Theatre (C3)*	4
TH 220 Acting Methods	4
TH 227 Theatre History I	4
TH 228 Theatre History II	4
TH 230 Stagecraft I	4
TH 250 Costume Construction	4
TH 260 Voice and Diction <i>or</i>	
TH 280 Movement for The Actor	4
TH 290 Script Analysis	4
TH 295 Foundations in Theatrical Design	4
TH 300/TH 310/TH 320 (USCP)	4
TH 330 Stagecraft II	4
TH 350 Seminar in Playwriting	4
TH 430 Scenic Design <i>or</i> TH 432 Costume Design	4
TH 450 Directing	4
TH 461 Senior Project Seminar	4
Select 8 units from the following:	8
TH 240, 250, 260, 270, 280	
Select 4 units from the following:	4
TH 300, 310, 320, 341, 360, 370, 380, 390, 470, 471	
Select 4 units from the following:	4
TH 330, 345, 400, 430, 432, 434, 480	
	76

SUPPORT COURSES

ENGL 339 Introduction to Shakespeare (C4)*	4
Select 4 units from the following:	4
ARCH 217, 218, 219; ART 101, 111, 112;	
MU 154, 181, 185, 187, 188	
Select 4 units from the following:	4
ENGL 352, 370, 389, 431; LS 310; MU 324, 325, 381, 385, 387, 388	

12

GENERAL EDUCATION (GE)

72 units required, 8 of which are specified in Major/Support.
→See page 39 for complete GE course listing.
→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (20 units)

B1 Mathematics/Statistics	8
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5) ...	4

Area C Arts and Humanities (8 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts * 4 units in Major.....	0
C4 Upper-division elective * 4 units in Support ...	0

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

4

FREE ELECTIVES..... 28*(At least 12 units must be upper division)***180****DANCE MINOR**

The Dance Minor consists of 30 units designed to provide the student with a well-balanced program in the art and education of dance. Admission to the minor is contingent upon a departmental interview and review. Students must have more than a 2.0 GPA.

Core courses*Units*

DANC 134 Beginning Ballroom Dance or DANC 234 Intermediate Ballroom Dance	2
DANC 221 Dance Appreciation (C3)	4
DANC 231 Intermediate Ballet	2
DANC 232 Intermediate Modern Dance	2
DANC 321 Cultural Influences on Dance in America (C4) (USCP)	4
DANC 340 Dance Composition	4
DANC 381 Dance for KINE/Dance Minors	4

Elective courses to be selected from: 8*(at least 3 elective units must be upper division)*

DANC 130 Pilates/Physicalmind Conditioning Method (2-6)	
DANC 135 International Folk Dance (2-6)	
DANC 139 Beginning Tap (2-6)	
DANC 233 Intermediate Jazz (2-6)	
DANC 234 Intermediate Ballroom Dance (2-6)	
DANC 311 Dance in American Musical Theatre (4) (C4)	
DANC 331 Advanced Ballet and Repertory (2-6)	
DANC 332 Modern Dance Repertory (2-6)	
DANC 345 Choreography (4-12)	
DANC 346 Dance Production (4-12)	
DANC 400 Special Problems for Undergrads (1-8)	
DANC 470 Selected Advanced Topic (1-8)	
DANC 471 Selected Advanced Laboratory (1-8)	

30**THEATRE MINOR**

The Theatre Minor is designed to provide the student with a sound foundation in the major aspects of theatre. This program assures each student of a balanced program in the major areas of theatre, and it allows for a degree of specialization in an area of the student's choice. Students should discuss their interests with department faculty.

Admission to the minor is contingent upon a departmental interview and review. Students must have more than a 2.0 GPA.

Core courses*Units*

TH 210 Introduction to Theatre (C3).....	4
TH 230 Stagecraft.....	4
TH 300/TH 310/TH 320	4

Theatre electives (lower division) 4*Select any 4 units of lower division TH courses***Theatre electives (upper division)** 12*Select any 12 units of upper division TH courses***28**

Western Intellectual Tradition, a Minor

Professor and Director, John C. Hampsey
Faculty Offices North (Bldg. 47), Room 26S
805 756-2239

ACADEMIC PROGRAM

Western Intellectual Tradition – Minor

This minor is designed to appeal not only to majors in the College of Liberal Arts and the College of Science and Mathematics, but to a cross section of students in major programs throughout the university community. It focuses on the major accomplishments of the Western intellectual tradition through courses that trace the development of literary expression, philosophical, and scientific thought, and historical understanding from their beginnings to the modern world. Courses in the minor provide direct experience with significant works of the Western tradition, and also expose students to crucial ideas and themes that shaped Western thought and culture. Such exposure cultivates the intellectual skills of analysis and creative expression, and promotes an understanding of the inherent intellectual debate and diversity within the Western intellectual tradition.

Prerequisites. Students must complete the second quarter of calculus (MATH 142 or MATH 162 or MATH 182) *or* the fourth quarter of a foreign language (FR 121, GER 121, SPAN 121) or equivalent. The prerequisites reflect the centrality of both mathematics and language to the Western intellectual tradition. Mathematics pervades the modern world and has a particularly close connection with the human capacity for learning. To study a language other than English is to study English as well, and promotes insight into language in general as the articulation of experience and the discourse of reason.

Courses used to satisfy the required 12 units in Group A and 16 in Group B must be chosen outside the student's major and from at least two disciplines in each group.

<i>* Satisfies General Education requirement</i>	<i>Units</i>
Group A	12
<i>Select 12 units from the following:</i>	
Great Books World Literature (C1)*:	
ENGL 251, 252, 253	
Western Civilization:	
HIST 110 or 111	
Philosophical Classics (C2)*:	
PHIL 230 or 231	
PHYS 211 Modern Physics I (4)	
POLS 230 Basic Concepts of Political Thought (4)	
Group B	16
<i>Select 16 units from the following:</i>	
BIO 414 Evolution (4)	
American Literature (C4)*:	
ENGL 340, 341, 342	
British Literature (C4)*:	
ENGL 330, 331, 332, 333, 334, 335	
Shakespeare (C4)*:	
ENGL 338 or 339	
History:	
HIST 307 (D5)*, 436, 451, 452, 453, 454	
MATH 419 Introduction to the History of Mathematics (4)	
Philosophy (C4)*:	
PHIL 311, 312, 313, 314, 315, 332	
PHIL 421 Philosophy of Space, Time and Matter	
Political Thought:	
POLS 330, 349 (D5)*	
SPAN 416 Don Quixote (4)	

Women's & Gender Studies

Faculty Office Building (Bldg. 47), Room 25H
805 756-1525

Department Chair, Mary A. Armstrong

The following faculty are associated with the Women's and Gender Studies department and hold academic rank in their home department:

Art and Design

Elizabeth Adan Jean Wetzel

Communication Studies Lorraine Jackson

English

Mary A. Armstrong	Claudia Royal
Linda Halisky	Johanna Rubba
Brenda Helmbrecht	Kathryn Rummell
David Hennessee	Debora Schwartz
Carol MacCurdy	Catherine Waitinas

Ethnic Studies

Denise Isom	Victor Valle
Jane Lehr	

History

Christina Firpo	Tom Trice
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Kinesiology Camille O'Bryant

Music Alyson McLamore

Philosophy

Rachel Fernflores	Devin Kuhn
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Political Science Jean Williams

Psychology and Child Development

Shawn Burn	Julie Garcia
Patrice Engle	

Social Sciences Maliha Zulfacar

Theatre and Dance Virginia Anderson

ACADEMIC PROGRAM

Women's and Gender Studies – Minor

The Women's and Gender Studies Minor provides a thorough, interdisciplinary background in feminist thought and theory. Required and elective courses interrogate the history and evolution of ideas about gender and sexual identity, and engage with these issues on multiple levels of inquiry. The minor encourages active student learning and emphasizes sophisticated analysis of how gender and sexuality, as well as race, ethnicity and class (and other markers of identity) shape women's and men's lives. The program embraces the intellectual perspectives of faculty and students across the spectrum of Cal Poly's majors and colleges.

The Minor is housed within the College of Liberal Arts, and its courses are offered by the departments of Art and Design, Communication Studies, English, Ethnic Studies, History, Kinesiology, Music, Philosophy, Political Science, Psychology and Child Development, Social Sciences, Theatre and Dance, and Women's and Gender Studies.

WOMEN'S AND GENDER STUDIES MINOR

Required Courses (20)

	<i>Units</i>
WGS 301 Introduction to Women's and Gender Studies (D5) (USCP).....	4
WGS 450 Feminist Theory (USCP)	4
<i>Choose three from the following courses</i>	12
WGS/SOC 311, WGS/PSY 314, WGS 320 (D5), WGS 340 (D5), WGS/ES 350 (Area F) (USCP), WGS/RELS 370 (C4) (USCP), WGS 401, WGS/HIST 435 (USCP)	

Approved Elective Courses 4

Students select 4 units from the approved list of elective courses in consultation with their Women's and Gender Studies faculty advisor.

COMS 421 Gender and Communication (4)
ENGL 345 Women Writers of the Twentieth Century (4) (C4) (USCP)
ENGL 349 Gender in 20th Century Lit.(4)(C4) (USCP)
ENGL 382 Lesbian, Gay, Bisexual, Transgender Literature and Media (4)
ENGL 469 Women's Rhetoric: Definitions, Contexts, Issues (4)
ENGL topics courses. See a Women's and Gender Studies advisor for approval of specific topics. Topics courses include:
ENGL 439 Significant British Writers (4)
ENGL 449 Significant American Writers (4)
ENGL 459 Significant World Writers (4)
ENGL 495 Topics in Applied Language Study (4)
ES 300 Chicano/a Non-Fiction Lit. (4) (C4) (USCP)
ES 325 Sex & Gender in African American Communities (4) (USCP)
HIST 421 History of Prostitution (4)
HIST 458 Gender & Sexuality in Modern Europe (4)
KINE 323 Sport and Gender (4) (D5) (USCP)
MU 328 Women in Music (4) (C4)
PHIL 336 Feminist Ethics, Gender and Society (4) (C4) (USCP)
POLS 310 Politics of Ethnicity & Gender (4) (USCP)
SOC 351 Women in East Asia (4)
TH 310 Women's Theatre (4) (C4)
WGS/SOC 311 Sociology of Gender (4)
WGS/PSY 314 Psychology of Women (4)
WGS/ART 316 Women as Subj & Object in Art Hist (4)
WGS 320 Women in Global Perspective (4) (D5)
WGS 340 Sexuality Studies (4) (D5)
WGS/ES 350 Gender, Race, Science & Technology (4)(Area F) (USCP)
WGS/RELS 370 Religion Gender & Soc(4)(C4)(USCP)
WGS 400 Special Problems for Adv. Undergrads (1-4)
WGS 401 Sem. in Women's & Gender Studies (4)
WGS/HIST 434 Amer. Women's Hist to 1870 (4)
WGS/HIST 435 American Women's History from 1870 (4) (USCP)

College of *Science & Mathematics*

Philip S. Bailey, Dean
Dane R. Jones, Associate Dean
Dean E. Wendt, Associate Dean
Faculty Offices East (25), Room 229
805 756-2226

ACADEMIC PROGRAMS

Actuarial Preparation.....	<i>Minor</i>
Astronomy.....	<i>Minor</i>
Biochemistry.....	<i>BS</i>
Biological Sciences.....	<i>BS, MA, MS</i>
Biology.....	<i>Minor</i>
Biotechnology.....	<i>Minor</i>
Chemistry.....	<i>BS</i>
Environmental Studies.....	<i>Minor</i>
Geology.....	<i>Minor</i>
Kinesiology.....	<i>BS, MS</i>
Liberal Studies.....	<i>BS</i>
Mathematics.....	<i>BS, MS, Minor</i>
Microbiology.....	<i>BS, Minor</i>
Physics.....	<i>BA, BS, Minor</i>
Polymers and Coatings Science.....	<i>MS</i>
Statistics.....	<i>BS, Minor</i>

SCHOOL OF EDUCATION

Academic Programs

Education.....	<i>MA</i>
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Credential Programs

See pages 286 and 288 for lists

MISSION

The mission of the College of Science and Mathematics is to facilitate learning, understanding, and appreciation of science and mathematics as a basis for creative endeavors, intellectual pursuits, careers, and critical consideration of issues confronting society. The College has two equally important roles: (1) to provide specialized coursework for students enrolled in the College's undergraduate, graduate and minor programs, and (2) to provide support and breadth courses in science and mathematics for all students of the university. Cal Poly is a national leader in preparing college students for careers in science, technology, engineering, and mathematics (STEM) professions, including science and mathematics teaching careers.

The College of Science and Mathematics has a tradition and reputation for excellence in teaching and is dedicated to both undergraduate and graduate instruction. The College

provides a student-centered learning environment consistent with the University's "learn by doing" philosophy. In laboratories, students have access to modern instrumentation and computer technology. Classroom instruction is done in relatively small classes so that a personal approach by instructors is possible. Because of the College's large role in offering support courses to the rest of the university community, the number of faculty in each department is relatively large and favors student-faculty interaction, both inside and outside of the classroom.

School of Education

The School of Education prepares students to be effective, ethical and informed teachers, counselors and administrators, who have a particular expertise in and understanding of science, mathematics, and technology integrated across the curriculum in inquiry-based, hands-on approaches. The School of Education offers a range of programs: multiple subject and single subject teaching credentials; agriculture specialist credential; educational technology certificate; integrated credential and M.A. in Education with specializations in educational leadership and administration and special education, and an M.A. in Education with specialization in counseling and guidance. Single subject credentials programs are offered in Agriculture, English, Biology, Chemistry, Mathematics, Physics and Social Science.

Teaching credential candidates have opportunities for additional authorizations in Computer Concepts and Applications, Mathematics, General Science, and other subjects.

To prepare students in these fields, faculty from agriculture, science, mathematics, the liberal arts, and humanities work collaboratively with faculty in the School of Education to provide outstanding programs that maintain a balance of subject matter, education foundations, and pedagogy, together with field experiences for applied practice. In the Liberal Studies Program, students can pursue an integrated pre-professional program that leads to a B.S. degree and a multiple subject credential to teach elementary school. Cal Poly takes pride in producing elementary school teachers and leaders who have special expertise in science and mathematics education through a balanced multiple subject curriculum. More information on the programs offered in the School of Education can be found on pages 285-290.

CESaME

The University Center for Excellence in Science and Mathematics Education (CESaME) was created to focus Cal Poly on preschool through college (P-16) STEM education in order to improve the STEM education and workforce pipeline and to enhance the scientific and technological literacy of our citizens. As an inter-disciplinary, university-wide endeavor, CESaME fosters collaborations among students, staff and faculty from across campus and nurtures partnerships with preschool through high school (P-12) teachers and community college faculty as well as business, industry, government and foundations in support of improving STEM learning and teacher education.

CESaME leads the state in the development and implementation of model programs in teacher education and professional development, such as the Science Teacher and Researcher (STAR) program that provides summer research internships for aspiring and early career science and mathematics teachers from any CSU campus. CESaME is responsible for Cal Poly's Math and Science Teacher Initiative and fosters other programs such as Cal Poly's Noyce Scholarship program, the Learn By Doing Laboratory (a local P-16 STEM initiative) and various professional development programs for local science and mathematics teachers.

STUDENT SERVICES

The College Office acts on various student-initiated petitions (change of major, curriculum substitutions, withdrawal from the university). In addition, the office has the dual function of counseling those on academic probation and notifying those undergraduate students who are eligible each quarter for the Dean's Honor List.

FACULTY ADVISING

Faculty members take an active role in academic and career advising. Students are encouraged to obtain academic advising prior to registration each quarter. The advisor-student relationship becomes important especially when the student needs a letter of reference for a potential employer or graduate school or needs career advice.

COLLEGE OF SCIENCE AND MATHEMATICS ADVISING CENTER

Kristi Weddige, Director/Advisor
Rebecca Westmoreland, Administrative Coordinator
Science North (Bldg. 53), Room 219
805 756-2615
<http://www.csmadvising.calpoly.edu>

The College of Science and Mathematics Advising Center provides academic advising services to students within the college. Professional advisors take a holistic approach to advising, designing an academic plan that will assist students in defining academic, career and personal goals and empower students to create an educational plan consistent with those goals. These services include assistance with scheduling classes, developing long-range academic plans, and career advising, as well as informing students of their graduation requirements, and interpreting university and college policy and procedures. Advisors also serve as advocates and mentors to promote student success. Students are encouraged to seek advice early and often throughout their time at Cal Poly.

Health Professions Peer Advisors

Science North (Bldg. 53), Room 219
<http://healthprofessions.calpoly.edu>

Health professions advising is available to all students who are interested in pursuing a health professions career. Students should begin their preparation by visiting the Health

Professions Peer Advisors. Support includes health careers advising, assistance in selecting courses and course sequencing, and finding appropriate community service and other health related opportunities such as summer internships.

Professional staff advisors offer additional, more detailed advising for students and alumni who are preparing to apply to professional schools, including assistance with the application and interview process.

APPLYING TO GRADUATE SCHOOL

College of Science and Mathematics faculty have earned advanced degrees from a wide variety of universities and are excellent sources for information and advice about graduate programs, prerequisites and application procedures. Applications to graduate programs should be made in the fall for admission to the following fall term. The Graduate Record Exam (GRE) should be taken early in the application cycle. Generally, two or more letters of reference from faculty are required. Most Ph.D. granting institutions offer financial support in the form of teaching assistantships and research fellowships.

ACTUARIAL PREPARATION MINOR

Actuaries are professional risk managers that assess the likelihood and impact of future, uncertain events. They use their quantitative skills to prepare businesses for the financial impact of the risk to which they are exposed. Actuaries must meet rigorous standards for admission to professional societies. To be called an actuary in the United States, one must become an Associate or Fellow of the Society of Actuaries (SOA) or the Casualty Actuarial Society (CAS).

The Actuarial Preparation Minor provides education in probability, financial mathematics, and mathematical statistics. The coursework will satisfy the Validation by Educational Experience (VEE) requirements of the SOA and CAS, and will help students prepare for the actuarial exams, which are also prerequisite to SOA or CAS membership.

The minor is open to any major, but it is especially suited to students in statistics, mathematics, and business/finance. Students interested in the minor should consult the website www.calpoly.edu/~stat/actuary.html.

Additional information about the actuarial profession, societies, and exams, as well as additional suggested coursework, is available at the website above.

Core courses (Validation by Educational Experience)

(20)	Units
ECON 221 Microeconomics.....	4
ECON 222 Macroeconomics (D2).....	4
BUS 342 Fundamentals of Corporate Finance.....	4
STAT 324 Applied Regression Analysis.....	4
STAT 416 Statistical Analysis of Time Series.....	4

Approved electives (8)

BUS 431 Security Analysis and Portfolio Mgt <i>or</i>	
BUS 439 Fixed Income Securities/Markets.....	4
STAT 325 Intro to Probability Models <i>or</i>	
STAT 425 Probability Theory	4
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BIOTECHNOLOGY MINOR

The Biotechnology Minor consists of a core of required courses and restricted elective courses. Advising for students in the Biotechnology Minor takes place in the student's major department, including selection of restricted electives and preparation of an agreement form listing specific courses to satisfy the requirements for the minor.

The Biotechnology Minor Form is available from the Dean's Office or the Advising Center in the College of Science and Mathematics. Final approval of the minor is by the Program Coordinator in the College of Science and Mathematics.

The minor is open to any major except Biochemistry, Microbiology, and Biological Sciences with the Molecular and Cellular Biology concentration.

Biological Sciences students preparing for the minor should take CHEM 316, 317, and 371 to fulfill the organic chemistry and biochemistry requirements in their major.

Students interested in more information should contact either Margaret (Peggy) Rice in the Chemistry and Biochemistry Department or Ken Hillers in the Biological Sciences Department.

Core courses (15-21)

BIO 161 (B2/B4), BOT 121 (B2/B4), MCRO 221 (B2/B4) <i>or</i> MCRO 224 (B2/B4).....	4-5
BIO 303, BIO 351, <i>or</i> CHEM 373	3-5
CHEM 313 <i>or</i> CHEM 371	5
Laboratory elective: ASCI 403, BIO/CHEM 375, BOT 450 <i>or</i> CHEM 474	2-5
SCM 201 Orientation to Biotechnology.....	1

Approved electives 7-13*Animal Biotechnology:*

ASCI 403, 406, 503; DSCI 330; ASCI 440

Bioinformatics:

BIO/CHEM 441; CSC/CPE 448

Cell and Molecular Biology/Microbial Biotechnology:

BIO/CHEM 375, BIO 426, 452, 476; CHEM 472, 474, 528; MCRO 225, 320, 402, 433

Engineering-related Biotechnology:

BRAE 448; ENVE 443; ENGR 581, 582, 583

Ethics:

PHIL 339; SCM 451

Pharmaceutical Biotechnology:

CHEM 377, 477

Plant Biotechnology:

BOT 323, 324, 450; CHEM 472

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ENVIRONMENTAL STUDIES MINOR

Students who complete a minor in Environmental Studies will be able to:

- Analyze, explain, and evaluate environmental issues from both scientific/technical and social/political/economic/ethical perspectives.
- Integrate and synthesize knowledge from multiple disciplines.
- Explain and apply the methodologies and approaches that different disciplines bring to bear on complex problems.
- Work productively and effectively with students from other disciplines and with other points of view.
- Confront and grapple with real issues of contemporary significance.
- Gain employment or pursue further study that emphasizes interdisciplinary knowledge and skills.

More information about the Environmental Studies Minor, including Subject Area Electives appropriate for students in each of the colleges, can be obtained from the College of Science and Mathematics Dean's Office in Building 25, Room 229C. Subject Area Electives **must be approved in advance** by an advisor for the minor.

Units

Subject Area Approved Electives

Select one course from each subject area. Electives must be approved in advance by an advisor for the minor.

<i>Biology and ecology: select one</i>	4
BIO 112 (B5), 227 (B2), 325; NR 306, 319 (B5)	
<i>Earth science: select one</i>	3-4
ERSC 144; GEOG 250; GEOL 102 (B3); PHYS 313; PSC 201 (B5); ERSC 202	
<i>Energy and pollution: select one</i>	3-4
BRAE 348 (F); ENVE 324 (F), 330, 331; ME 321 (F); PHYS 310; PSC 320 (F)	
<i>Social, political, economic, and ethical issues: select one</i>	3-4
CRP 404; ECON 431; HUM 303 (C4); PHIL 340 (C4); POLS 325 (D5), 333 (F); RPTA 302; SOC 431; UNIV 333 (F)	
<i>Environmental planning, management, and sustainability: select one</i>	3-4
AG/HUM/UNIV 330 (F); AG 360 (F); CRP 336; EDES 406; NR 142; GEOG 301 (D5), 333; LA 321	

Approved Elective 4
Choose one additional 300-400 level course from the above lists.

Capstone Course..... 4
AG/BUS/EDES/ENGR/HUM/SCM/UNIV 350
The Global Environment (F)

 24-28

Biological Sciences

Fisher Science Hall (33), Room 273
805 756-2788
Email address: bio@calpoly.edu
www.calpoly.edu/~bio

Department Chair, Christopher L. Kitts

Nikki L. Adams	Shannon J. McCauley
Michael W. Black	Mark A. Moline
Jason M. Blank	Royden Nakamura
Sandra L. Clement	John D. Perrine
Susan L. Elrod	Matthew K. Ritter
Pat M. Fidopiastis	Scott J. Steinmaus
Michael T. Hanson	Christy R. Strand
Kristin M. Hardy	Emily N. Taylor
Kenneth J. Hillers	Lars Tomanek
Edward T. Himelblau	Francis X. Villablanca
Elena L. Keeling	Larisa K. Vredevoe
David J. Keil	Dean E. Wendt
Charles A. Knight	Candace R. Winstead
Gita R. Kolluru	Po Sai Marie Yeung
Sean C. Lema	Michael A. Yoshimura

ACADEMIC PROGRAMS

Biological Sciences – BS, MA, MS

Biology – Minor

Microbiology – BS, Minor

The department offers complete undergraduate programs leading to Bachelor of Science degrees in Biological Sciences and Microbiology, and minors in Biology and Microbiology. For qualified students, a graduate program is available leading to the Master of Science degree. In addition, courses are offered to satisfy biology requirements in other academic majors.

The Biological Sciences department teaches courses with the following prefixes: BIO (Biology), BOT (Botany), MCRO (Microbiology), and ZOO (Zoology).

The department is housed in modern facilities equipped with up-to-date instrumentation. Cal Poly's geographical setting offers unusual opportunities for studying representative plants and animals of both Northern and Southern California. Graduates of the various programs enter fields in teaching; medical laboratory technology; public health; biotechnology research and manufacturing; wildlife management; agriculture; industry; and private, state, and national park and forest services. A significant number enter graduate or professional schools for advanced study of botany, entomology, micro-biology, plant pathology, zoology, marine sciences, veterinary science, cell and molecular biology, medicine, and dentistry. The department offers courses required for preprofessional training in medicine and paramedical fields. In the teaching area, all state

requirements may be met with a major in biological sciences and a biology teaching concentration leading to a credential in secondary teaching.

The department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see Study Abroad Programs.

Students majoring in Biological Sciences or Microbiology may take advantage of opportunities to participate in research projects. Special opportunities are available through the Environmental Biotechnology Institute (EBI) that is developing biological tools to address environmental concerns through collaborative interdisciplinary research and education; the Center for Coastal Marine Science (CCMS) that promotes and facilitates basic and applied studies of coastal marine systems for the purposes of addressing environmental concerns and fostering hands-on learning through discovery and outreach; and the Undergraduate Biotechnology Laboratory (UBL), which is co-funded by Cal Poly and the National Science Foundation to provide undergraduates with hands-on experience with biotechnology. In addition, there are many opportunities to work in the laboratory of individual faculty members in areas such as conservation, genetics, biology, behavioral ecology, endangered species, infectious disease mechanisms, developmental biology, and plant pathology, and physiology.

Biological Sciences Major

With the curricular concentrations described below, this degree offers students a broad education in biology from molecules to ecosystems. It is suitable for preprofessional preparation in the biomedical fields, teaching, technical competency in the concentrations offered, progress towards certification as an Associate Ecologist, Fisheries Biologist, or Associate Wildlife Biologist, or as a base for work toward post-baccalaureate studies. Students are encouraged to take BIO 100 Orientation to Biological Sciences (1 unit) their first quarter to help them learn about their chosen degree program, concentration choices, career options, study skills, and departmental opportunities.

Curricular Concentrations

Anatomy and Physiology. Designed for students who are interested in the biological sciences with an emphasis in the structure and function of animals and especially for preprofessional students interested in the health sciences.

Biology Teaching. Ideal for students planning to pursue a single subject credential. The courses fulfill the California Commission on Teacher Credentialing guidelines for subject matter preparation in biology. Opportunities to teach and to learn about the teaching profession are provided and students attain an early experience in teaching.

Ecology. The study of ecology spans a wide breadth of habitats, from terrestrial to marine, and multiple scales of

organization, from microbial interactions to global processes. As such, the ecology concentration allows flexibility for students to design a program to fit their interests and career goals within this broad discipline. The concentration emphasizes collection and analysis of data to better understand the factors that affect the distribution and abundance of organisms. In many contexts, these results are used to identify and solve environmental problems.

Graduates may pursue careers in education, ecological consulting, planning or coordination, habitat restoration, or environmental law. A graduate may be academically qualified for professional certification as an Associate Ecologist by the Ecological Society of America.

Field and Wildlife Biology. Field and Wildlife biologists understand the factors that affect the distribution and abundance of terrestrial plants and animals. Emphasis is on identification of organisms in the field and a conceptual understanding of community structure. The concentration prepares students for graduate training or for professional employment in public or private agencies dealing with field inventories of biological diversity, abundance and distribution. Graduates may pursue careers as field biologists, outdoor educators, park naturalists, biological resource scientists, biology teachers, environmental consultants, or wildlife conservation biologists.

Marine Biology and Fisheries. Prepares students for advanced training or professional employment in public or private agencies concerned with marine sciences, freshwater ecology, fisheries biology, fisheries management, or related fields. By judicious selection of electives, the student is academically prepared to apply for professional certification as a Fisheries Biologist by the American Fisheries Society.

Molecular and Cellular Biology. Designed for students who are interested in how genes and their products work to create cellular structures, activities and interactions in organisms ranging from microbes to plants and animals.

This concentration augments the diverse biological sciences curriculum with laboratory courses in nucleic acid and protein techniques, along with additional courses in bioinformatics, industrial microbiology, immunology, virology, and plant biotechnology. An understanding of molecular and cellular biology is a cornerstone for various biotechnology, medical, and pharmaceutical industries as well as for graduate or professional study in biology, microbiology, biochemistry, the health professions, or other related fields. Students electing this concentration are not eligible for the Biotechnology Minor.

Microbiology Major

Cal Poly is one of the few California State University or University of California universities offering a laboratory-intensive Bachelor of Science degree in Microbiology. The Microbiology major consists of a core of freshman courses that provide students with a basic foundation in key biological principles and includes an introduction to

organismal, cellular, and molecular biology, as well as evolution, ecology and biodiversity. In the sophomore year, majors are provided with a solid training in the manipulation of microorganisms, as well as an understanding of microbial cell structure and function, metabolism, genetics, and ecology.

In the junior and senior years, majors take specialized courses in medical microbiology, immunology, microbial physiology, genetics, virology, and cell biology. During this time students also choose elective courses related to individual student interests and career goals in close consultation with their faculty advisor. Such goals may include graduate school, professional studies or post-baccalaureate employment in applied areas such as industrial microbiology, food and dairy microbiology, and biotechnology, as well as in public health microbiology, epidemiology, or medical laboratory technology.

Biotechnology Minor

For information regarding the Biotechnology Minor, please see College of Science and Mathematics Section.

BIOLOGY MINOR

The purpose of the minor is to help students from other disciplines acquire increased factual and conceptual knowledge in biology, an increased understanding of scientific methods and techniques used to study biology, and an increased ability to analyze biological topics in the news or in various jobs. Biological issues are important throughout modern life and particularly relevant in many careers, including those in health-related businesses, agriculture, several engineering disciplines, city planning, teaching K-12 students, journalism, political science, psychology, and statistics. Students in more closely related majors such as biochemistry or kinesiology may also be interested in strengthening their biology background. In addition, an enhanced biology background helps students become better educated citizens regarding a variety of controversial issues (e.g., genetically-modified organisms in agriculture, human cloning, genetic discrimination, the pressures of population growth).

Required Courses.

Units

Choose one of the following three tracks..... 12-14

Track 1 (13-14)

- BIO 160 Diversity and the History of Life (4) *or*
- MCRO 221 Microbio. (4) (B2&B4) *or*
- MCRO 224 Gen. Microbio. I (5) (B2&B4)
- BIO 161 Introduction to Cell and Molecular Biology (4) (B2&B4)
- BIO 162 Intro to Organismal Form/Function (5)

Track 2 (13)

- BIO 161 Introduction to Cell and Molecular Biology (4) (B2&B4)
- BIO 162 Intro to Organismal Form/Function (5)
- BIO 263 Intro Ecology and Evolution (4)

Track 3 (12-13)

BIO 111 General Biology (4) (B2&B4)

And two of the following three options

¹ a) BIO 114 Plant Diversity and Ecology (4) (B2&B4) *or*

BOT 121 General Botany (4) (B2&B4)

¹ b) BIO 113 Animal Diversity and Ecology (4) (B2&B4) *or*

BIO 115 Animal/Human Structure and Function (4) (B2&B4)

c) MCRO 221 Microbiology (4) (B2&B4) *or*

MCRO 224 General Microbio I (5) (B2&B4)

The three tracks are intended to meet prerequisites in different areas of the curriculum. The choice of which introductory courses to take should be made in consultation with one of the Biology Minor Coordinators to ensure that students have appropriate prerequisites for upper division electives.

Approved Electives 15-16

Select at least four courses at the 300-400 level in BIO, BOT, MCRO or ZOO, with the exception of BIO 400, BIO 450, BIO 485, and BIO 495.

Suggested combinations of courses in particular areas of biology are available in the department.

Specific combinations of courses may not be allowed if the courses overlap too much in content.

Students must obtain prior approval from one of the Biology Minor Coordinators.

28-30

MICROBIOLOGY MINOR

This minor is designed to give students from majors in which microbiology may be an important component increased exposure to factual information, concepts, and skills in order to provide those students a more complete understanding of the roles of microorganisms as they pertain to studies in their chosen major. Students in the allied health and related fields may expand their breadth of knowledge in microbial diseases, transmission and prevention, and immunologic responses. Students in applied fields of study such as Food and Dairy Sciences and various aspects of agriculture can gain additional information in pertinent topics such as microbial involvement in water and wastewater treatment; the role of microorganisms in recycling of nutrients and soil fertility; microbial roles in food processing, spoilage, production; and disease transmission.

Required Courses.

Units

MCRO 221 Microbiology (B2&B4) *or*

MCRO 224 General Microbiology (B2&B4)..... 4/5

MCRO 225 General Microbiology II..... 5

MCRO 423/MCRO 424/MCRO 402 5/5/4

Approved electives 11-13

Select courses from the following:

BIO 426; DSCI 444;

MCRO 301, 320, 342, 402, 421, 423, 424, 433, 436;

SS 422; ZOO 425, 428

26

BS BIOLOGICAL SCIENCES

☐ 60 units upper division

☐ GWR

☐ 2.0 GPA

☐ USCP

* = Required in Major/Support; also satisfies GE

Course sequencing: See flowcharts at csmadvising.calpoly.edu

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

MAJOR COURSES

BIO 160 Diversity & the History of Life	4
BIO 161 Intro to Cell & Molecular Bio (B2&B4)*	4
BIO 162 Intro to Organismal Form & Function	5
BIO 263 Introductory Ecology and Evolution.....	4
BIO 351 Principles of Genetics	5
BIO 414 Evolution.....	4
BIO 461 Senior Project – Research Proposal <i>or</i>	
BIO 462 Senior Project – Research.....	2
² <i>Biological Diversity:</i>	4
BIO 415; BOT 313, 323, 433, 437; MCRO 224,	
402; ZOO 321, 322, 323, 329, 335, 336, 341,	
425	
<i>Ecology:</i> BIO 325, 327, 328, 401; BOT 326;	
MCRO 436	4
³ <i>Physiology:</i> BIO 361, 434, 435.....	4
^{4,5} Concentration or General Curriculum in Biology ..	39
	79

SUPPORT COURSES

CHEM 127 General Chemistry (B3&B4)*	4
CHEM 128, 129 General Chemistry	4, 4
⁶ CHEM 312 Survey of Organic Chemistry <i>or</i>	
CHEM 316 Organic Chemistry I.....	5
MATH 161, 162 Calculus/Life Sciences I, II (B1)*	4, 4
PHYS 121, 122, 123 College Physics I, II, III	4, 4, 4
STAT 218 Appl Statistics-Life Sciences (B1)*	4
	41

GENERAL EDUCATION (GE)

72 units required, 16 of which are specified in Major/Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing.....	4

¹ For Liberal Studies majors, BIO 211 may be substituted for BIO 114, BOT 121, BIO 113 or BIO 115.

² Students in the Molecular and Cellular Biology concentration should take MCRO 224 to fulfill this requirement.

³ Students in the Anatomy and Physiology concentration and in the Biology Teaching concentration should take BIO 361 to fulfill this requirement.

⁴ Note that courses in concentrations or the general curriculum may not double-count in the major core.

⁵ Maximum of 6 units may be applied toward the major from the following courses: BIO 400, BIO 450, BIO 462, BIO 463.

⁶ Students in the Molecular and Cellular Biology concentration should take CHEM 316 to fulfill this requirement.

Area B Science and Mathematics (no add'l units req'd)	
B1 Mathematics/Statistics * 8 units in Support....	0
B2 Life Science * 4 units in Major.....	0
B3 Physical Science * 4 units in Support	0
B4 One lab taken with either a B2 or B3 course * in Major	
Area C Arts and Humanities (20 units)	
C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4
Area D/E Society and the Individual (20 units)	
D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
¹ D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4
¹ Area F Technology Elective (upper division)(4 units)	4
	56
FREE ELECTIVES	4
	180

GENERAL CURRICULUM IN BIOLOGY or CONCENTRATIONS (select one)

General Curriculum in Biology

CHEM 313 Survey of Biochem and Biotech <i>or</i> CHEM 371 Biochemical Principles.....	5
<i>Anatomy/Physiology (Select at least 1 course)</i>	4-5
BIO 361, 432, 433, 434, 435; MCRO 424; ZOO 422	
<i>Botany (Select at least 1 course)</i>	4
BOT 311, 313, 323, 324, 335, 431, 433, 437	
<i>Ecology/Evolution/Conservation (Select at least 1 course)</i>	3-4
BIO 325, 327, 328, 401, 415, 419, 427, 438, 439, 443, 444; BOT 326; MCRO 436; ZOO 437	
<i>Microbiology (Select at least 1 course).....</i>	3-5
MCRO 224, 225, 301, 320, 342, 421, 423, 433; ZOO 425	
<i>Molecular/Cellular Biology (Select at least 1 course)</i>	3-4
BIO 405, 426, 452; BIO/CHEM 375, 441, 476; BOT/HCS 450; MCRO 402; ZOO 428	
<i>Zoology (Select at least 1 course)</i>	4
ZOO 321, 322, 323, 329, 335, 336, 341	
<i>Research, Projects and Seminars.....</i>	0-6
BIO 200, 330, 400, 450, 462, 463, 470, 471, 472; SCM 302	
² Approved Electives.....	2-13
<i>(Select additional courses in any of the areas listed or request faculty advisor approval for other courses with a maximum allowed of 8 units of coursework outside of the department)</i>	
	39

Anatomy and Physiology Concentration	
BIO 432 Vertebrate/Human Anatomy & Phys I.....	5
BIO 433 Vertebrate/Human Anatomy & Phys II.....	5
BIO 452 Cell Biology	4
CHEM 371 Biochemical Principles <i>or</i> CHEM 313 Survey of Biochemistry and Biotechnology	5
² Approved electives	20
<i>Select 20 units from the following:</i>	
<i>8 units minimum from:</i>	
BIO/CHEM 375; BIO 405, 426, 434, 435; MCRO 225, 320, 342, 402, 423, 424; ZOO 422, 425, 428	
<i>11 units maximum from:</i>	
CHEM 317, 318, 372	
<i>8 units maximum from:</i>	
ASCI 351, 406; BIO 400, 462, 463; FSN 310, 429; KINE 406, 445, 446; PHIL 339; PSY 340; SCM 451	
	39

¹ Biology Teaching Concentration

BIO 432 Vertebrate/Human Anatomy/Phys I.....	5
BIO 433 Vertebrate/Human Anatomy/Phys II.....	5
BIO 452 Cell Biology	4
BIO/PSC 424 Organizing/Teaching Science	4
MCRO 320 Emerging Infectious Diseases	3
SCM 300 Early Field Experience, Science/Math...	4
SCM 451 Ethics in the Sciences	3
² Approved electives	11
<i>Select 11 units from the following:</i>	
BIO 328, 330, 375, 400, 401, 415, 434, 435, 450, 462, 463, 472; BOT 311, 313, 323, 326, 335, 433, 437; MCRO 225, 421, 424, 433; ZOO 321, 322, 323, 329, 335, 336, 341, 437	
	39

Ecology Concentration

<i>Ecology of the Individual (select 1 course)</i>	4-5
BIO 434, 435; MCRO 424; ZOO 437	
<i>Population Ecology (select 1 course).....</i>	3-4
BIO 327, 401, 439, 444	
<i>Community Ecology (select 1 course).....</i>	4
BIO 325, 328; BOT 326, 433; MCRO 436	
<i>Global Ecology (select 1 course)</i>	4
BIO 415, GEOG 250, 333; UNIV 350	
<i>Methodology (select 3 courses).....</i>	10-12
BIO/CHEM 375, BIO 419, BIO 443, LA/NR 318, STAT 313, STAT 419	

¹ To meet credentialing requirements, it is recommended teaching students take KINE 250 to fulfill GE D4, and SCM 330 to fulfill GE Area F.

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

¹ Approved electives.....	10-14
<i>Select courses from the above five lists in this concentration, or from the Biological Diversity list of courses in the major core, or from the following:</i>	
BIO 330, 400, 441, 462, 463, 472;	
BOT 311, 313, 323, 437;	
MCRO 224, 402;	
NR 307, 418;	
SS 321, 322;	
ZOO 321, 322, 323, 329, 335, 336, 341, 425	

39

Field and Wildlife Biology Concentration

BOT 313 Taxonomy of Vascular Plants	4
BOT 433 Field Botany	4
ZOO 321 Mammalogy	4
ZOO 323 Ornithology	4
ZOO 341 Herpetology.....	4
Emphasis Area (select Field or Wildlife).....	19

Field Biology Emphasis

ZOO 335 General Entomology (4)
ZOO 437 Animal Behavior (4)
BIO 439/ZOO 322 (4)

¹ Approved electives (*Select 7 units from*):

BIO 325, 327, 328, 330, 400, 401, 415, 419, 427, 439, 434, 443, 444, 462, 463;
BOT 326, 437; LA/NR 318;
NR 141, 142, 203, 307, 404, 416;
MCRO 402; SS 121, 321, 322;
STAT 313, 324, 330, 416, 419, 421;
ZOO 322, 329, 335, 336, 425, 437

² *Wildlife Biology Emphasis*

BIO 327 Wildlife Ecology (4)
BIO 427 Wildlife Management (4)
BIO 444 Population Ecology (3) or
BIO 401 Conservation Biology (4)

¹ Approved electives. Select 7-8 units from the approved electives list above in the Field Biology Emphasis

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Marine Biology and Fisheries Concentration

BIO 328 Marine Ecology	4
BIO/CHEM 375 Molecular Biology Laboratory	3
BOT 437 Phycology.....	4
STAT 313 App Exp Design/Regression Models	4
ZOO 322 Ichthyology	4
ZOO 336 Invertebrate Zoology.....	4

¹ Approved electives

16

Select at least 8 units from:

BIO 400, 401, 405, 419, 434, 435, 438, 439, 443, 444, 452, 462, 463;
MCRO 436;
ZOO 321, 323, 425, 437

Select no more than 8 units from:

CHEM 317, 313 or 371, 341, 474;
PSC 201

39

Molecular and Cellular Biology Concentration

BIO/CHEM 375 Molecular Biology Laboratory	3
BIO 452 Cell Biology	4
CHEM 317 Organic Chemistry II.....	5
CHEM 371 Biochemical Principles	5
CHEM 372 Metabolism.....	4

³ CHEM 474 Protein Techniques Laboratory *or*

BIO/CHEM 476 Gene Expression Laboratory	2
Choose 8 units from the following.....	8
BIO 405, 426; BIO/CHEM 441, BIO/CHEM 476 or CHEM 474; BOT 450; MCRO 402, 433; SCM 201	

¹ Approved electives

8

Select 8 units from:

List A

BIO 400 [†] , 405, 426, 432, 433, 435, 462, 463;
BIO/CHEM 441;
BIO/CHEM 476 or CHEM 474;
BOT 323, 450;
MCRO 320, 402, 423, 424, 433;
ZOO 422, 425, 428

List B (*Only one course from List B*)

ASCI 403, 406;
CHEM 318, 331, 377, 472, 477, 478, 528;
SCM 201, 451

39

BS MICROBIOLOGY

- 60 units upper division GWR
 2.0 GPA USCP

* = Required in Major/Support; also satisfies GE

Course sequencing: See flowcharts at

www.csmadvising.calpoly.edu

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

MAJOR COURSES

BIO 160 Diversity & the History of Life	4
BIO 161 Introduction to Cellular & Molecular Biology (B2&B4)*.....	4
BIO 263 Introductory Ecology and Evolution.....	4
BIO 351 Principles of Genetics	5
BIO 426 Immunology	4
BIO 452 Cell Biology	4
MCRO 224 General Microbiology I	5
MCRO 225 General Microbiology II	5
MCRO 402 General Virology.....	4
MCRO 423 Medical Microbiology.....	5
MCRO 424 Microbial Physiology	5
BIO 461 Senior Project – Research Proposal <i>or</i>	
BIO 462 Senior Project - Research	2

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.² Students seeking Wildlife Biologist Certification should see faculty advisor for assistance.³ The course selected to satisfy this requirement may not be used to satisfy electives in the concentration.[†] Total credit limited to 4 units.

¹ Approved electives.....	18
Limited to a total of 4 units from BIO 400, 450, 462, and 463. At least 10 units must be upper division (300-400 level).	
<i>Biotechnology</i>	
MCRO 433;	
ASCI 403;	
BIO/CHEM 375, 441, 476;	
BOT/HCS 450;	
BRAE 448;	
CHEM 331, 372, 373, 474, 478;	
SCM 201	
<i>Food Microbiology</i>	
MCRO 421;	
DSCI 402, 434, 444;	
FSN 230, 275, 335, 341, 364, 368, 374, 474	
<i>Medical and Public Health Microbiology</i>	
MCRO 320, 342;	
ASCI 203, 312, 321, 438, 440;	
BIO 162, 432, 433;	
CHEM 331, 349, 377, 477;	
KINE 301;	
ZOO 425, 428	
<i>Microbial Ecology and Evolution</i>	
MCRO 436;	
BIO 325, 414, 443;	
CHEM 341;	
ENVE 434;	
SS 422	
<i>Other electives for Microbiology Majors</i>	
BIO 361, 400, 434, 450, 462, 463;	
BOT 323;	
CHEM 318, 319, 419, 472;	
MATH 151, 162;	
PPSC 311, 441;	
SCM 451;	
STAT 313, 419, 421;	
ZOO 335, 336, 436	
	69

² SUPPORT COURSES

CHEM 127 General Chemistry I (B3&B4)*.....	4
CHEM 128, 129 General Chemistry II, III	4, 4
CHEM 316 Organic Chemistry I.....	5
CHEM 317 Organic Chemistry II	5
³ CHEM 371 Biochemical Principles	5
MATH 161 Calculus for the Life Sciences I (B1)*	4
PHYS 121, 122, 123 College Physics I, II, III.....	4, 4, 4
STAT 218 Applied Statistics-Life Sciences (B1)*	4
	47

GENERAL EDUCATION (GE)

72 units required, 16 of which are specified in Major/Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing.....	4

Area B Science and Mathematics (no add'l units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Major	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

	56
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FREE ELECTIVES

	8
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180**MASTER OF ARTS DEGREE IN BIOLOGICAL SCIENCES****General Characteristics**

This degree offers a broad background in the biological sciences. The program is designed to offer sufficient breadth and depth to strengthen the student's academic understanding and improve competence for: (a) many types of biological work that require advanced training beyond the bachelor's degree; (b) careers in industry and/or civil service; (c) teaching biological sciences at the elementary, secondary, and community college levels. This degree differs from the MS in Biological Sciences in that a research thesis is not required.

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, submission of scores on the Graduate Record Examination (GRE) and the Biology Subject GRE, 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

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² Students planning to attend graduate or professional schools are strongly advised to meet with their advisors to ensure that they meet necessary prerequisites for entry into these programs. Additional courses in math and chemistry may be necessary.

³ CHEM 313 may be substituted, with advisor approval, for students not planning to pursue graduate school, or a health professions career.

specific departmental requirements for admission to graduate standing—classified or graduate standing—conditionally classified may be obtained from the Director of the Graduate and Research Committee (Graduate Coordinator) of the Biological Sciences Department.

Program of Study

The formal program of study for the degree must include 45 units of committee-approved graduate work, at least 30 units of which must be at the 500 level. A grade point average of 3.0 or better is required in all courses included in the Formal Study Plan. Coursework must include 32 units within the Biological Sciences Department at Cal Poly. Only 4 units of BIO 575 College Teaching Practicum can be used; a maximum of 6 units of BIO 590 Seminar in Biology can be used in the Formal Study Plan. To complete the degree the GRE Advanced Biology exam must be passed with a score of 650 or higher. The culminating experience is a comprehensive written exam covering three areas of biology.

CURRICULUM FOR MA BIOLOGICAL SCIENCES

	<i>Units</i>
Required courses	19
BIO 501 Molecular and Cellular Biology (4)	
BIO 502 Biology of Organisms (4)	
BIO 503 Population Biology (4)	
BIO 590 Seminar in Biology (3)	
BIO 500 Individual Study (4)	
Advisor approved electives 500-level	11
Advisor approved electives 400- or 500-level	15
Satisfactory completion of the comprehensive examinations.	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 Chair of the Biological Sciences Department or with the Director of the Graduate and Research Committee.

MASTER OF SCIENCE DEGREE IN BIOLOGICAL SCIENCES

General Characteristics

This degree offers a broad background in the biological sciences. The program is designed to offer sufficient breadth and depth to strengthen the student's academic understanding and improve competence for: (a) many types of biological work that require advanced training beyond the bachelor's degree; (b) careers 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, submission of Graduate Record Examination (GRE) scores, and submission of Biology Subject GRE score, and letters of recommendation from persons knowing your academic potential.

Information pertaining to specific departmental requirements for admission to graduate standing—classified or graduate standing—conditionally classified may be obtained from the Director of the Graduate and Research Committee (Graduate Coordinator) of the Biological Sciences Department.

Program of Study

The formal program of study for the degree must include 45 units of committee-approved graduate work, at least 30 units of which must be at the 500 level. Coursework must include 32 units taken within the Biological Sciences Department at Cal Poly. A grade point average of 3.0 or better is required in all courses included in the Formal Study Plan. A maximum of 6 units of BIO 590 Seminar in Biology can be used. To complete the degree the GRE Advanced Biology exam must be passed with a score of 650 or better.

CURRICULUM FOR MS BIOLOGICAL SCIENCES

	<i>Units</i>
Required courses	27
BIO 501 Molecular and Cellular Biology (4)	
BIO 502 Biology of Organisms (4)	
BIO 503 Population Biology (4)	
BIO 561 Proposal Writing for Bio Research (3)	
BIO 590 Seminar in Biology (3)	
BIO 599 Thesis, including oral defense of thesis (3) (3) (3)	
Electives	18
Additional units at the 400 or 500 level. At least 3 units must be 500 level to meet the 30 unit requirement.	
	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 Chair of the Biological Sciences Department or with the Director of the Graduate and Research Committee.

MS Biological Sciences, Specialization in STEM CELL RESEARCH

Characteristics. Prepares students for research careers working with stem cells. Graduates of the program are well-prepared to matriculate into stem-cell focused doctoral programs. Following completion of a PhD in a stem-cell focused program (and likely post-doctoral training), students

would have job opportunities as principal investigators at universities/non-profit research institutes or as lead scientists at for profit institutions. Graduates are also well prepared for immediate employment as research specialists/laboratory managers at universities, research institutes, or private companies in the field of stem cells/regenerative medicine.

Culminating Experience. Students who obtain a degree in the Master of Science in Biological Sciences with a specialization in Stem Cell Research are not required to complete BIO 599. In place of the thesis as a culminating experience, students are required to complete a non-traditional Comprehensive Exam. This non-traditional Comprehensive Exam includes a 9-month internship in a stem cell research laboratory¹ (BMED/ASCI/BIO 593), a quarter-long project course at Cal Poly (BMED/ASCI/BIO 594), a written report of their internship research, a written report of their quarter-long project course, and an oral presentation of their internship research. Through the completion of these components, students demonstrate their “ability to integrate the knowledge of the area, show critical and independent thinking, and demonstrate mastery of the subject matter.”

Required Courses	38
BIO 501 Molecular and Cellular Biology (4)	
BIO 502 Biology of Organisms (4)	
BIO 534 Principles of Stem Cell Biology (2)	
BIO 590 Seminar in Biology (1)	
¹ BIO/BMED/ASCI 593 Stem Cell Research Internship (10)	
BIO/BMED/ASCI 594 Applications in Stem Cell Research (2)	
BMED 510 Principles of Tissue Engineering (4)	
BMED 515 Introduction to Biomedical Imaging (4)	
BMED 545 Cell Transplantation and Biotherapeutics (4)	
BMED 563 (2) <i>and</i> ASCI 581 (1) Stem Cell Research Seminars	
Approved engineering, science and mathematics electives	<u>7</u>
	45

¹ Students will complete their internship in stem cell research laboratories at UCSD, the Salk Institute, the Scripps Research Institute, Stanford University, or Novocell Inc.

Chemistry & Biochemistry

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Kevin B. Kingsbury	

ACADEMIC PROGRAMS

Biochemistry – BS

Chemistry – BS

Polymers and Coatings Science – MS

The Chemistry and Biochemistry Department has two roles in the university: to provide professional education for students who are majors in chemistry and biochemistry and who plan careers in the natural sciences and related fields, and to provide instruction in the fundamentals of chemistry to students with majors in fields related to chemistry, especially in the life sciences, agriculture, and engineering.

The Chemistry and Biochemistry Department provides curricula leading to the Bachelor of Science in Chemistry, the Bachelor of Science in Chemistry with a certified concentration in Polymers and Coatings, the Bachelor of Science in Biochemistry, the Bachelor of Science in Biochemistry with a concentration in Polymers and Coatings, and the Master of Science in Polymers and Coatings Science. Both the BS in Chemistry and the concentration in Polymers and Coatings are certified by the American Chemical Society. An option in Chemical Education designed for aspiring teachers in secondary schools is also available.

The baccalaureate curricula in biochemistry and chemistry include required courses in general chemistry, analytical chemistry, inorganic chemistry, organic chemistry, bio-

chemistry and physical chemistry. Advanced undergraduates choose electives from courses that cover a broad range of specialized topics, such as environmental chemistry, geochemistry, glass chemistry, nutritional biochemistry, advanced organic and physical chemistry, pharmacology, and polymer chemistry. The curricula emphasize laboratory work, especially current techniques and the use of instrumentation in all fields of chemistry. The programs provide opportunities for independent research under faculty guidance, including a requirement for a senior project. A senior project may consist of pure or applied research in chemistry or biochemistry, or it may involve interdisciplinary work with another field such as art, biology, agriculture, civil or environmental engineering, psychology, or soil science. Under the department's cooperative education program, bachelor's degree candidates may 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 environmental analysis, the health professions, industrial research and production, pharmacology, toxicology, product quality control, and teaching at the secondary or university level. Newer opportunities lie in related areas such as library science, market research, patent law, and safety engineering.

There is a rapidly increasing number of career opportunities in the expanding fields of biotechnology and polymers and coatings. Students completing a degree in biochemistry or a concentration in polymers and coatings are prepared for direct entry into these careers, as well as for postgraduate education in a professional specialty.

The department offers a flexible chemical education degree option for students interested in a career in pre-college science education. Interested students should contact the single subject teaching credential advisor early in their academic career for more information.

Curricular Concentration

Polymers and Coatings. Includes the required courses in the chemistry or biochemistry curriculum and electives in the area of polymers, coatings, surface chemistry and materials engineering. The concentration gives students the background and practical experience to move into a rewarding career in a wide range of fields including textiles, paints and varnishes, rubber, plastics, adhesives and resins.

Biotechnology Minor

For information regarding the Biotechnology minor, see College of Science and Mathematics section.

BS CHEMISTRY

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

* = Required in Major/Support; also satisfies GE

Course sequencing: See flowcharts at
www.csmadvising.calpoly.edu

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

MAJOR COURSES

CHEM 127 General Chemistry (B3 & B4)*	4
CHEM 128 General Chemistry	4
CHEM 129 General Chemistry	4
CHEM 316 Organic Chemistry I	5
CHEM 317 Organic Chemistry II	5
CHEM 318 Organic Chemistry III	3
CHEM 319 Advanced Organic Chemistry Lab	2
¹ CHEM 331 Quantitative Analysis	5
CHEM 351 Physical Chemistry I.....	3
CHEM 352 Physical Chemistry II.....	3
CHEM 353 Physical Chemistry III	3
CHEM 354 Physical Chemistry Laboratory.....	2
CHEM 357 Physical Chemistry III Laboratory.....	1
CHEM 371 Biochemical Principles	5
CHEM 439 Instrumental Analysis	5
² CHEM 459 Undergraduate Seminar (2) or SCM 491 Student Teacher Seminar (1) (1)	2
CHEM 461 Senior Project Report.....	1
CHEM 481 Inorganic Chemistry	3
CHEM 484 Inorganic Chemistry Lab	2
³ Select 15 units of advanced chemistry electives (a minimum of three courses from List B) or Polymers and Coatings Concentration to complete major.....	15/18
Advanced Chemistry Electives	
List A	
CHEM 252, 341, 349, 372, 373, 377, 400 ⁴ , 401 ⁵ , 447, 448, 449, 465, 474, 477, 478, 485 ⁴ , 495 ⁴ , 528;	
BIO/CHEM 375, 441;	
PSC/BIO 424; SCM 451	
List B (Select at least 3 courses)	
CHEM 405, 419, 420, 444, 445, 446, 458, 463, 470	
	77/80

SUPPORT COURSES

BIO 161 Intro to Cell & Molecular Biology (B2)*	4
MATH 141, 142, 143 Calculus I, II, III (B1)*.....	4,4,4
MATH 241 Calculus IV	4
MATH 244 or 200-400 level STAT or CSC course	4
PHYS 141 General Physics IA.....	4
PHYS 132 General Physics II.....	4
PHYS 133 General Physics III.....	4
Physics elective (200-level and above)	3
	39

GENERAL EDUCATION (GE)

72 units required, 16 of which are specified in Major/Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing.....	4

Area B Science and Mathematics (no additional units are required)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support	0
B3 Physical Science * 4 units in Major	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

	56
FREE ELECTIVES	5-8
	180

Concentration

(Students may select the following concentration instead of advanced chemistry electives in Major Courses)

Polymers and Coatings Concentration

CHEM 444 Polymers and Coatings I.....	3
CHEM 445 Polymers and Coatings II	3
CHEM 446 Surface Chemistry of Materials	3
CHEM 447 Polymers and Coatings Lab I	2
CHEM 448 Polymers and Coatings Lab II	2
CHEM 449 Internship in Polymers and Coatings....	2
MATE 210 Materials Engineering.....	3
	18

¹ Students should take CHEM 331 during their second year.

² SCM 491 only for students pursuing Single-Subject Teaching Credential.

³ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

⁴ No more than 2 units may apply to approved advanced chemistry electives.

⁵ No more than 4 units may apply to approved advanced chemistry electives.

BS BIOCHEMISTRY

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

* = Required in Major/Support; also satisfies GE

Course sequencing: See flowcharts at
 www.csmadvising.calpoly.edu

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

MAJOR COURSES

CHEM 127 General Chemistry (B3 & B4)*	4
CHEM 128 General Chemistry	4
CHEM 129 General Chemistry	4
CHEM 316 Organic Chemistry I	5
CHEM 317 Organic Chemistry II	5
CHEM 318 Organic Chemistry III	3
CHEM 319 Advanced Organic Chemistry Lab	2
¹ CHEM 331 Quantitative Analysis	5
CHEM 351 Physical Chemistry I	3
CHEM 352 Physical Chemistry II	3
CHEM 353 Physical Chemistry III	3
CHEM 354 Physical Chemistry Laboratory.....	2
CHEM 371 Biochemical Principles	5
CHEM 372 Metabolism	4
CHEM 373 Molecular Biology	3
CHEM 375 Molecular Biology Laboratory	3
Select two units from:	
CHEM 439 ² , 474; BIO 361 ² , 476.....	2
CHEM 459 Undergraduate Seminar (2) <i>or</i>	
SCM 491 ³ Student Teacher Seminar (1)(1).....	2
CHEM 461 Senior Project Report.....	1
⁴ Select 12 units of approved advanced biochemistry electives (one course must be a lecture and at least two courses must be from List A) or complete major with Polymers and Coatings Concentration.....	12/18
List A (at least two courses):	
CHEM 252, 341, 349, 357, 377, 400 ⁵ , 401 ⁶ , 405, 419, 420, 439, 441, 444, 445, 446, 447, 448, 449, 458, 463, 465, 470, 474, 477, 478, 481, 484, 485 ⁵ , 495 ⁵ , 528; BIO/PSC 424; SCM 451	
List B:	
BIO 361, 405, 432, 452; MCRO 402, 423, 424; ZOO 422	

75/81**SUPPORT COURSES**

BIO 161 Intro to Cell & Molecular Biology (B2)*	4
MATH 141, 142, 143 Calculus I, II, III (B1)*	4,4,4
PHYS 121, 122, 123 College Physics <i>or</i>	
PHYS 141, 132, 133 General Physics	4,4,4
MCRO 224 General Microbiology I <i>or</i>	
BIO 452 Cell Biology.....	4-5

32-33**GENERAL EDUCATION (GE)**

72 units required, 16 of which are specified in Major/Support.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing.....	4

Area B Science and Mathematics (no add'l units req'd)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Major	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)**56**

FREE ELECTIVES **10-17**
180

Concentration

(Students may select the following concentration instead
of advanced approved biochemistry electives in Major
Courses)

Polymers and Coatings Concentration

CHEM 444 Polymers and Coatings I.....	3
CHEM 445 Polymers and Coatings II	3
CHEM 446 Surface Chemistry of Materials	3
CHEM 447 Polymers and Coatings Lab I	2
CHEM 448 Polymers and Coatings Lab II	2
CHEM 449 Internship in Polymers and Coatings....	2
MATE 210 Materials Engineering.....	3
	18

¹ Students should take CHEM 331 as soon as possible after completing CHEM 129.

² Excess units count as approved advanced Biochemistry electives.

³ SCM 491 only for students pursuing Single-Subject Teaching Credential.

⁴ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

⁵ No more than 2 units may apply to approved advanced biochemistry electives.

⁶ No more than 4 units may apply to approved advanced biochemistry electives.

MASTER OF SCIENCE DEGREE IN POLYMERS AND COATINGS SCIENCE

General Characteristics

The MS degree in Polymers and Coatings Science offers a unique, focused program closely tied to industry. Students gain academic preparation in polymers and coatings science through lecture and laboratory courses, then undertake a rigorous industrial internship. While on the internship students specialize and develop advanced skills through directed study in areas related to their internship work. The program is designed to prepare students for challenging careers in the polymers and coatings industry. The program also provides excellent background for doctoral studies in areas related to polymer and coatings science. This program is unique in California and relies on the close relationship between the department and the polymers and coatings industry for its success.

Prerequisites

Students entering the program must have a bachelor's degree from an accredited institution with a minimum grade point average of 2.5 in the last 90 quarter units attempted. Applicants with majors in chemistry, biochemistry, materials engineering, chemical engineering or related fields generally meet the prerequisites for courses in the program. Applicants with degrees in other areas may need to take supplemental courses in organic and physical chemistry and can be admitted conditionally. For information concerning additional departmental requirements, the student should contact the Graduate Advisor in the Chemistry and Biochemistry Department.

Advancement to candidacy requires completion of 12 units of an approved study plan with a minimum grade point average of 3.0.

Blended BS + MS Program in Chemistry or Biochemistry (BS) and Polymers and Coatings Science (MS)

The blended program provides motivated students with an accelerated route to the MS in Polymers and Coatings Science, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Eligibility

Students majoring in chemistry or biochemistry may be eligible to pursue the blended program toward the MS in Polymers and Coatings Science. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 2.5 required (3.0 recommended). Students are generally selected for the blended program by a faculty committee during the junior year. Please see the catalog description on Blended Programs for eligibility criteria.

Students may begin taking the required graduate courses in either their junior or senior year depending on their

preparation. Students may not pursue both the Concentration in Polymers and Coatings and the MS in Polymers and Coatings Science. Students pursuing the concentration take the 400-level polymers and coatings courses while those pursuing the MS degree take the 500-level polymers and coatings courses. Students cannot receive credit for both 400 and 500-level courses in the same topic.

Students in the blended program are eligible to apply for the Graduate Internship upon completion of the required graduate-level chemistry courses.

Units

Required courses	27
CHEM 544 Polymer Physical Chemistry and Analysis (3)	
CHEM 545 Polymer Synthesis and Mechanisms (3)	
CHEM 547 Polymer Characterization and Analysis Laboratory (2)	
CHEM 548 Polymer Synthesis Laboratory (2)	
CHEM 550 Coatings Formulation Principles (3)	
CHEM 551 Coatings Formulation Laboratory (2)	
CHEM 590 Graduate Seminar (1,1,1)	
CHEM 598 Graduate Project (3)(3)(3) <i>or</i>	
CHEM 599 Graduate Thesis (3)(3)(3)	
Restricted Electives	18
18 units of advisor-approved electives (at least 3 units must be from 500 level). See department for list.	

A complete project report or thesis must be submitted to the graduate committee. Guidelines on how to prepare report or thesis are available from the graduate coordinator.

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Kinesiology

Kinesiology Bldg. (43), Room 451
805 756-2545
kinesiology.calpoly.edu
stride.calpoly.edu

Department Chair, Camille P. O'Bryant

Robert D. Clark	Kristine Z. Jankovitz
Steven C. Davis	Ann M. McDermott
Todd A. Hagobian	Suzanne Phelan
Kellie Green Hall	J. Kevin Taylor
David W. Hey	

ACADEMIC PROGRAMS

Kinesiology – BS, MS

The Kinesiology Department offers undergraduate and graduate degree programs in kinesiology. The department also contributes to the general education and elective needs of all students by providing health education, first aid/CPR courses, two upper-division elective courses in GE Area D5 and other sub-disciplines in kinesiology (e.g., biomechanics, exercise physiology, and motor behavior). The curriculum and coursework in the Kinesiology Department is designed to meet the mission of preparing students to be leaders in the fields of physical activity, health, and disease prevention and treatment. The department sponsors annual professional development workshops for physical education and health teachers and athletic coaches.

The Kinesiology and Recreation Center complex provides laboratory, research and office space for the Kinesiology Department, and provides access to quality physical activity and sport facilities for students, faculty and staff.

The Kinesiology Department is also home to the STRIDE center (Science through Translational Research in Diet and Exercise). STRIDE is a university-wide, multidisciplinary, translational research consortium, initiated in 2007 by the Kinesiology Department. The STRIDE center provides students with unique opportunities to contribute to ongoing research in lifestyle enhancement and health.

The BS in Kinesiology is a broad based program offering students training in the multiple sub-disciplines of kinesiology (biomechanics, exercise physiology, health, motor behavior and sport and exercise psychology/sociology) and two professional tracks based on a common curriculum that incorporates the scientific and clinical knowledge of exercise science, health promotion and nutrition as applied in preventive, clinical, commercial fitness, public health and educational settings. The courses in these two professional tracks provide additional depth of knowledge and coursework requirements to meet eligibility

for pursuing certification in two different areas. The Exercise Science professional track prepares students for national exams for American College of Sports Medicine (ACSM) Certification. The Health Promotion professional track prepares students to meet the professional practice standards developed by the National Commission for Health Education Credentialing, Inc. and meets the competencies and seven responsibilities for Certified Health Education Specialists (CHES) as identified by the 2010 Health Education Job Analysis. Students who complete this professional track are eligible to take the CHES exam.

BS KINESIOLOGY

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

* = Required in Major; also satisfies GE

Course sequencing: See flowcharts at
www.csmadvising.calpoly.edu

MAJOR COURSES

KINE 180 Orientation to Kinesiology	3
KINE 181 First Aid/CPR/AED.....	1
KINE 208-229 Professional Activity.....	1
KINE 230 Aquatic Fitness Activities.....	1
KINE 231 Leading Group Fitness Activities.....	2
KINE 250 Health Education (D4)* or KINE 255 Personal Health: A Multicultural Approach (D4)* (USCP) or KINE 260 Women's Health Issues (D4)* (USCP).....	4
KINE 265 Intro to Community Health Issues.....	4
KINE 266 Intro to Psycho/Social Aspects of Physic Act	4
KINE 298 Chronic and Communicable Disease Prevention	4
KINE 301 Functional Muscle Anatomy	2
KINE 302 Biomechanics	4
KINE 303 Physiology of Exercise.....	4
KINE 304 Pathophysiology of Exercise.....	3
KINE 311 Strength Training Instruction	1
KINE 319 Intro to Research Methods in Kine.....	4
KINE 320 Media and Technology in Science and Human Performance.....	4
KINE 402 Motor Learning and Control.....	4
KINE 407 Adapted Physical Activity	4
KINE 408 Exercise and Health Gerontology.....	4
KINE 434 Health Promotion Program Planning I ...	4
KINE 449 Exercise Prescription and Leadership	4
KINE 451 Nutrition for Fitness and Sport.....	3
KINE 452 Testing and Exercise Prescription for Fitness Specialists	4
KINE 453 Lifestyle Prescriptions for Wellness.....	3
KINE 460/KINE 461/KINE 462 Senior Project.....	1-4
KINE 463 Exercise Science and Health Promotion Fieldwork	1-3
BIO 111 General Biology or BIO 161 Intro to Cell and Molecular Biology (B2&B4).....	4

CHEM 111 Survey of Chemistry (5) <i>or</i>	
CHEM 127 General Chemistry I (4) (B3&B4)	4-5
FSN 210 Nutrition.....	4
MATH 119 Pre-Calculus Trigonometry (B1)*	4
PHYS 121 College Physics I.....	4
STAT 217 Intro to Statistical Concepts and Methods <i>or</i> STAT 218 Applied Statistics-Life Sciences (B1)*	4
ZOO 331, 332 Human Anatomy & Physiol I, II (transfer equivalent ZOO 231, 232)	5,5
¹ Approved elective (<i>select one</i>).....	3-4
KINE 308, 406, 446, 454	
Professional track preparation courses (select one of the following tracks).....	10-11
² <i>Exercise Science</i>	
KINE 308, 401, and 445	
³ <i>Health Promotion</i>	
KINE 305, 435, and 450	

125-133

GENERAL EDUCATION (GE)

72 units required, 20 of which are specified in Major.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing.....	4

Area B Science and Mathematics (no add'l units req'd)

B1 Mathematics/Statistics * 8 in Major	0
B2 Life Science * 4 in Major	0
B3 Physical Science * 4 in Major	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (16 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E) * 4 in Major	0
D5 Upper-division elective (not in KINE).....	4

Area F Technology Elective (upper division) (4 units)

52

FREE ELECTIVES.....

0-3

180

MASTER OF SCIENCE DEGREE IN KINESIOLOGY

General Characteristics

The degree program offers advanced study in kinesiology to qualify graduates to enter occupations that require training beyond the bachelor's degree. The program is designed to strengthen the breadth and depth of the student's academic preparation in kinesiology and its sub-disciplines and improve competence for: a) positions in corporate/commercial, community, non-profit or government exercise and health promotion programs, b) teaching physical education, health or exercise science at the community college level, c) positions in obesity, diabetes and heart disease prevention in community, clinical or rehabilitative health care settings, d) independent research in the field of emphasis, and e) continued graduate study at doctoral granting institutions.

Two program options are available:

Thesis Option: 39 units of graduate committee approved coursework, 6 units of thesis research/project design, and successful completion of an oral defense of the thesis/project.

Non-Thesis Option: 45 units of graduate committee approved coursework and a comprehensive examination.

Most kinesiology graduate courses are offered every other year on a rotational basis. Students admitted with classified graduate standing can typically complete the program within two academic years. Applications to the program are currently accepted every quarter; however, a fall quarter entry is best for optimal progression toward completion of the degree.

Prerequisites

Applicants to the program must have a bachelor's degree from an accredited institution with a minimum grade point average of 2.75 in the last 90-quarter units. Letters of recommendation from persons knowledgeable about the applicant's academic achievement and potential as a graduate student are required.

Classified Graduate Standing

For admission to the program with classified graduate standing, the applicant must have an undergraduate degree in kinesiology or the equivalent academic preparation as determined by the coordinator of the kinesiology graduate program. Applicants with a grade point average below the required 2.75 and an undergraduate degree in kinesiology may appeal to the graduate coordinator to be "conditionally" accepted. This procedure involves a review process and a specified contract to be successfully completed before

¹ KINE majors should select one course from these approved electives in consultation with their academic advisor.

² Students who are interested in pursuing American College of Sports Medicine (ACSM) Certification should follow this track.

³ Students who are interested in pursuing Certified Health Education Specialist (CHES) Certification should follow this track.

admission to classified graduate standing. Special attention is focused upon student performance in undergraduate science and kinesiology coursework for applicants with a GPA below 2.75 requesting to be conditionally accepted.

Conditionally Classified Graduate Standing

Applicants to the program without an undergraduate degree in kinesiology or equivalent academic preparation may be admitted to the program with conditionally classified graduate standing. Applicants with undergraduate deficiencies must remove these deficiencies through coursework or examination before Advancement to Candidacy and may complete this coursework while enrolled as a graduate student at Cal Poly.

Information regarding specific coursework prerequisites and application procedures for admission to the kinesiology master of science program is available on the department website at <http://kinesiology.calpoly.edu> or from the graduate program coordinator.

Advancement to Candidacy

For Advancement to Candidacy a student shall have:

- successfully completed all conditionally classified requirements
- successfully completed the Graduation Writing Requirement
- filed a formal study plan
- maintained a minimum 3.0 GPA for all course work completed on the formal study plan

Requirements for the Degree

The formal study plan must include 45 units of graduate committee approved coursework. The approved coursework on the formal study plan is designed to prepare the student to achieve his/her stated career objective. At least 30 of the units must be completed at the 500 level in Kinesiology.

All candidates must meet the current Graduation Writing Requirement.

Each candidate must successfully complete a comprehensive examination before the degree is granted. The examination can take one of two forms: (1) those students following the thesis option must successfully defend the thesis or project in an oral examination, or (2) those students following the non-thesis option must pass a comprehensive examination dealing with current general knowledge in the discipline of kinesiology and the application of coursework taken on the formal study plan.

If the degree requirements are not completed within 7 years, the student will need to complete additional requirements as determined by the graduate committee. See the catalog for "Time Limit for Degree" for more information.

Up to 15 units may be taken in 400/500-level courses outside of the Kinesiology Department with graduate committee approval provided these courses were not required as part of the undergraduate degree program. Only 12 units of

400-level kinesiology courses may be put on the formal study plan.

At least 32 units must be completed in residence and no more than 9 units of graduate committee approved extension courses may be included on the formal study plan.

CURRICULUM FOR MS KINESIOLOGY

	Thesis Option	Non-Thesis Option
KINE 501 Eval Literature & Current Trends in Kinesiology	3	3
KINE 511 Administration and Leadership in Kinesiology	3	3
KINE 517 Research Methods in Kinesiology	3	3
Select from the following:	12	12-20
KINE 503 Current Health Issues (3)		
KINE 522 Adv. Biomechanics (4)		
KINE 525 Adv Motor Learning and Control (3)		
KINE 526 Sport/Exercise Psych (3)		
KINE 530 Advanced Physiology of Exercise (4)		
KINE 539 Effective Practice in Teaching and Coaching (3)		
Approved 400-500 electives	12	12-20
Thesis option	12	–
KINE 518 Research Prospectus and Proposal Writing (2)		
KINE 599 Thesis or Project (3,3)		
STAT 513 Applied Experimental Design/Regression Models (4)		
Elective appropriate for thesis research or applied project (4)		
Non-Thesis option	–	4
STAT 512 Statistical Methods		
Comprehensive Exam	No	Yes
	45	45

For more detailed information or advisement, contact the Kinesiology graduate program coordinator.

Liberal Studies, an Undergraduate Teacher Preparation Program

Science North (Bldg. 53), Room 211
805 756-2935 Fax: 805-756-2967
Advisor: 805-756-2615
liberalstudies.calpoly.edu

Department Chair, Lola Berber-Jimenez

ACADEMIC PROGRAM

Liberal Studies – BS

Faculty from the following disciplines help to offer the required curriculum in the major: Art and Design, Biological Sciences, English, Ethnic Studies, History, Kinesiology, Mathematics, Music, Philosophy, Political Science, Physics, Psychology and Child Development, Social Sciences, Statistics, Theatre, and Education.

Liberal Studies is a pre-professional Teacher Preparation Program leading to enrollment in a Multiple Subject Credential Program. The mission of Liberal Studies is to ensure that students are prepared to teach competently and professionally each of the seven content areas in the state-mandated curriculum (K-8). These include language arts, mathematics, science, history/social sciences, visual and performing arts, health/physical education and human development. Liberal Studies provides the educational experience and preparation best suited for the prospective elementary teacher.

Choice of Emphasis Areas

A “depth of study” is required of all students seeking a multiple subject credential by the California Commission on Teaching Credentialing. Liberal Studies majors choose an “emphasis” area in which they take 16 units of coursework (minimally 8 units at the upper division) in one of the following areas: arts, English, child development, history - social studies, kinesiology, science, mathematics, music, or Spanish.

BS LIBERAL STUDIES

- 60 units upper division
 - 2.0 GPA
 - GWR
 - USCP
- * = Required in Major; also satisfies GE

MAJOR COURSES

LS 101 Orientation to Liberal Studies.....	1
LS 214 Constitutional Issues in History of U.S. and California Education.....	4
LS 230 Field Experience in the Elem Classroom I..	2
LS 250 Field Experience in the Elem Classroom II	2
LS/ENGL 260 Children’s Literature.....	4

LS 270 Intro to Visual and Performing Arts Standards in the Elementary Classroom.....	4
LS 310 Storytelling: Modern Applications of Traditional Narrative.....	4
LS 311 Visual Arts in the Elementary Classroom ...	4
LS 461 Senior Project Seminar <i>or</i> LS 462 Senior Project Research.....	4
ASTR 101 Introduction to the Solar System	4
BIO 111 General Biology (B2&B4)*	4
BIO 211 Biology of Plants and Animals	4
ENGL 391 Topics in Applied Linguistics	4
GEOG 308 Global Geography (D5)*	4
HIST 208 Survey of California History (USCP)	4
HIST 210 World History (D3)*	4
KINE 310 Concepts and Applications in Elementary Physical Education.....	3
KINE 443 Health Education for Teachers	4
MATH 227 Math for Elementary Teaching I (B1)*	4
MATH 328 Math for Elementary Teaching II.....	4
MATH 329 Math for Elementary Teaching III.....	4
MATH 330 Algebraic Thinking with Technology ..	4
PSC 101 The Physical Environment: Matter and Energy (B3&B4)*	4
PSC 102 The Physical Environment: Atoms and Molecules	4
PSC 103 The Physical Environment: Earth	4
PSY 201/202 General Psychology (D4)*	4
STAT 130 Intro to Statistical Reasoning <i>or</i> STAT 217 Intro to Statistical Concepts and Methods (B1)*	4
Emphasis Area (a minimum of 8 units at 300-400 level).....	16
	116

SUPPORT COURSES

CD/EDUC 207 The Learner’s Development, Culture and Identity in Educational Settings.....	4
EDUC 310 Effective Teaching & Classroom Mgt: Multicultural Perspective in K-3 & 4-8 Setting ...	4
EDUC 430 Teaching Reading and Language Arts with a Multicultural Perspective.....	6
EDUC 431 Teaching Soc. Science and the Arts with a Multicultural Perspective.....	4
EDUC 435 Learning to Teach K-8 Mathematics with a Multicultural Perspective.....	4
EDUC 436 Learning to Teach K-8 Science with a Multicultural Perspective	4
	26

GENERAL EDUCATION (GE)

72 units required, 32 of which are specified in Major.
→See page 39 for complete GE course listing.
→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing.....	4

Area B Science and Mathematics (no add'l units req'd)	
B1 Mathematics/Statistics * 8 units in Major.....	0
B2 Life Science * 4 units in Major.....	0
B3 Physical Science * 4 units in Major.....	0
B4 One lab taken with either a B2 or B3 course *	
Select one course from B1-B5* 4 units in Major..	0
Area C Arts and Humanities (16 units)	
C1 Literature	4
C2 Philosophy (PHIL 230/231 recommended)	4
C3 Fine/Performing Arts	4
C4 Upper-division elective.....	4
Area D/E Society and the Individual (8 units)	
D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions * 4 units in Major	0
D4 Self Development (CSU Area E) * 4 units in Major	0
D5 Upper-division elective * 4 units in Major.....	0
Area F Technology Elective (upper division)	4
	40
FREE ELECTIVES	0
	182

Courses Needed for Multiple Subject Credential

EDUC 440 Educating Individuals with Exceptional Needs	4
EDUC 454 Multiple Subject Student Teaching I....	7
EDUC 455 Multiple Subject Student Teaching Seminar I	3
EDUC 456 Multiple Subject Student Teaching II...	12
EDUC 457 Multiple Subject Student Teaching Seminar II	3
EDUC 480 Computer Based Curriculum (Level I Technology requirement) or its equivalent	2
	31

Mathematics

Faculty Offices East Bldg. (25), Room 208
805 756-2206
www.math.calpoly.edu

Department Chair, Don P. Rawlings

Steven J. Agronsky	James R. Mueller
Vincent Bonini	Dana Paquin
Joseph E. Borzellino	Linda J. Patton
Charles D. Camp	Dylan Q. Retsek
Paul F. Choboter	Benjamin P. Richert
Susan M. Cooper	Kate J. Riley
Harvey C. Greenwald	Marian E. Robbins
Todd A. Grundmeier	Amélie Schinck
Caixing Gu	Jonathan E. Shapiro
Donald G. Hartig	Morgan P. Sherman
Goro C. Kato	Mark Stankus
Anton Kaul	Lawrence Sze
Colleen M. Kirk	Raymond D. Terry
Jeffrey E. Liese	Todor Todorov
Elsa Medina	Matthew E. White
Anthony Mendes	Stan Yoshinobu
Kent E. Morrison	

ACADEMIC PROGRAMS

Mathematics – BS, MS, Minor

The Mathematics Department offers a complete undergraduate program of courses leading to a Bachelor of Science degree in mathematics. It also offers a program of courses for students who wish to minor in mathematics, as well as graduate courses for programs of study leading to a Master of Science degree. The mix of pure and applied mathematics in these courses increases both the usefulness of and the demand for graduates with a degree in mathematics. In addition, the Mathematics Department offers courses that serve all departments in the university.

The undergraduate program for math majors contains a central core of courses. These courses give a solid basis for advanced work that is tailored to fit the needs and objectives of each individual student. Advanced course-work is chosen in close consultation with faculty advisors.

The rich variety of courses available in the department permits the student not only to obtain a broad exposure to those fields of mathematics which are most useful in the physical sciences and engineering, but also to obtain experience with the mathematics that is used in business, management sciences, and operations research.

Curricular Concentrations

Applied Mathematics. Provides a curriculum with an emphasis on application to the physical sciences and engineering. This concentration benefits students who are interested in the use of mathematics within areas such as

engineering, computer science, physics, aeronautics, astronomy, and the geosciences. Potential career paths include pursuit of advanced degrees in any of the above fields or in applied mathematics, as well as industrial jobs where physical processes are modeled by ordinary and partial differential equations.

Pure Mathematics. A broad and rigorous curriculum designed both for students who will pursue an advanced degree in mathematics as well as those who choose careers requiring significant mathematical training. Graduates of the program are well prepared to enter graduate programs in mathematics and capable of bringing a broad range of mathematical skills and expertise to a wide range of professional careers.

Mathematics Teaching. Students wishing to prepare for a career teaching mathematics in middle or senior high school should choose the concentration in teaching. The courses in the concentration, coupled with the other required courses in the major, fulfill the prerequisites for the California Commission on Teacher Credentialing.

General Curriculum in Mathematics

The General Curriculum in Mathematics is not a concentration, and is the default curriculum required for students who do not declare a concentration.

All of these programs provide a strong mathematical foundation for the student contemplating the pursuit of an advanced degree in mathematics.

MATHEMATICS MINOR

Students may earn a minor in mathematics by completing a coordinated course of study. The program consists of a core of required courses, followed by two tracks of advanced work, to be chosen in concert with a student's career objectives. Interested students should contact the Mathematics Department for individual advisement.

- | | |
|--|----|
| I. Required courses | 8 |
| MATH 206 Linear Algebra I (4) <i>or</i> | |
| MATH 244 Linear Analysis I (4) | |
| MATH 248 Methods of Proof in Mathematics (4) | |
| II. Complete two tracks | 16 |
| A track consists of two courses from one of the groups A-L. Completion of four courses in either group A or L is considered two tracks. Some tracks have additional mathematics prerequisites. | |
| A. MATH 304 Vector Analysis (4) | |
| MATH 344 Linear Analysis II (4) | |
| MATH 350 Mathematical Software (4) | |
| MATH 416 Differential Equations II (4) | |
| MATH 418 Partial Differential Equations (4) | |
| B. MATH 304 Vector Analysis (4) | |
| MATH 404 Intro to Differential Geometry (4) | |
| C. MATH 306 Linear Algebra II (4) | |
| MATH 406 Linear Algebra III (4) | |
| D. MATH 335 Graph Theory (4) | |
| MATH 336 Combinatorial Mathematics (4) | |
| MATH 437 Game Theory (4) | |

- E. MATH 408 Complex Analysis I (4)
MATH 409 Complex Analysis II (4)
- F. MATH 412 Introduction to Analysis I (4)
MATH 413 Introduction to Analysis II (4)
- G. MATH 435 Discrete Math with Apps. I (4)
MATH 436 Discrete Math with Apps. II (4)
- H. MATH 437 Game Theory (4)
MATH 453 Numerical Optimization (4)
- I. MATH 440 Topology I (4)
MATH 441 Topology II (4)
- J. MATH 442 Euclidean Geometry (4)
MATH 443 Modern Geometries (4)
- K. MATH 451 Numerical Analysis I (4)
MATH 452 Numerical Analysis II (4)
- L. MATH 341 Theory of Numbers (4)
MATH 419 Intro. to History of Mathematics (4)
MATH 481 Abstract Algebra I (4)
MATH 482 Abstract Algebra II (4)

III. Mathematics electives 6
MATH 142 and MATH 143, or other course(s)
as approved by advisor

30

BS MATHEMATICS

- 60 units upper division GWR
- 2.0 GPA USCP

* = Required in Major; also satisfies GE

Course sequencing: See flowcharts at
www.csmadvising.calpoly.edu

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

MAJOR COURSES

MATH 141 Calculus I (B1)*	4
MATH 142 Calculus II (B1)*	4
MATH 143 Calculus III	4
MATH 202 Orientation to the Mathematics Major	1
MATH 206 Linear Algebra I.....	4
MATH 241 Calculus IV	4
MATH 242 Differential Equations I	4
MATH 248 Methods of Proof in Mathematics.....	4
MATH 306 Linear Algebra II	4
MATH 412 Introduction to Analysis I.....	4
MATH 459 Senior Seminar <i>or</i>	
MATH 460 Applied Math Senior Seminar.....	4
MATH 461 Senior Project I	2
MATH 462 Senior Project II.....	2
MATH 481 Abstract Algebra I.....	4
PHYS 141 General Physics IA.....	4
PHYS 132 General Physics II <i>or</i>	
PHYS 133 General Physics III (B3 & B4)*	4
General curriculum or concentration	48/56/52/52 ¹

105/113/109/109¹

GENERAL EDUCATION (GE)

72 units required, 12 of which are specified in Major.
→See page 39 for complete GE course listing.
→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (4 units)

B1 Mathematics/Stat * 8 units in Major/ Support	0
B2 Life Science.....	4
B3 Physical Science * 4 units in Support	0
B4 One lab taken with either a B2 or B3 course *in Major	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

4

60

FREE ELECTIVES 15/7/11/11¹

180

General Curriculum in Mathematics or Concentrations (select one)

General Curriculum in Mathematics

This is the default curriculum required for students who do not declare a concentration.

CSC/CPE 101 Fund. of Computer Science I <i>or</i> CSC/CPE 235 Fundamentals of Computer Science for Scientists and Engineers I	4
STAT 301 <i>or</i> STAT 325 <i>or</i> STAT 425	4
MATH 336 Combinatorial Mathematics	4
Tracks.....	24

Choose three tracks from the following list, with at least one track chosen from the first two tracks listed. A track consists of two paired courses representing depth of study with a particular focus.

- MATH 413 *and* MATH 414
- MATH 406 *and* MATH 482
- MATH 304 *and* MATH 404
- MATH 335 *and* MATH 435

¹ General Curriculum/Applied Concentration/Pure Concentration/
Mathematics Teaching Concentration.

MATH 344, <i>and</i> MATH 416 <i>or</i> MATH 418	
MATH 350, <i>and</i> MATH 341 <i>or</i> MATH 344	
MATH 408 <i>and</i> MATH 409	
MATH 437 <i>and</i> MATH 453	
MATH 440 <i>and</i> MATH 441	
MATH 442 <i>and</i> MATH 443	
MATH 451 <i>and</i> MATH 452	
Approved Electives	12
Select 3 courses from the following:	
MATH 304, 335, 341, 344, 350, 404, 406, 408,	
409, 413, 414, 416, 418, 419, 435, 436, 437, 440,	
441, 442, 443, 451, 452, 453, 470, 482;	
CSC/CPE 102, 103, 236, 349;	
PHYS 132, 133, 211, 301, 302, 322, 323, 405, 408;	
STAT 301, 302, 325, 425, 426, 427	
	48

Applied Mathematics Concentration

CSC/CPE 101 Fund. of Computer Science I <i>or</i> CSC/CPE 235 Fundamentals of Computer Science for Scientists and Engineers I	4
MATH 304 Vector Analysis	4
MATH 344 Linear Analysis II	4
MATH 350 <i>or</i> CSC/CPE 102 <i>or</i> CSC/CPE 236	4
MATH 413 Introduction to Analysis II	4
MATH 451 Numerical Analysis I	4
STAT 301 <i>or</i> STAT 325 <i>or</i> STAT 425	4
Tracks	16
Choose two tracks from the following list. A track consists of two paired courses representing depth of study with a particular focus.	
MATH 408 <i>and</i> MATH 409	
MATH 416 <i>and</i> MATH 418	
MATH 452 <i>and</i> MATH 453	

¹ Approved electives	12
Select 12 units from one of the following categories, with at least one course at the 300 level or above. Other choices are also possible, and should be pre-approved in consultation with academic advisor.	
1. ASTR 301, 302, 326	
PHYS 132, 133, 211, 301, 302, 303, 317, 322, 323, 405, 408, 412, 417	
2. STAT 302, 323, 324, 325, 330, 331, 416, 417, 418, 419, 421, 423, 425, 426, 427	
3. CSC/CPE 102 <i>or</i> 236, 103, 225, 349, 357, 448	
4. ME 211, 212, 341	
5. ECON 311, 313, 408	
	56

Pure Mathematics Concentration

MATH 336 Combinatorial Mathematics	4
MATH 408 Complex Analysis I	4
MATH 413 Introduction to Analysis II	4
MATH 440 Topology I	4
MATH 482 Abstract Algebra II	4
Select 3 courses from the following:	12
MATH 406, 409, 414, 435, 441	

Select 2 courses from the following	8
CSC/CPE 101 <i>or</i> CSC/CPE 235 (4)	
MATH 350 (4)	
STAT 301 <i>or</i> STAT 325 <i>or</i> STAT 425 (4)	
Select 3 courses from the following	12
MATH 304, 335, 341, 344, 350, 404, 406, 409, 414, 416, 418, 435, 436, 437, 441, 451, 452, 453, 470	
	52

Mathematics Teaching Concentration

CSC/CPE 101 Fundamentals of Computer Science I <i>or</i> CSC/CPE 235 Fundamentals of Computer Science for Scientists and Engineers I	4
SCM 300 Early Field Experience, Science/Math	4
MATH 300 Technology in Mathematics Education	4
STAT 301 Statistics I	4
STAT 302 <i>or</i> STAT 325 <i>or</i> STAT 425	4
MATH 336 Combinatorial Mathematics	4
MATH 341 Theory of Numbers	4
MATH 419 Intro to the History of Mathematics	4
MATH 423 Advanced Mathematics for Teaching	4
MATH 442 Euclidean Geometry	4
MATH 443 Modern Geometries	4
MATH 482 Abstract Algebra II	4
Select 1 course from the following:	4
CSC/CPE 102, 236;	
MATH 304, 335, 344, 406, 408, 413, 416, 435, 437, 440, 451, 470;	
PHYS 132, 133, 302	
	52

MASTER OF SCIENCE DEGREE IN MATHEMATICS

General Characteristics

The master of science program in mathematics prepares students to enter careers in government, industry or teaching. A student who completes the degree is qualified and eligible to teach at the community college level. Many of the graduates of the program also pursue further graduate study at Ph.D.-granting institutions.

Prerequisites

Prerequisite to entering the program with a classified or conditionally classified status, the student must have a bachelor's degree from an accredited institution with a minimum grade point average of 2.5 in the last 90 quarter units attempted. Applicants with majors in other areas or applicants with deficiencies in their undergraduate background may be admitted conditionally. For information concerning additional requirements, the student should contact the Graduate Coordinator in the Mathematics Department.

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Advancement to candidacy requires completion of 12 units of an approved study plan with a minimum grade point average of 3.0 and satisfactory completion of the preliminary examinations in analysis and algebra.

BLENDED BS+MS MATHEMATICS

The blended program provides motivated students with an efficient way to complete a BS and MS in mathematics with both degrees being conferred simultaneously. Students are provided with ample advising to ensure a seamless transition from undergraduate to graduate status.

Eligibility

Students majoring in mathematics may apply for the blended program as early as their junior year after completing at least two upper-division mathematics classes and before they have completed 180 units. The Graduate Committee evaluates each applicant individually.

Acceptance into the program is based on prior academic performance and the applicant's promise to successfully complete the master's program. See page 60 for additional eligibility criteria.

Program of Study

Students must complete the requirements of both the undergraduate and master's program of study for a total of 225 units. However, they are advised to take the undergraduate courses most suitable as preparation for the master's program. They should take the graduate preliminary written examinations at the time they complete the appropriate courses, even possibly before they have graduate status. Finally, the senior project, if sufficiently complex, may be extended into a graduate thesis. This last option is particularly attractive to students participating in one of the many undergraduate summer research programs available at either Cal Poly or other universities, since the research can then be used as a basis for the senior project and master's thesis.

CURRICULUM FOR MS MATHEMATICS *Units*

Required courses	32
MATH 520 and MATH 521 Applied Analysis I, II (4)(4)	
MATH 530 and MATH 531 Discrete Math with Applications I, II (4)(4)	
MATH 540 and MATH 541 Topology I, II (4)(4)	
MATH 550 Real Analysis (4)	
MATH 560 Field Theory (4)	
Electives	13
Select additional units at the 400 or 500 level as approved by the Graduate Committee.	

Satisfactory completion of the comprehensive examinations.

45

Physics

Science Bldg. (52), Room D-37
805 756-2448
www.calpoly.edu/~phys; physics@calpoly.edu

Department Chair, Matthew J. Moelter

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David H. Chipping	Scott C. Johnston
Jodi Christiansen	John M. Keller
Robert Echols	Jennifer L. Klay
Jonathan Fernsler	Randall D. Knight
Neil L. Fleishon	David Mitchell
Antonio F. Garcia	John Mottmann
Glen D. Gillen	John E. Poling
Katharina Gillen	Richard A. Saenz
Brian E. Granger	Karl F. Saunders
A. Elizabeth Griffith	Peter V. Schwartz
Thomas D. Gutierrez	John P. Sharpe
Chance Hoellwarth	Nilgun Sungar
Robert Holtzapple	Ronald E. Zammit
Gayle Iddings	

Affiliated Faculty: Lynn E. Moody
Seth Bush Grace Ann Neff

ACADEMIC PROGRAMS

Astronomy – Minor
Geology – Minor
Physics – BA, BS, Minor

The Physics Department offers the Bachelor of Arts and the Bachelor of Science degrees in Physics.

The department provides a comprehensive laboratory program. Facilities include specialized laboratories in electrical measurements, optics, solid state physics, nuclear and atomic physics. Student activities include a chapter of the national Society of Physics Students and a chapter of the national physics honor society, Sigma Pi Sigma.

High school students planning to major in physics should include in their high school program as much as possible of the following: eight semesters of college preparatory mathematics, two of physics, and two of chemistry.

Preparation for Middle or High School Teaching

Teaching middle or high school physics in public schools requires a physics teaching credential, usually obtained after graduation. The courses EDUC 300 and KINE 250 are required for entrance into most teacher credential programs. Teachers must also be subject-matter certified, which can be done by taking subject-matter exams. Students interested in a teaching career should talk to the single-subject advisor and can find more information at the Physics Department web site.

BA Physics

The BA in Physics provides the student with a solid foundation in physics. Its primary purpose is to serve students who plan to pursue careers teaching science at the

high school level and in science related fields for which a physics background is an asset. Students considering a career in teaching should consult with the department advisor early.

The curriculum has fewer required upper division courses than the BS, which allows the student to choose from an extensive list of electives in consultation with an academic advisor. In addition, the BA provides an attractive option for students in related disciplines who wish to pursue a double major.

BS Physics

The BS in Physics is the appropriate choice for those students planning a career involving physics in industry or government laboratories, as well as those seeking a strong foundation in physics for graduate study.

Students have the choice of selecting one of the specialized concentrations or following the general physics curriculum, which offers a variety of elective coursework. All offer good preparation for graduate study in physics. The electronics concentration is designed for students wishing to acquire a working knowledge of electronics to use in experimental physics. The electro-optics concentration provides a background in optical devices and techniques used in this rapidly expanding field.

ASTRONOMY MINOR

The Astronomy Minor provides students an opportunity to learn about and analyze astronomical phenomena and processes. A minor in astronomy provides a background for graduate-level studies in astronomy or work in related fields. Interested students should see an Astronomy Minor advisor.

Required Courses.

	<i>Units</i>
PHYS 132 General Physics II.....	4
PHYS 133 General Physics III	4
PHYS 211 Modern Physics	4
ASTR 301 The Solar System.....	3
ASTR 302 Stars and Galaxies.....	3
ASTR 326 Relativity and Cosmology.....	3
ASTR 444 Observational Astronomy	4
Select 4 units from the following:.....	4
ASTR 470, 471; PHYS 302, 303, 313, 323, 410; AERO 451; GEOL 415	

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GEOLOGY MINOR

The Geology Minor is offered in conjunction with the Earth and Soil Sciences Department. It provides a background useful for careers in environmental consulting or geotechnical fields. Interested students should consult with a Geology Minor advisor. This minor is not open to students in the Earth Sciences' Geology concentration. For more information about that concentration, please see the Earth Sciences major in the Earth and Soil Sciences Department.

Prerequisites for the Geology minor are SS 121, CHEM 111 or CHEM 128, and PHYS 132.

Required Courses.	Units
GEOL 201 Physical Geology	3
GEOL 241 Physical Geology Laboratory	1
GEOL 305 Fundamentals of Seismology	4
GEOL 415 Structural Geology	4
GEOL/ERSC 401 Field-Geology Methods	4
GEOL/ERSC 402 Geologic Mapping	4
ERSC 223 Rocks and Minerals	4
ERSC 323 Geomorphology	4
	28

PHYSICS MINOR

The Minor in Physics provides the student with the opportunity to build on the introductory physics core courses with a coordinated set of electives which are based on interests and career objectives selected in consultation with a physics advisor. It consists of 24 units in physics and astronomy, of which 12 units must be upper division, and no more than 4 units may be from astronomy courses.

Required Courses.	Units
PHYS 133 General Physics	4
(Prerequisite: PHYS 141 or PHYS 131 <i>and</i> MATH 142)	
PHYS 211 Modern Physics I	4
Physics/Astronomy electives:	16
Minimum 12 units must be upper division. Any upper-division course with prefix PHYS or PHYS 202 or PHYS 212. Students may also select a maximum of 4 units from ASTR 301, 302, 326, 444. Must include at least one of the following courses:	
PHYS 301 Thermal Physics (4)	
PHYS 302 Classical Mechanics I (4)	
PHYS 322 Vibrations and Waves (3)	
PHYS 323 Optics (4)	
PHYS 405 Quantum Mechanics I (4)	
PHYS 408 Electromagnetic Fields and Waves I (4)	
PHYS 412 Solid State Physics (3)	
	24

BA PHYSICS

- 60 units upper division GWR
 2.0 GPA USCP

* = Required in Major; also satisfies GE

Course sequencing: See flowcharts at
www.csmadvising.calpoly.edu

¹ Note: Major courses with lab component may not be taken credit/no credit.

MAJOR COURSES

PHYS 141 General Physics IA	4
PHYS 132 General Physics II (B3 & B4)*	4
PHYS 133 General Physics III	4
PHYS 206 Instrumentation in Experimental Physics	3
PHYS 211 Modern Physics I	4
PHYS 212 Modern Physics II	4
PHYS 256 Electrical Measurements Laboratory	1
PHYS 301 Thermal Physics I	4
PHYS 302 Classical Mechanics I	4
PHYS 322 Vibrations and Waves	3

PHYS 405 Quantum Mechanics I <i>or</i>	
PHYS 412 Solid State Physics	3-4
PHYS 461 Senior Project I <i>or</i>	
PHYS 463 Senior Project - Lab Research I	2
Select one from the following:	3-4
² PHIL 321 Philosophy of Science (4) (C4*),	
³ PHIL 421 Phil. of Space, Time and Matter (4),	
<i>or</i> SCM 451 Ethics in the Sciences (3)	
CHEM 127 General Chemistry	4
CHEM 128 General Chemistry	4
MATH 141 Calculus I (B1) *	4
MATH 142 Calculus II (B1)*	4
MATH 143 Calculus III	4
MATH 241 Calculus IV	4
MATH 244 Linear Analysis I	4
MATH/STAT elective (300-400 level; MATH 344 recommended)	4
Physics electives (300-400 level)	16
Select at least one of the following:	
PHYS 323, 340, 341, 342, 357, 417, 422, 423,	
452, ASTR 444. In addition, choose courses with the prefixes PHYS, ASTR or GEOL (but no more than 6 units from each of ASTR and GEOL)	

91-93

GENERAL EDUCATION (GE)

72 units required, 12 of which are specified in Major.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 in Major	0
B2 Life Science	4
B3 Physical Science * 4 in Major	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

60

FREE ELECTIVES

27-29[†]

180

¹ The following major courses cannot be taken as CR/NC grading: PHYS 132, 133, 256, 323, 340, 341, 342, 357, 417, 422, 423, 452, ASTR 444.

² Note (C2) prerequisite for this course.

³ Note PHIL 230 or 231 (C2) prerequisite for this course.

[†] Care must be taken when selecting electives to ensure compliance with the "60 unit upper division" requirement.

BS PHYSICS

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

* = Required in Major; also satisfies GE

Course sequencing: See flowcharts at
www.csmadvising.calpoly.edu

¹ Note: Major courses with lab component may not be taken credit/no credit.

MAJOR COURSES

PHYS 141 General Physics IA.....	4
PHYS 132 General Physics II (B3 & B4)*	4
PHYS 133 General Physics III.....	4
PHYS 202 Physics on the Computer.....	4
PHYS 206 Instrumentation in Experimental Phys.	3
PHYS 211 Modern Physics I	4
PHYS 212 Modern Physics II	4
PHYS 256 Electrical Measurements Laboratory	1
PHYS 301 Thermal Physics I.....	4
PHYS 302 Classical Mechanics I	4
² PHYS 322 Vibrations and Waves	3
PHYS 340 Quantum Physics Laboratory I.....	2
PHYS 341 Quantum Physics Laboratory II	2
PHYS 405 Quantum Mechanics I	4
PHYS 408 Electromagnetic Fields and Waves I	4
PHYS 461 Senior Project I <i>or</i>	
PHYS 463 Senior Project – Lab Research I.....	2
PHYS 462 Senior Project II <i>or</i>	
PHYS 464 Senior Project – Lab Research II.....	2
CHEM 127 General Chemistry	4
CHEM 128 General Chemistry	4
MATH 141 Calculus I (B1)*	4
MATH 142 Calculus II (B1)*	4
MATH 143 Calculus III	4
MATH 241 Calculus IV	4
MATH 244 Linear Analysis I	4
MATH 304 Vector Analysis	4
MATH 344 Linear Analysis II.....	4
Advanced Physics electives or Concentration courses (see below)	<u>21</u>

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GENERAL EDUCATION (GE)

72 units required, 12 of which are specified in Major.

→See page 39 for complete GE course listing.

→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing.....	4

Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Major.....	0
B2 Life Science	4
B3 Physical Science * 4 units in Major.....	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4

C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)

	60
FREE ELECTIVES	8
	180

Advanced Physics Electives or Concentrations (select one)**Advanced Physics Electives**

This is the default curriculum required for students who do not declare a concentration.

Select two of the following: PHYS 323, 342, 357, 417, 422, 423, 452, ASTR 444 2-8

Select one from: PHYS 424 or MATH 418. 3-4

PHYS 300-400 level elective units (minimum) 9

Additional 300 or 400 level elective units (if needed): PHYS/ASTR/GEOL/MATH/STAT/CSC prefix (excludes ASTR 324; CSC 302, 310); CSC 101, 231, 234, 235 0-7

For students anticipating an industrial career, PHYS 323, 357, 412, 413, 423, and 452 are suggested.

For students anticipating graduate work in physics, PHYS 303, 401, 406, 409, 424, and MATH 408 are suggested. PHYS 357 is suggested for students who anticipate becoming experimental physicists.

21

Electronics Concentration

Students are not allowed to enroll in EE 228 until they have
a) completed PHYS 357 and MATH 344, and
b) received the approval of advisors in both Physics and Electrical Engineering. Students are then allowed to enroll in EE courses with physics courses substituting for EE prerequisites.

PHYS 357 Advanced Instrumentation in Experimental Physics.....	3
EE 228 Continuous-Time Signals and Systems	4
EE 302 Classical Control Systems	3
EE 328 Discrete Time Signals and Systems.....	3
EE 342 Control Systems Laboratory.....	1
EE 368 Signals and Systems Laboratory.....	1

¹ The following major courses cannot be taken as CR/NC grading: PHYS 132, 133, 256, 323, 340, 341, 342, 357, 417, 422, 423, 452, ASTR 444.

² Students in Electro-optics Concentration should take PHYS 323 instead of PHYS 322.

EE 336 Microprocessor System Design <i>or</i> EE 306 and EE 346 Semiconductor Device Electronics and Laboratory.....	4
Elective chosen from Advanced Physics Electives (see above)	2
	21

Electro-optics Concentration

Students following this concentration should take PHYS 323 instead of PHYS 322 as a major requirement.

Students are not allowed to enroll in EE 228 until they have a) completed PHYS 357 and MATH 344, and b) received approval of advisors in both Physics and Electrical Engineering. Students are then allowed to enroll in EE courses with physics courses substituting for EE prerequisites.

PHYS 357 Advanced Instrumentation in Exp Physics	3
PHYS 423 Advanced Optics	4
EE 228 Continuous-Time Signals and Systems.....	4
EE 403 Fiber Optics Communication.....	3
EE 418 Photonic Engineering.....	3
EE 443 Fiber Optics Laboratory.....	1
EE 458 Photonic Engineering Laboratory.....	1
Elective chosen from Advanced Physics Electives (see above)	2
	21

Statistics

Faculty Offices East (25), Room 107D
805 756-2709

Department Chair, Robert K. Smidt

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Beth L. Chance	Allan J. Rossman
Jimmy A. Doi	Soma Roy
Samuel Frame	Andrew A. Schaffner
Iliana Ignatova	Jeff C. Sklar
Ulric J. Lund	Kent D. Smith
Karen J. McGaughey	John H. Walker

ACADEMIC PROGRAMS

Statistics – BS, Minor

The Statistics Department has two primary purposes—to offer introductory statistics courses to students from many different majors at Cal Poly, and to offer a curriculum of diverse statistics courses for those students pursuing a Bachelor of Science degree in Statistics or a minor in the discipline.

In this age of high technology it has become increasingly easy to record and store information resulting from experiments, surveys, and historical studies. It is the responsibility of the professional statistician to determine the best ways to collect, summarize and analyze these data. Because of the increasing number of quantitative studies that are conducted in fields ranging from medicine to agriculture to business, the professional statistician is in great demand.

It has been projected that the job market for those with substantial statistical training remains healthy into the foreseeable future. Recent graduates of the program at Cal Poly are working for companies in fields as varied as insurance, aircraft manufacturing, banking, computer manufacturing, and pharmaceutical development.

The statistics degree program requires students to have a solid foundation in mathematics and computer science. With this basis the students take courses in the following areas: analysis of variance, regression analysis, statistical computing, sampling methods, experimental design, analysis of categorical data, multivariate analysis, time series and forecasting, survival analysis,78 probability, and mathematical statistics. In the various courses the students make use of computing facilities available at Cal Poly.

Throughout the program faculty encourage students to work on practical, realistic problems that require the understanding of all aspects of the data acquisition and analysis process.

STATISTICS MINOR

The Statistics minor program allows students from across the University to acquire substantial statistical skills that can be applied in their own disciplines.

- Select one of the following introductory sequences** 8–9
- STAT 217 Introduction to Statistical Concepts and Methods (4) *and* STAT 313 Applied Experimental Design and Regression Models (4)
 - STAT 218 Applied Statistics-Life Sciences (4) *and* STAT 313 Applied Experimental Design and Regression Models (4)
 - STAT 221 Intro Probability and Statistics (5) *and* STAT 313 Applied Experimental Design and Regression Models (4)
 - STAT 251 Statistical Inference for Mgmt. I (4) *and* STAT 252 Statistical Inference for Mgmt. II (5)
 - STAT 301 Statistics I (4) *and* STAT 302 Statistics II (4)
 - STAT 312 Statistical Methods for Engineers (4) *and* STAT 313 Applied Experimental Design and Regression Models (4)
- Select four courses from the following**..... 16
- STAT 323, 324, 325[†], 330, 331, 416, 417, 418, 419, 421, 423, 425[†], 426, 427

24-25

BS STATISTICS

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

* = Required in Major; also satisfies GE

Course sequencing: See flowcharts at www.csmadvising.calpoly.edu

Note: No course with a STAT prefix may be taken as credit/no credit.

MAJOR COURSES

STAT 150 Introduction to Statistical Investigations	4
MATH 141 Calculus I (B1)*	4
MATH 142 Calculus II (B1)*	4
MATH 143 Calculus III	4
MATH 206 Linear Algebra I	4
MATH 241 Calculus IV	4
STAT 301 Statistics I	4
STAT 302 Statistics II	4
STAT 323 Design and Analysis of Experiments I	4
STAT 324 Applied Regression Analysis	4

[†] Students may only count STAT 325 or STAT 425, not both, for credit in the minor.

STAT 325 Introduction to Probability Models	4
STAT 330 Statistical Computing with SAS.....	4
STAT 331 Statistical Computing with R	4
STAT 425 Probability Theory.....	4
STAT 426 Estimation and Sampling Theory	4
STAT 427 Mathematical Statistics.....	4
STAT 461 Senior Project I.....	1
STAT 462 Senior Project I.....	2
STAT 465 Statistical Communication and Consulting	4
Statistics electives	20
<i>Any 400-level STAT course. A maximum of 8 units can also be selected from the following: CSC/CPE 102, 103, 236; IME 430; MATH 242, 306, 335, 336, 406, 412, 437, 451, 452</i>	
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SUPPORT COURSES

CSC/CPE 235 Fundamentals of Computer Science for Scientists and Engineers <i>or</i> CSC/CPE 101 Fundamentals of Computer Science I	4
MATH 248 Methods of Proof in Mathematics	4
¹ Approved support electives	8
	16

GENERAL EDUCATION (GE)

72 units required, 8 of which are specified in Major.
→See page 39 for complete GE course listing.
→Minimum of 12 units required at the 300 level.

Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

Area B Science and Mathematics (8 units)

B1 Mathematics/Statistics * 8 units in Major	0
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities (20 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective (upper division) (4 units)**64****FREE ELECTIVES.....****9****180**

¹ Consultation with faculty advisor is required of students, to select and obtain approval for these courses. Students are requested to consult their advisors before the start of their junior year.

School of *Education*

Director, Patricia A. Mulligan
Education Bldg. (02), Room 120
805 756-2126
soe.calpoly.edu; soe@calpoly.edu

James L. Gentilucci	Donald K. Maas
Kathleen C. Harris	Shirley J. Magnusson
Anita C. Hernandez	George J. Petersen
Roberta J. Herter	Louis B. Rosenberg
Jodi D. Jaques	Michael B. Ruef
Steven Kane	

Affiliated Faculty

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

Lola Berber-Jimenez	William C. Kellogg
Michael Black	Elsa Medina
Seth Bush	Grace Neff
Denise Daniels	Joel Orth
Ann De Lay	Jeannine Richison
Robert A. Flores	Kate J. Riley
Richard Gearhart	Johanna Rubba
Megan Guise	Michael Sutliff
Todd A. Grundmeier	Kevin Taylor
Ed Himelblau	Scott Vernon
Chance Hoellwarth	Wendy Warner
John M. Keller	Raymond F. Zeuschner

VISION, MISSION AND PROGRAMS

Vision: The School of Education develops and supports qualified, competent, and caring education professionals who prepare a diverse student population to become active and thoughtful participants in a democratic society.

Mission: The School of Education leads the campus in an all-university approach to preparing education professionals. These professionals create, assess and modify environments, practices, and policies to foster the achievement of each and every learner; they strive for equity in schools and society; and they are committed to inquiry and professional growth for themselves and the advancement of P-20 education.

School of Education faculty models leadership in its teaching, scholarship, and service through a grounded, reflective *learn-by-doing* approach and through sustained collaborations with its education partners: P-12 schools, families, community colleges, universities, and local, state, and national agencies.

Learning Outcomes: All candidates who complete a credential or master's degree in the School of Education will:

- *Be Qualified, Competent, and Caring Professional Educators*
- *Integrate Principles and Practices of Professional Fields to Support Student Learning*
- *Engage in Cross-Disciplinary and Collaborative Practices*
- *Demonstrate Authentic Assessments Designed for Student Success, Individual Growth, and Program Improvement*
- *Effect Sustainable Communities in a Multicultural Environment*
- *Engage in Professional Practices*

Programs: The School offers a wide variety of courses and programs leading to careers in education. Common to all programs is a commitment to excellence, to partnerships and collaboration, and to preparation for future educational challenges. As the state's population grows, enrollments in grades P–12 increase and with them the demand for well-prepared teachers, and for specialists in administration and special education.

To meet the need for excellent teachers the School seeks talented, creative students who are committed to a long-term career in education and to the improvement of educational processes and institutions.

The School offers programs that lead to a preliminary credential in Multiple Subject or Single Subject Instruction, in Administrative Services or as an Education or Agriculture Specialist. Supplementary and subject matter authorizations are available in a variety of subject areas.

The School offers a Master of Arts in Education degree with specializations in Counseling and Guidance, Educational Leadership and Administration, and Special Education.

Courses in these programs are offered to meet the needs of the students. To accommodate the working professional, courses in some programs are offered during the late afternoons, evenings, weekends, and during the summer.

Stressing the "learn by doing" philosophy, the School provides opportunities for extensive student on-site observation, tutoring, and fieldwork. Cal Poly maintains cooperative relations with the surrounding school districts, and within our service area students can enjoy cross-cultural, city and rural fieldwork.

Teacher Education

Education Bldg. (02), Room 120
805 756-2126

Multiple Subject Coordinator, James Brescia
Single Subject Coordinator, Patricia A. Mulligan

The following credential programs are accredited by the California Commission on Teacher Credentialing (CTC) to prepare candidates and recommend for these credentials.

Teaching Credential Programs

Agriculture Specialist
Multiple Subject Instruction
Multiple Subject: Bilingual Crosscultural Language and Academic Development (BCLAD) Emphasis
Single Subject: Agriculture
Single Subject: Biological Science Instruction
Single Subject: Chemistry
Single Subject: English
Single Subject: Mathematics
Single Subject: Social Science
Single Subject: Physics

Credential programs consist of coursework and field experiences, including student teaching, that are required to obtain the Preliminary Multiple or Single Subject teaching credentials in California. The teaching credential programs typically take four or five quarters of full-time enrollment, depending on completed prerequisites. The School has technology in place to assist students in meeting California's teaching performance assessment requirements.

Applications are accepted during specific periods at the beginning of each fall, winter and spring quarter. Detailed information about dates and other requirements are available on the School of Education website at www.soe.calpoly.edu.

Multiple Subject Teaching

A student may enter the Multiple Subject Credential program as a Cal Poly Liberal Studies undergraduate, as a graduate student, or as a Cal Poly undergraduate in any program leading to a baccalaureate degree. The integrated, pre-professional program offers undergraduates in the Liberal Studies major the opportunity to earn a bachelor of science degree while also pursuing a teaching credential. The Liberal Studies Program is designed so that students take education related courses in their freshman and sophomore years to help them meet the prerequisites for admission to the program, and begin professional education course work and field experiences during their junior and senior years.

Students applying for the post-baccalaureate Multiple Subject Credential program must have completed a baccalaureate degree. During the program, candidates take educational foundation and methods courses; engage in extensive field experiences, one quarter of part-time student teaching, and a final quarter of full-time student teaching. Upon successful completion of the program, candidates are recommended for a Preliminary Multiple Subject Teaching Credential.

Candidates may also elect to earn a Preliminary Multiple Subject Teaching Credential with a Bilingual Crosscultural Language and Academic Development emphasis (BCLAD). The BCLAD emphasis requires proficiency in Spanish and additional course work in the foundations and methods for bilingual teaching, and knowledge of the history of Mexico/Latin America. Detailed information for the Multiple Subject Credential and the BCLAD emphasis is available on the School of Education website at www.soe.calpoly.edu.

Single Subject Teaching

The Single Subject Teaching Credential is for candidates who wish to teach a specific content area at the secondary level. Single subject candidates must demonstrate subject matter competency by completing a California Commission on Teacher Credentialing approved subject matter course work program in that subject matter area or provide evidence of passing the appropriate California Subject Examinations for Teachers (CSET) specialty area test(s). Demonstration of subject matter competency must be completed before candidates begin their part-time student teaching experience.

Candidates for the Single Subject teaching credential in Agriculture or the Agricultural Specialist credential complete their preparation program through the Agricultural Education and Communication Department at Cal Poly and should communicate with the department credential advisor for further information or advisement (Dr. Bill Kellogg, at 805-756-2803 or bkellogg@calpoly.edu).

NOTE: Credential requirements are subject to change. Please check with program advisors for up-to-date information.

ADMISSION REQUIREMENTS

Details concerning specific requirements are available from the appropriate advisor, the advisement handbook, or at www.soe.calpoly.edu.

The requirements for admission to Cal Poly to pursue a Multiple Subject credential differ slightly from those for the Single Subject credential. All applicants must first apply for admission to graduate studies in Education at Cal Poly by completing an application at www.csumentor.edu.

Preliminary Credential

Admission to the university does not guarantee admission to either teacher education program. Admission to either Preliminary Credential program requires candidates to be in at least their junior year, pass the Basic Skills Requirement, earn a Certificate of Clearance, verify completion of early field experience, and satisfy all other prerequisites for a specific credential program.

To make successful progress through the program, candidates must maintain a B average in all professional education courses, and complete a series of applications (STEP I or A, II or B, & III) at specific transition points in the credential program. Check with the credential program advisor, the credential handbook, and www.soe.calpoly.edu to be sure all requirements are completed.

Clear Credential

California Senate Bill 2042 transferred the granting of clear multiple subject and single subject teaching credential recommendations to school district based Induction Programs. Graduates obtaining their preliminary credential from Cal Poly should consult the school district employing them, whether in San Luis Obispo County or elsewhere in California, for information about the Induction Program and obtaining the clear credential.

Supplementary and Subject Matter Authorizations

Students are encouraged to complete additional authorizations that can be added to Preliminary Multiple and Single Subject credentials. These authorizations allow teachers to teach additional subjects without completing a full professional preparation program for that credential. To earn an authorization, students must complete a specific number of course credits in the new content area. See www.ctc.ca.gov for specific information on these authorizations.

Graduate Studies in Education

Education Bldg. (02), Room 120
805 756-2126

Counseling and Guidance Coordinator, Jodi D. Jaques
Educational Leadership and Administration
Coordinator, James L. Gentilucci
Special Education Coordinators, Kathleen Harris and
Michael B. Ruef

Credential Programs in:

Administrative Services

Education Specialist (Mild/Moderate Disabilities)

These credential programs are accredited by the California Commission on Teacher Credentialing (CCTC) to prepare candidates and recommend for these credentials.

M.A. in Education with Specializations in:

Counseling and Guidance

Educational Leadership and Administration

Special Education

Credential Programs

Admission Requirements

Details concerning specific requirements are available from the appropriate advisor, the advisement handbook, or at www.soe.calpoly.edu.

ADMINISTRATIVE SERVICES

Preliminary (Tier I)

Administrative Intern

Administrative Services offers two credential programs: one leading to recommendation for the Preliminary Administrative Services Credential, and a second, the Administrative Intern Credential, for those persons earning their Preliminary Administrative Services Credential and who concurrently serve in an administrative position.

Preliminary Administrative Services. This program emphasizes a comprehensive knowledge of public school administration including applied theory, administration and leadership, schools in contemporary society, and effective management related to educational outcomes. As a basis for credential recommendation, the preliminary program emphasizes applied theory with actual experience in fieldwork assignments and an evaluation of administrative competence.

The credential program requires 45 quarter units, most of which are applicable to the MA in Education with a Specialization in Educational Leadership and Administration.

The Preliminary Administrative Services Credential authorizes service in any administrative position at any grade level in California.

Administrative Intern. This program supports districts that have an immediate need for an administrator and are without suitable candidates. Candidates earn the Preliminary Administrative Services Credential as they serve in an administrative capacity within a one year timeframe.

EDUCATION SPECIALIST (Mild/Moderate Disabilities)

Preliminary Level I

This credential authorizes the holder to teach in the following settings: special day classes, special schools, home/hospital settings, correctional facilities, nonpublic schools and agencies, and resource rooms.

The program is designed to prepare candidates to work with pupils with mild/moderate disabilities, which include specific learning disabilities; mild to moderate mental retardation; attention deficit and attention deficit hyper-activity disorders; and serious emotional disturbance, and authorizes serving individuals in K-12, and in classes organized for adults through age 22.

A full-time candidate may complete the requirements in one calendar year. The Education Specialist program is heavily field based and requires 57 quarter units, most of which are applicable to the MA in Education with a Specialization in Special Education.

A Multiple or Single subject teaching credential is *not* required for admission. However, some coursework taken for the Single Subject or Multiple Subject Credential program may meet prerequisite course requirements for the Education Specialist Credential program.

Master of Arts in Education

General Characteristics

The Master of Arts degree program in Education is designed to provide a broad-based perspective of education. The specializations are closely related to the occupational and professional requirements of a variety of pursuits in the fields of education, college student affairs, and agencies involved with community affairs.

Admission

Admission to the MA in Education degree program minimally requires the following:

- 3.0 GPA in last 90 quarter units
- Letters of recommendation
- Bachelors degree from a regionally accredited college/university

Each specialization below may list additional requirements for the specific program (see the Graduate section of this catalog for additional information on admission).

Program of Study

All specializations require a minimum of 45 quarter units of graduate work, with at least 40 units of 500-level Education (EDUC) courses. Courses taken in these specializations may also be applied toward related credentials.

Candidates must maintain a grade point average of 3.0 or better in all coursework and remain in good professional standing within their specialization. Calculation of the GPA includes all grades, although only the courses with A, B, or C grades are counted to satisfy requirements for the degree. Required courses with a grade of D or F must be repeated. All candidates must meet the Graduation Writing Requirement.

Credits earned in student teaching are not accepted toward completion of any specialization within the MA Education. At least 36 program-required units shall be completed in residence. Transfer and/or extension credits are only accepted when the credits are acceptable for master's degree credit by the offering institution in its own programs.

Advising

The candidate must meet with his/her advisor on a regular basis. Continued consultation with the advisor assists a smooth progression toward completion of the degree.

Formal Study Plan

The candidate is required to file a Formal Study Plan prior to completion of 12 units in his/her program. This plan is completed in consultation with the program advisor and helps the candidate to schedule courses in a sequence that results in timely completion of the program. A Formal Study Plan is required prior to Advancement to Candidacy.

Advancement to Candidacy

Advancement to master's degree candidacy requires:

- Completing at least 24 units of program-required courses in residence, specified in a formal program of study, with minimum GPA of 3.0;
- Having met the university Graduation Writing Requirement;
- Receiving formal recommendation of the graduate faculty;
- GPA of 3.0 in all coursework included on the formal program of study, and in all coursework completed subsequent to admission to postbaccalaureate standing; and
- Having satisfactorily met any conditions of admission.

Culminating Experience

Depending on the specialization, final assessment of a candidate's progress shall include a comprehensive written examination and EDUC 590 Research Applications in Education, *or* the completion of a thesis/project. Students must enroll in EDUC 599 Thesis/Project for every quarter in which they are receiving advisement.

MA Education, Specialization in COUNSELING & GUIDANCE

This program prepares students for careers as student affairs professionals and counselors in higher education settings. Admission to the program, which occurs **only** in spring quarter, requires references, an auto-biographical statement, and an interview. Students who have career goals of working in clinical counseling in agency settings or in private practice should refer to the MS Psychology in the College of Liberal Arts.

Education Core

EDUC 586 Introduction to Inquiry in Education	4
EDUC 587 Educ Foundations & Current Issues	4
EDUC 588 Education, Culture and Learning	4
EDUC 589 Educational Research Methods	4
EDUC 590 Research Applications in Education (4) <i>and comprehensive exam or</i>	
EDUC 599 Thesis/Project (3) (3)	4/6

Required in the Area of Specialization:

EDUC 555 Intro to the Counseling Profession (4)	
EDUC 556 Multicultural Counseling (4)	
EDUC 557 Career Counseling (4)	
EDUC 560 Counseling Theories (4)	
EDUC 561 Group Counseling (4)	
EDUC 562 Student Dev-Higher Education (4)	
EDUC 564 Legal & Ethical Issues in Counseling (4)	
EDUC 565 Measurement & Assess. Counseling (4)	
EDUC 566 Leadership & Consultation Counsel (4)	
EDUC 568 Counseling Techniques (4)	
EDUC 573 Field Experience, Counseling (12)	

 72/74
MA Education, Specialization in EDUCATIONAL LEADERSHIP and ADMINISTRATION

The fast-track M.A. and Preliminary Administrative Services Credential program allows students to complete their master's degree and/or credential in 16 weekends (Friday evenings and all day Saturdays) and one summer session during an 11-month period. This rigorous, practical program is designed for those seeking leadership positions in K-12 schools, community colleges, universities, government agencies, and educationally related organizations. Students are admitted once each year in the fall, and they progress through the program as a cohort. The application deadline is MARCH 1. The fast-track program emphasizes applied theories of educational leadership, mastery of practical skills required for effective school administration, and competence in research methods necessary for understanding and assessing learning organizations. While designed primarily for K-16 leaders, the program is beneficial for leaders from other fields. Individuals interested in leading nonprofit organizations are encouraged to apply.

Fall Quarter

EDUC 586 Introduction to Inquiry in Education	4
EDUC 512 Educational Organization & Mgmt	4
EDUC 513 Educ. Planning & Decision Making	4
¹ EDUC 518 Supervised Fieldwork	3

Winter Quarter

EDUC 514 School Site Administration	4
EDUC 515 Curriculum and Program Evaluation	4
EDUC 516 Personnel Supervision and Evaluation	4
¹ EDUC 518 Supervised Fieldwork	3

Spring Quarter

EDUC 510 Educ Finance & Resource Allocation...	4
EDUC 511 Educational Law and Governance	4
EDUC 589 Educational Research Methods.....	4
¹ EDUC 518 Supervised Fieldwork	3

Summer Session

EDUC 587 Educ Foundations & Current Issues	4
EDUC 588 Education, Culture and Learning	4
² EDUC 590 Research Applications in Education	4

M.A. degree only requires 48 units minimum; 48/57
M.A. and credential require 57 units minimum

MA Education, Specialization in SPECIAL EDUCATION

Applicants must meet personal and professional standards, including necessary qualifying examinations, presentation of personal recommendations, and a personal interview.

Approved units for the master's degree program can be applied towards the requirements for a Preliminary Level I Education Specialist Credential. It is also possible for the qualified student to complete the requirements for the Specialist Credential while pursuing the requirements for the Master of Arts degree in Education.

Education Core

EDUC 586 Introduction to Inquiry in Education	4
EDUC 587 Educ Foundations & Current Issues	4
EDUC 588 Education, Culture and Learning	4
EDUC 589 Educational Research Methods.....	4
EDUC 590 Research Applications in Education and comprehensive exam.....	4

Required in Area of Specialization

EDUC 544 Adv Collaboration and Consultation for Teachers of Pupils with Special Needs	5
EDUC 545 Characteristics and Instruction of Pupils with Mild/Moderate Disabilities	5
EDUC 550 Assess Strategies Special Education	5

Electives (to be selected with advisor's approval) 10
45

¹ Administrative services credential candidates only.

² All students are required to complete a comprehensive electronic portfolio and pass an oral examination at the end of the program.

Continuing Education

Brian C. Tietje, Dean
 Patricia-Ann Stoneman, Director of Academic Programs
 John P. Lyons, Director of Business Services
 Jespersen Hall (116), Room 101
 805 756-2053
continuing-ed@calpoly.edu

ACADEMIC PROGRAMS

Interdisciplinary Studies – BA
 Disaster Management/Homeland Security – Minor
 Organizational Leadership – Certificate

Continuing Education (CE) advances the academic and public service mission of Cal Poly beyond the traditional undergraduate and graduate college experience. Its goal is to increase access to the intellectual resources of the University by developing and offering a wide range of innovative lifelong learning opportunities to the citizens of California and the nation. Educational programs are offered in a variety of learning formats including classroom instruction, distance learning, and client centered services both on- and off-campus.

Information on programs and current offerings is listed in the Continuing Education catalog, which is published four times a year, and at www.continuing-ed.calpoly.edu.

Degrees and Credit Classes

Open University. This option enables adequately prepared members of the community to enroll in regular Cal Poly courses on a space available basis. Open University is a *non-degree* registration option. Limits as to the number of credits earned through Open University may apply when seeking admission to a degree program. Enrollment forms and guidelines for registering may be obtained from CE two weeks prior to the beginning of each quarter.

Other Degrees. The following programs are offered in cooperation with the Orfalea College of Business: MS in Accounting with Specialization in Taxation, MS in Accounting with Specialization in Financial Accounting; and MS Business and Technology.

The MS in Fire Protection Engineering is offered in cooperation with the College of Engineering.

Professional Advancement

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

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

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

DISASTER MANAGEMENT AND HOMELAND SECURITY MINOR

The program is a multidisciplinary cooperative effort between the Natural Resource Management Department, Continuing Education, California Emergency Management Agency, and the California State Fire Marshal's Office. It includes a broad understanding of the nature, impact and recovery methods of natural and human caused disasters on the wildland and built environments.

The program includes courses in policy, planning and operational components of disaster management and homeland security, including opportunities to gain practical experience and work with current incident management technologies. The minor prepares students from various majors whose careers will be related to disaster management and homeland security.

Required courses

CRP 458 Local Hazard Mitigation Png/Design	4
NR 455 Wildland-Urban Interface Fire Protection	3
DMHS/NR/CRP 351 Intro to Emergency Management in California	3
DMHS/NR 353 Intro to Crisis Communications and the Media	3
DMHS/NR/CRP 401 Disaster Recovery	3
UNIV 339 Disaster-Resistant Sustainable Communities (Area F)	4

Approved electives

Select from the following courses:

CRP 212; NR 312 (Area F), 418;
 DMHS/NR 352, 405, DMHS/FNR/CRP 466

Interdisciplinary Studies

Coordinator, Rose Duran
 Jespersen Hall (116), Room 101, 805 756-2053
www.adultdegreeprogram.calpoly.edu

ACADEMIC PROGRAM

Interdisciplinary Studies – BA

NOTE: The Adult Degree Program (ADP), which offers the Bachelor of Arts in Interdisciplinary Studies, is presently not accepting applications.

The curriculum consists of three major parts: interdisciplinary studies courses; major courses from other academic departments; and 12 units of upper-division General Education courses. Students must complete a total of at least 180 units, of which a minimum of 50 upper-division units must be taken through the Adult Degree Program at Cal Poly.

University Requirements

Students must meet the general graduation requirements as described on page 34 of the catalog, including the Graduation Writing Requirement, U. S. Cultural Pluralism requirement, 2.0 GPA, and academic residence requirements.

Credit for Prior College-Level Learning

Students in the Adult Degree Program can earn academic credit toward their degrees for college-level learning acquired outside a traditional college classroom. Earning academic credit for prior college-level learning can reduce a student's time to degree completion. Students can receive Cal Poly academic credit for training or educational programs that they completed and that are included in the American Council on Education's:

- Educational Credits and Credentials' Guide to the Evaluation of Educational Experiences in the Armed Services, and/or
- National Guide to Educational Credit for Training Programs.

Credit can also be awarded for successful completion of subject examinations through the:

- College-Level Examination Program (CLEP), and the
- University's challenge examination program.

In addition, ADP students can complete a Prior College-level Learning Portfolio. Portfolios must be completed and submitted within one year of being admitted to the ADP. For complete information and guidelines on obtaining academic credit through any of the above, students should consult with the ADP Coordinator and/or the Prior College-level Learning Student Handbook.

BA INTERDISCIPLINARY STUDIES

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

Major Courses *Note: Major courses may not be taken as credit/no credit*

IS 101 Interdisciplinary Studies	4
IS 301 Critical Issues Seminar.....	4,4
IS 302 Analytical Skills Seminar.....	4
IS 450 Adv. Investigation Seminar.....	4
IS 460 Capstone Project	4
Select one course from each of the following eight areas (at least seven courses must be upper division):	32
<i>Applied technology (4); Business (4); Communications/English (4); Ethnic studies/US Cultural Pluralism (4); Fine and performing arts (4); Philosophy/religion (4); Science or nutrition (4); Social science (4)</i>	
Five additional courses approved for use in the Adult Degree Program	22
	78

Upper-Division General Education Courses

→See page 39 for complete GE course listing.

Arts and humanities (C4)	4
Society/Individual (D5)	4
Technology (Area F)	4
	12

Transferred Units	90
	180

Academic Resources

BIOTECHNOLOGY PROGRAMS

Biotechnology is broadly defined as the application of modern technological advances, whether in genetics, chemistry, engineering, or other fields, to biological systems. Modern biotechnology has evolved over the last twenty years to advance the power of molecular biology and genetic engineering technology to further develop microorganisms, as well as plants and animals, for improved manufacturing of biomedical and agricultural products.

Examples of today's biotechnology applications range from the production of human insulin in bacterial cells to the development and use of genetically engineered crops, animals, and microbial fermentation for the production of crop protection products as well as the use of microbes to help clean up the environment (bioremediation) or the use of computers to help decipher complex genetic information (bioinformatics). Biotechnology is also used in the development of new technologies and therapies applied to health, nutrition, and the treatment of diseases in both human and non-human animals.

The biotechnology industry is highly interdisciplinary and involves people with backgrounds in biochemistry, biology, microbiology, agriculture, engineering, as well as business and law. For additional program information, please refer to the program's catalog description.

College of Agriculture, Food and Environmental Sciences

Agricultural and Environmental Plant Sciences, BS
 Agricultural Systems Management, BS
 Agriculture, MS
 Animal Science, BS
 BioResource and Agricultural Engineering, BS
 Soil Science, BS

College of Engineering

Biomedical Engineering, BS, MS
 Civil and Environmental Engineering, MS
 Computer Science, BS, MS
 Engineering, MS
 Environmental Engineering, BS
 General Engineering, BS

College of Science and Mathematics

Biochemistry, BS
 Biological Sciences, BS, MS, Minor
 Biotechnology Minor
 Microbiology, BS, Minor

Biotechnology-Related Center and Institutes

The **Dairy Products Technology Center (DPTC)** conducts research that provides the scientific and technological basis for new and improved dairy food products and processes. Through research and outreach, undergraduate and graduate programs train students to enter careers in the dairy industry

and allied fields. *Contact:* Dr. Rafael Jimenez-Flores, 805-756-6103, rjimenez@calpoly.edu.

The **Environmental Biotechnology Institute (EBI)** focuses on advancing biotechnology research on the Central Coast. Faculty partnerships with major corporations and local laboratories carry out research efforts and offer learning experiences for students. Research projects include the study of microbial communities in the environment, genomics, bioremediation, fungal biotechnology, and microbial diversity and evolution. *Contact:* Dr. Chris Kitts, 805-756-2949, ckitts@calpoly.edu.

The **Renewable Energy Institute**, a multidisciplinary institute involving the Colleges of Agriculture, Engineering and Architecture, offers research and teaching opportunities in the development of renewable energy sources including biomass, wind, passive- and active- solar energy. *Contact:* Margot McDonald, 805-756-1298, mmcdonal@calpoly.edu.

The **Advanced Technology Laboratory** (St. Jude Bioengineering Laboratory) symbolizes the dynamic partnership between academia, government and industry. Faculty and students pursue applied research projects such as bioinstrumentation, medical devices, biomaterials, microfluidics, biomems, tissue engineering, biomechanics, bioremediation, prosthetic robotics and microbial interaction with materials. *Contact:* Dr. Dan Walsh, 805-756-6400, dwalsh@calpoly.edu.

CENTER FOR TEACHING AND LEARNING

Bruno Giberti, Director, Center for Teaching and Learning
Walt Bremer, Director, Instructional Technology
Robert E. Kennedy Library (35) Room 209, 805 756-7002
wwwctl.calpoly.edu

The Center for Teaching and Learning (CTL) promotes educational excellence in the curriculum and co-curriculum while providing Cal Poly with opportunities for professional and organizational development. The center sponsors courses, learning communities, panels, speakers, and workshops on themes relating to academic leadership, educational diversity, instructional technology, pedagogy, program review, SOTL (scholarship of teaching and learning), student learning, and student success. Center associates are available for classroom visits and other forms of consultation regarding teaching and learning.

COMPUTING AT CAL POLY

Timothy J. Kearns, Vice Provost & CIO
Information Technology Services (ITS)
Frank E. Pilling Bldg. (14), 805 756-7000
<http://servicedesk.calpoly.edu>

Cal Poly's learn-by-doing environment is enhanced by electronic access to learning materials and resources, multimedia classrooms, distance learning and video-conferencing facilities, digital video editing systems, media and presentation equipment checkout, and open access student computing labs. Students frequently use computers

in their courses, and are strongly encouraged to have access to a computer and the Internet in their residences.

Students, faculty, staff and others accessing Cal Poly's information technology resources agree to abide by the Responsible Use Policy and other policies at <http://security.calpoly.edu/policies/>.

When connecting to the university network, students are expected to comply with campus security standards. This includes ensuring that networked devices are protected against viruses, spyware, and other threats. Standard tools are available for students to use for this purpose.

ENDOWED CHAIRS AND PROFESSORS

Cal Poly has received generous corporate and private donations and grants that have created endowed chairs and professorships, and helped support new faculty positions. Endowment funds support faculty teaching and research and provide opportunities for students to become involved in research. Examples include the J. G. Boswell Professorship (College of Agriculture, Food and Environmental Sciences); the Bartlett Professorship, the Chrones Endowed Professorship, the Forbes Endowed Professorship, the Hood Professorship Endowment, the Lockheed Martin Endowed Professorship (College of Engineering); the Susan Currier Visiting Professorship for Teaching Excellence in the Liberal Arts (College of Liberal Arts); the Arthur C. Edwards Endowed Chair of Polymers and Coatings, the Unocal Chair for Environmental Studies, and two Unocal Professors of Marine Science (College of Science and Mathematics); and the Joseph and Victoria Cotchett endowed professorship of educational technology (School of Education).

HEALTH PROFESSIONS PREPARATION

Health Professions Advising Center
805 756-2615 Bldg. 53, Room 219
healthprofessions@calpoly.edu
<http://healthprofessions.calpoly.edu>

Cal Poly provides excellent preparation and resources for students interested in a career in the health professions. Information about professional school prerequisites, internships, research opportunities, health professions experience, and other requirements, is available at the Health Professions Advising Center.

Choosing a Major. There is no best major to prepare students for professional school as long as the prerequisite courses for the chosen profession are completed. A major should be chosen on the basis of interest. Professional schools are concerned with the overall quality and scope of the undergraduate work and not with the major course of study. Specific requirements vary for each professional school, so students should contact the schools directly.

Health Professions Peer Advising Program

Health professions peer advisors are upper-division students who advise students regarding preparation for the health

professions, including information about required coursework, gaining experience in health care, and application strategies.

INCLUSIVE EXCELLENCE

W. David Conn, Associate Vice President
Bldg. 01, Room 412, 805 756-6655
<http://inclusiveexcellence.calpoly.edu>

Developed by the Association of American Colleges & Universities, "Making Excellence Inclusive" is a unifying vision designed to help institutions fully integrate their diversity, equity, and educational quality efforts and embed them into the core of academic mission and institutional operations. Cal Poly's adoption of Inclusive Excellence (IE) in 2009 was supported by resolutions of the Academic Senate and the ASI Board. Activities and programs are described on the IE website.

INTERNATIONAL EDUCATION & PROGRAMS

Raymond Zeuschner, Interim Director
Bldg 38, Room 145, 805 756-1477
<http://iep.calpoly.edu>

Cal Poly's International Education & Programs (IEP) supports the vision and mission of the University by providing programs and services for both international students studying on campus and students preparing to study abroad. College graduates in the twenty-first century are citizens of a world in which communicating in other languages and understanding other cultures are requirements for successful careers. Many Cal Poly colleges and departments encourage students to pursue overseas study opportunities.

Study Abroad Programs

Students interested in studying abroad should begin by visiting the IEP website (see above) and coming to the Study Abroad office, Cal Poly's clearinghouse for information on all study abroad programs. A resource center provides students with printed material and web resources on study abroad. A study abroad advisor is available to provide guidance and suggestions.

Study Abroad and Exchange Eligibility Requirements

Students must be in good academic and disciplinary standing at Cal Poly in order to be eligible to participate in a study abroad or exchange program. In addition, students must meet the eligibility requirements of their chosen programs. Participants may not study abroad during their first quarter at Cal Poly. Students who are on Academic Probation or Disciplinary Probation ("See Student Conduct and Discipline" on page 55 for more information) at the time of application, or the term prior to studying abroad, must notify the Study Abroad Office. Normally, such students will be considered ineligible to participate in the program unless extenuating circumstances exist, and the Study Abroad Office gives its approval. Pre-approval for courses before departing for a term abroad is strongly recommended.

If a program is located in a country where there is a U.S. Department of State Travel Warning, Cal Poly will NOT provide the approval to participate in the program, nor provide approval for the transfer of credits.

The CSU International Programs

Developing intercultural communication skills and international understanding among its students is a vital mission of the California State University (CSU). 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 for an academic year. The CSU International Programs serves the needs of students in over 100 designated academic majors. Affiliated with more than 70 recognized universities and institutions of higher education in 19 countries, it also offers a wide selection of study locales and learning environments.

Programs

Australia. Griffith University, Macquarie University, Queensland University of Technology, University of Queensland, University of Western Sydney, Victoria University

Canada. Concordia University (Montréal), McGill University (Montréal), Université Laval (Québec City)

Chile. Pontificia Universidad Católica de Chile (Santiago)

China. Peking University (Beijing), Shanghai Jiao Tong University (Shanghai)

Denmark. Danish Institute for Study Abroad (international education affiliate of the University of Copenhagen)

France. Institute Catholique de Paris, Université de Provence (Aix-en-Provence), Universités de Paris I, III, IV, VI, VII, VIII, X, XI, XII, XIII, Université Paris-Est Marne-la-Vallée, Université d'Evry Val d'Essonne, and Université de Versailles Saint-Quentin-en-Yvelines

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

Ghana. University of Ghana, Legon

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

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

Japan. Waseda University (Tokyo)

Korea. Yonsei University (Seoul)

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

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

South Africa. Nelson Mandela Metropolitan University, Port Elizabeth

Spain. Universidad Complutense de Madrid, Universidad de Granada

Sweden. Uppsala University

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

United Kingdom. Bradford University, Bristol University, Hull University, Kingston University, Swansea University

International Programs pays all tuition and administrative costs for participating California resident students to a similar extent that such funds would be expended to support similar costs in California. Participants are responsible for all tuition and program fees, personal costs, such as transportation, room and board, and living expenses. Financial aid, with the exception of Federal Work-Study, is available to qualified students.

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

Additional information about specific programs and answers to questions regarding the application materials may be obtained from the IP Coordinator at Cal Poly (38-106), or by writing to The California State University International Programs, 401 Golden Shore, 6th Floor, Long Beach, California 90802-4210, or by visiting the following website: www.calstate.edu/ip.

Cal Poly's Exchange Programs

A number of Cal Poly colleges and departments have individual exchange agreements with a variety of universities around the world. Students in colleges or departments with exchange agreements have an opportunity for a low-cost, easily arranged study abroad experience within their own academic discipline. If students qualify for one of these exchanges, they pay Cal Poly tuition fees and can spend up to one year at an overseas university with all the rights and privileges of regularly enrolled students. For an exchange to take place, there must also be students from the overseas university coming to study at Cal Poly. More information can be found by visiting http://iep.calpoly.edu/programs_study_abroad/exchanges.html.

Exchange Programs in the United States

National Student Exchange (NSE) Consortium All Majors "Trade places" with another student for a quarter, semester or full year at over 40 partner universities in the United States, Canada and Puerto Rico and Guam. Visit the NSE section of the IEP website for details.

Cal Poly Faculty-Led Programs

In addition to The CSU International Programs and agreements for exchange programs, Cal Poly offers faculty-led study programs.

Australia Study Program. A one quarter study program led by Cal Poly faculty at the University of Adelaide campus in Adelaide during Winter Quarter. The study program includes eight weeks of classes with field trips to nearby sites. The University of Adelaide is a stimulating place to study, combining the beauty of a historic campus, the friendly, accessible nature of Australian society, and the culture of an established university. Learn more by visiting <http://iep.calpoly.edu/facultyled/australiastudy>.

Summer Study in London. While the six-week program is planned primarily for general education experiences in the arts, humanities, and social sciences, the program draws students from all majors. Students take numerous field trips visiting London's concert halls, theaters, museums, cathedrals, and halls of government. The arts, theatre, nightlife, music, and literature are showcased in London. Learn more by visiting <http://iep.calpoly.edu/facultyled/londonstudy>.

Thai Study and Internship Program. In addition to selected General Education courses, an internship program with U.S. corporations, the American Embassy, and universities is also available. Thailand retains a unique character and charm, with an unusual blend of ancient culture and modern industry. Students study in Chiang Mai, Nong Khai and Bangkok, and may participate in service learning and field trip opportunities. Learn more by visiting <http://iep.calpoly.edu/facultyled/thaistudy>.

Peru Study Program. One of the most unique study abroad programs offered. The summer program offers students a chance to spend five weeks living in Cuzco, Peru. Students study Spanish and take Cal Poly general education courses that incorporate hands-on community-based development work. Excursions include trips to Machu Picchu, Lake Titicaca, and the Amazon rainforest. Learn more by visiting <http://iep.calpoly.edu/facultyled/perustudy>.

Affiliation Agreements

Cal Poly has a university-wide affiliation agreement with **AustraLearn and AsiaLearn.** **AustraLearn: North American Center for Australia** provides direct enrollment study abroad opportunities in Australia, New Zealand, and Fiji. The 26 Australian and eight New Zealand universities that are working with AustraLearn have unique academic programs with the highest standard of service. AustraLearn serves as the liaison with the host universities and Cal Poly regarding credit transfer, financial aid, and academic issues. Learn more by visiting www.australlearn.org. **AsiaLearn** brings Asia within reach of students from all academic areas with opportunities for study abroad opportunities at excellent universities in mainland China, Hong Kong, Malaysia, Singapore, and South Korea. Learn more by visiting www.asialearn.org.

Cal Poly's newest affiliation agreement is with **Cultural Experiences Abroad (CEA)**, which was founded in 1996 to provide international education opportunities for U.S. and Canadian college students of all language levels and

majors. CEA sends thousands of students on study abroad programs at 36 universities in 15 countries. Learn more by visiting www.GoWithCEA.com.

Cal Poly has a university-wide affiliation agreement with **Danish Institute For Study Abroad (DIS)** that provides students from any major with the option of enrolling in any of the following academic tracks offered for a semester or summer program: Architecture & Design, European Politics and Society, International Business & Economics, Biotechnology and Biomedicine, and Psychology and Child Development. Learn more by visiting www.dis.dk.

Since its establishment in 1998, the **Foundation for International Education (FIE)** in London has set high standards in offering study abroad, internship, and service-learning programs. FIE provides academic and student support services within fifteen-week Fall and Spring semester programs. Students are immersed in the arts and humanities in London where theatre, music, history, and literature are showcased. Learn more by visiting www.fie.org.uk.

Cal Poly joins 29 member and associated universities that cooperate within the **University Studies Abroad Consortium (USAC)**. USAC has provided quality programs for over 25 years and currently offers 38 study abroad programs at host universities in 24 countries ranging from summer, semester, and year-long programs. USAC offers two types of programs: (1) the language specialty programs focus on language immersion and cultural studies (beginning through advanced language tracks) and (2) partnership programs offer direct enrollment in partner universities offering a full curriculum of studies. Learn more by visiting www.usac.unr.edu.

International Students and Scholars

International Students and Scholars (ISS) offers a variety of comprehensive programs designed to assist international students and scholars as they pursue their academic goals. ISS is committed to creating an academic environment that supports and emphasizes international and cross-cultural understanding.

ISS provides individual immigration advising for international students and visiting faculty and researchers to facilitate compliance with immigration regulations. This includes providing information on maintaining visa status, timely application processing, transfer of schools, extensions, change of status and employment authorization. Cal Poly is a SEVIS-Certified School which provides electronic updates to the U.S. Citizenship & Immigration Services and the Department of State. Updates include quarterly enrollment, change of address, dates of study, and major, as required by immigration law.

Monthly informational programs are offered on various inter-cultural topics to spur discussion and provide a broad-based educational experience. These meetings are open to the entire Cal Poly and San Luis Obispo community.

Workshops on employment, residency, and work visas are also presented throughout the academic year.

ISS offers the program, “Holistic Approach to Cross-Cultural Adaptation and Reentry.” The main objective is to increase cross-cultural understanding of all segments of the university community with the goal of bringing about more globally aware and committed citizens of the world.

LIBRARY SERVICES

Michael D. Miller, Dean

Robert E. Kennedy Library (Bldg 35)

805-756-2598 (Hours); 805-756-2029 (Circulation)

lib.calpoly.edu

The Kennedy Library supports Cal Poly’s mission by selecting and delivering quality information in all formats, by fostering active learning environments, by promoting the skills that are needed for student success, by enriching the experience of academic community within and across the colleges, and by collecting and preserving unique collections. The Library features a 24-hour study space, a technology-rich collaborative environment with ample student seating and a café. The Library is engaged in planning a major addition to the existing building that will offer greatly expanded student collaboration spaces, electronic presentation rooms, and a Center for Inclusive Excellence bringing together a variety of student and University groups.

Services

The Kennedy Library is open until 2 am Sunday through Thursday and opens at 7 am on weekdays. The Library offers a full suite of traditional and digital library services, including print and electronic course reserves, an active interlibrary borrowing service that offers rapid access to over 7 million titles held in California libraries; reference assistance both on-demand at service desks and through instant messaging 24 hours a day; and consultative and instructional services delivered by expert library faculty based in each of Cal Poly’s colleges.

Instruction

Kennedy librarians are active partners with faculty in helping students develop lifelong learning skills. Librarians work directly with faculty to ensure that students have the opportunity to practice the specialized information skills that contribute to student success in their majors. Kennedy librarians teach these skills in nearly 400 courses each year and provide web-based resources to supplement in-class teaching.

Technology

In partnership with campus Information Technology Services, the Library offers a high-speed free wireless network, laptops available for check-out; 300 open computing workstations, all equipped with standard and specialized software that includes Geographic Information Systems and statistical packages. Other media and computing facilities include adaptive software and hardware and access to international broadcasting via satellite. Oversized

and specialty (CAD) printing services and scanners are also available. Student technicians provide on-demand assistance to technology users.

Assistive Technology. The Kennedy Library provides 10+ general use assistive technology/collaboration stations, and five instructor stations throughout the building, featuring a range of assistive software applications and peripheral hardware, dual displays, and height-adjustable tables. The Kennedy Library partners with the Campus Disability Resource Center to provide consultation as needed for assistive technology users.

Collections

Print and Electronic Resources. The Kennedy Library hosts a physical collection of nearly 3.5 million items, including books, journals, government documents, maps, senior projects and master’s theses. The Library licenses more than 7,000 electronic resources, including major indexes and full text databases, and provides access to 32,000 electronic scholarly journal titles. These electronic resources are available to Cal Poly students, faculty and staff anytime and anywhere on or off campus.

Special Collections and University Archives. The Kennedy Library’s Special Collections include more than a hundred unique collections in many formats, including manuscripts, correspondence, business records, architectural drawings, photographs and online collections. Collection strengths include architectural records and drawings, fine printing and graphic arts, regional and California history. Among its holdings are the Julia Morgan papers, the San Luis Obispo Environmental Archives, and the Central Coast Farm Labor Organizing Collection. The University Archives houses materials that document the history, growth and development of Cal Poly, including campus records, publications, photographs, plans, blueprints, and ephemera dating from the founding of the university in 1901 to the present.

DigitalCommons@Cal Poly. As one of the first programs of its kind in the California State University system, the DigitalCommons@CalPoly promotes discovery, research, cross-disciplinary collaboration and instruction by collecting, preserving and providing online access to scholarly work created at Cal Poly. This program enhances the availability of research, scholarship and creative work created at Cal Poly by digitally archiving faculty research and student-generated scholarship including theses, graduate internship reports and senior projects. The service also provides access to relevant documents created by administrative offices, departments and programs at Cal Poly. Members of the Cal Poly academic community are invited to contribute completed scholarship for long-term preservation and worldwide electronic accessibility through the DigitalCommons@CalPoly.

Osher Lifelong Learning Institute (OLLI).

Established through a gift from the Bernard Osher Foundation, the Institute offers classes and field trips for retired and semi-retired adults. Programs change each term and are led by Cal Poly faculty and community experts on a wide variety of subjects. Information on membership and current programs is available at www.lli.calpoly.edu.

Partners

The Kennedy Library is proud to partner with program units that support student learning. Among these partners located in the Library are the Academic Skills Center; the Center for Teaching and Learning; Julian's Café and Patisserie; Student Ombuds Services; Cal Poly Print and Copy; Research Scholars in Residence; and the University Honors Program.

Facilities

Featuring ample natural light, an open-air atrium, and study balconies; five floors with 20+ collaboration rooms, including a dedicated graduate student study room, over 1400 student seats, 300 computer workstations, on-site printing and copying services and an on-site café, the Kennedy Library is visited over 1.25 million times a year and has been regularly voted "Best Study Spot" at Cal Poly for many years.

LOUIS STOKES ALLIANCE FOR MINORITY PARTICIPATION (LSAMP)

Mary Whiteford, Coordinator
Bldg. 01, Room 315, 805 756-5475
<http://lsamp.calpoly.edu>

The CSU Louis Stokes Alliance for Minority Participation (CSU-LSAMP) Program is dedicated to increasing the number of students from underrepresented groups graduating from the CSU with baccalaureate degrees in science, technology, engineering, and mathematics (STEM) disciplines. The LSAMP program emphasizes activities designed to enhance graduate school preparedness, including undergraduate research experiences, interventions for community college transfer students, and expanding opportunities for student engagement in international activities.

The program is for undergraduate students who face or have faced social, cultural, educational or economic barriers to careers in STEM; are U.S. citizens or permanent residents; are enrolled at Cal Poly in a major in the College of Engineering, College of Science and Mathematics, Architectural Engineering, Architecture, BioResource and Agricultural Engineering, Animal Science, Food Science, Nutrition, Crop Science, Environmental Horticultural Science, Forestry and Natural Resources or Soil Sciences.

RESEARCH AND PROJECT INVOLVEMENT

Susan Opava, Dean, Research and Graduate Programs
Bldg. 38, Room 154, 805 756-1508

Faculty actively seek grants and contracts for research and development activities. These sponsored projects enhance

the educational program by bringing to the campus state-of-the-art equipment and financial support for undergraduate and graduate student research. Students who wish to become involved in significant applied research and development activities on the leading edge of their disciplines are encouraged to contact faculty members in their programs who have ongoing projects, to explore becoming part of the project team.

SERVICE LEARNING AND CIVIC ENGAGEMENT

Student Life, University Union, Bldg 65, Room 217,
805 756-6749, www.studentlife.calpoly.edu/csv and
www.civic.calpoly.edu

Service learning provides students an opportunity to participate in a structured learning experience that combines service to the community with explicit learning objectives, preparation, reflection, and evaluation. Students enrolled in service learning courses provide direct service in areas identified by the community. The students learn about the context in which the service is provided, the connection between the service and their academic coursework, and their roles as citizens. Each quarter, hundreds of students participate in service learning classes and volunteer to provide thousands of hours of service to homeless shelters, low-income families, youth, and disabled individuals.

Service learning workshops are offered quarterly through the Center for Teaching and Learning to support faculty development of service learning classes. As part of the strategic plan supported by the Chancellor's Office of Community Service Learning, Cal Poly is working towards extending the influence and resources of the University beyond the campus through quality service learning opportunities.

Each year, the University President awards the President's Community Service Award to outstanding students, clubs, and faculty.

STUDENT LEARNING ASSESSMENT

Cal Poly has adopted University Learning Objectives (ULOs) that describe what all students who complete an undergraduate or graduate program should be able to do (see page 300). Academic programs are designed to provide students with opportunities to achieve program objectives that relate to the ULOs. Other opportunities for learning are provided outside the classroom, such as internships, residence hall programming, and co-curricular activities.

To determine the effectiveness of these educational opportunities, students are asked to participate in learning assessments at the course, program, and university levels. These efforts provide a measure of students' progress and achievement of the ULOs over the course of their academic careers. The assessments may include the review, using standardized rubrics, of students' assignments, exams,

projects, or theses, as well as surveys and other indirect methods of assessment.

While grades may measure individual student progress, course-, program-, and university-level assessments provide information on the effectiveness of educational opportunities for groups of students. The information is intended primarily as the basis for program improvement, although it may also be used for accountability purposes, e.g., for documenting educational effectiveness to accreditation agencies.

Students at Cal Poly should expect that their academic work may be used for assessment purposes.

STUDENT OMBUDS SERVICES

*Patricia Ponce, Associate Ombuds,
Robert E. Kennedy Library (35), Room 113,
805 756-1380, <http://ombuds.calpoly.edu>*

The Office of Student Ombuds Services provides students with a confidential, informal, impartial and independent resource to assist in the resolution of university-related complaints or concerns. The ombuds staff are committed to hearing about students' experiences, assisting them in understanding applicable university policies and procedures, and - as appropriate - helping them to resolve informally any university-related concerns. The staff adhere to the Code of Ethics and Standards of Practice of the International Ombudsman Association.

SUSTAINABILITY PRACTICES

Cal Poly has been a signatory of the Talloires Declaration, a 10-point action plan, since April 2004. This plan commits Cal Poly to sustainability and environmental literacy in teaching, theory, and practice, and is summarized below.

1. **Increase Awareness of Environmentally Sustainable Development:** In 2008 Cal Poly began SUSTAIN (Sino-US Strategic Alliance for Innovation), a partnership among faculty from Tongji University, Cal Poly and Stanford University. SUSTAIN (www.sustainnow.org) was formed as an institute committed to innovating for sustainable design in China and San Luis Obispo.
2. **Create an Institutional Culture of Sustainability:** In 2010 the College of Agriculture, Food and Environmental Sciences created the CAFES Center for Sustainability which joined other sustainability-related centers in the College of Engineering and the College of Architecture and Environmental Design.
3. **Educate for Environmentally Responsible Citizenship:** At Cal Poly, literacy in sustainability begins with a student's first on-campus experience through presentations and modeled sustainable activities such as zero waste meals. Students may elect to fulfill general education and major requirements by enrolling in courses that focus in sustainability. Over 170 courses are available to fulfill GE and major requirements (see suscat.calpoly.edu). For students wishing to specialize in a specific aspect of sustainability, there are currently twelve minors.
4. **Foster Environmental Literacy For All:** In 2009 the Academic Senate proposed and the University accepted the addition of Sustainability Learning Objectives to Cal Poly's University Learning Objectives. As a result all faculty are encouraged to systematically incorporate sustainability into their courses.
5. **Practice Institutional Ecology:** Cal Poly has taken significant steps to reduce its environmental footprint. In 2009 Cal Poly opened Poly Canyon Village – a 1.4-million-square-foot mixed-use complex, which provides apartment-style housing for over 2,600 students – the largest LEED Gold project in the region and in the CSU. LEED certification is being achieved in all new buildings as well as selected retrofits.
6. **Involve All Stakeholders:** Cal Poly has reached out to others interested in learning how to contribute to a sustainable future. Cal Poly hosted the statewide 2008 UC/CSU/CCC Sustainability Conference, attended by some 1,100 people. The Graphic Communication Institute at Cal Poly partnered with SustainCommWorld in 2008 and 2009 to host the Business of Green Media Conference at Cal Poly. In partnership with California Certified Organic Farmers (CCOF), Cal Poly also hosts the annual Sustainable Agriculture Pest Management Conference which provides agriculture industry professionals with innovative strategies for controlling pests using sustainable agricultural practices.
7. **Collaborate for Interdisciplinary Approaches:** Several of the UNIV courses (university-level, co-taught by faculty from different colleges) address a wide range of sustainability issues. Numerous senior projects and courses reach across academic disciplines to engage students in learn-by-doing projects that address issues of sustainability and of meeting the needs of those less fortunate.
8. **Enhance Capacity of Primary and Secondary Schools:** Cal Poly's STRIDE Program has worked with schools and government agencies to design and assess novel, comprehensive community-based education and intervention programs for promoting healthy living.
9. **Broaden Service and Outreach Nationally and Internationally:** Empower Poly Coalition serves as the center for student engagement and unifies the voice of over 27 sustainability-related clubs and groups on campus.
10. **Maintain the Movement:** Cal Poly became the 13th California campus to found a chapter of the Alliance to Save Energy's "Green Campus Program". In 2010 the

National Wildlife Federation's "National Report Card on Sustainability in Higher Education" rated Cal Poly as "Leading School for Environmental Sustainability Goal Setting" and "Leading Employer of Environmental Management and Sustainable Professionals."

Through the combined work of the President's Sustainability Advisory Committee, the Academic Senate's Sustainability Committee and the numerous faculty, staff and students involved with sustainability, the University's commitment to sustainability grows at all levels.

UNIVERSITY HONORS PROGRAM

Sema Alptekin, Director

*Robert E. Kennedy Library, Bldg. 35, Room 510
805 756-7029; <http://honors.calpoly.edu>*

The University Honors Program provides academically motivated students with the opportunity to develop their potential by fully exploring the resources at Cal Poly. Intellectual creativity, civic engagement, and research are the hallmarks of the program. In particular, it builds relationships among all colleges on campus and seeks to educate students in the connections between the disciplines, from engineering to English, agriculture to art, or business to biology. Honors students have the opportunity to enjoy a varied educational experience, including courses in specially designed honors seminars as well as undergraduate research opportunities.

Following Cal Poly's distinctive "hands-on" approach to education, students are encouraged to participate in community projects and international programs to enhance their global awareness. Most Honors courses offer smaller class sizes, where students work closely with faculty in a challenging, stimulating and supportive learning environment. Analytical and interpretive study is encouraged and communication skills, written and oral, are developed. Most courses fulfill graduation requirements.

UNIVERSITY LEARNING OBJECTIVES

The University Learning Objectives are the knowledge and the skills that every Cal Poly student should have by the time of graduation. They are what every student needs for success in a career and in life, particularly within the context of a changing, global society. Mastering these objectives will empower students with core knowledge and transferable skills, and prepare them to encounter challenging issues as leaders in the twenty-first century.

All students who complete an undergraduate or graduate program at Cal Poly should be able to:

- Think critically and creatively
- Communicate effectively
- Demonstrate expertise in a scholarly discipline and understand that discipline in relation to the larger world of the arts, sciences, and technology
- Work productively as individuals and in groups

- Use their knowledge and skills to make a positive contribution to society
- Make reasoned decisions based on an understanding of ethics, a respect for diversity, and an awareness of issues related to sustainability
- Engage in lifelong learning

Diversity Learning Objectives

All students who complete an undergraduate or graduate program at Cal Poly should be able to make reasoned decisions based on a respect and appreciation for diversity as defined in the Cal Poly Statement on Diversity, included in the catalog on page 14. They should be able to:

- Demonstrate an understanding of relationships between diversity, inequality, and social, economic, and political power both in the United States and globally
- Demonstrate knowledge of contributions made by individuals from diverse and/or underrepresented groups to our local, national, and global communities
- Consider perspectives of diverse groups when making decisions
- Function as members of society and as professionals with people who have ideas, beliefs, attitudes, and behaviors that are different from their own

Sustainability Learning Objectives

Cal Poly defines sustainability as the ability of the natural and social systems to survive and thrive together to meet current and future needs. In order to consider sustainability when making reasoned decisions, all graduating students should be able to:

- Define and apply sustainability principles within their academic programs
- Explain how natural, economic, and social systems interact to foster or prevent sustainability
- Analyze and explain local, national, and global sustainability using a multidisciplinary approach
- Consider sustainability principles while developing personal and professional values

UNIVERSITY STUDIES (UNIV) COURSES

Academic Programs

*Administration Bldg (01), Room 315, 805 756-2246
www.academicprograms.calpoly.edu/academicpolicies/univ-policies.htm*

University Studies (UNIV) courses provide an opportunity for interdisciplinary study, addressing university-wide learning objectives (such as diversity, environmental literacy, sustainability, etc.). UNIV courses are to be offered across college boundaries, typically team-taught by two or more faculty, and carry GE and/or USCP credit. Proposals are solicited annually for new and existing courses. UNIV courses are administered by the Academic Programs office for the first three offerings, then moved to

the colleges for funding and administration. The offerings are subject to available funding, which may be sufficient to offer two or three UNIV courses each quarter.

WRITING SKILLS PROGRAM

Dawn Janke, Director

Bldg 10, Room 130, 805 756-2067

www.writingskills.calpoly.edu

The Writing Skills Program is a free service for Cal Poly students, faculty, and staff designed to support writing and writing education across campus. The University Writing and Rhetoric Center, a division of the Writing Skills Program, offers one-to-one consultations to all Cal Poly students on any writing task. The CSU system-wide Graduation Writing Requirement (GWR) is administered through this program, including the upper-division Writing Proficiency Examination (WPE). The Writing Skills Office also oversees the placement of students into the appropriate first-year writing courses based on their English Placement Test (EPT) scores.

Support Services

ALUMNI ASSOCIATION

Alumni Relations

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

Cal Poly's Alumni Association (CPAA) provides a link between alumni and their alma mater by providing a variety of programs and services including newsletters, e-mail updates, continuing education opportunities, travel programs, POLY REPS (a student ambassador group), GOLD programs for Graduates Of the Last Decade, Homecoming and a host of regional events and activities both in the state of California and beyond.

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

Members of the CPAA enjoy unique benefits such as access to all CSU libraries, access to Cal Poly recreational facilities, group insurance programs, SLO merchant discounts, and special invitations and member pricing for alumni events.

CAL POLY CORPORATION

Corporation Administration Bldg. (15); 805 756-1131

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

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

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

PERFORMING ARTS CENTER

Ticket hotline: 805 756-2787,

Toll-free in California: 888 233-2787

Administrative office: 805 756-7222; www.pacslo.org/

The Christopher Cohan Center is the result of a partnership and cooperation between Cal Poly, the City of San Luis Obispo, and the community's Foundation for the Performing

Arts Center. Located on the campus, it features three performance venues: Sidney J. Harman Hall, Philips Electronics Recital Hall, and the Pavilion.

The Cohan Center and the 500-seat Spanos Theatre comprise the Performing Arts Center San Luis Obispo. The Center accommodates all types of cultural events, from student and local performances to major touring artists.

UNIVERSITY ADVANCEMENT

Administration Bldg. (01), Room 413

805 756-1445, www.giving.calpoly.edu

The University Advancement staff is responsible for Cal Poly's relations with alumni, donors, industry partners, government officials and the news media.

The staff's primary activity is to secure philanthropic support for the benefit of students through collaborative efforts with key volunteers and the Cal Poly Foundation Board of Directors. Comprised of more than 20 prominent alumni and friends, many whom give generously to Cal Poly, the Foundation Board spearheads the fundraising effort to ensure that Cal Poly – and its renowned learn-by-doing methodology – continues to be a high-value, first-choice educational experience for future students.

Generous gifts from alumni, friends, parents, industry partners and foundations help support and enrich the renowned hands-on learning experiences that Cal Poly offers to its students.

Indeed, private support is indispensable to Cal Poly's unique ability to transform students into resourceful professionals and innovative leaders, people able to help solve some of the most challenging problems confronting California, the nation, indeed, the world.

For more information about Cal Poly's Advancement programs, please visit www.giving.calpoly.edu.

UNIVERSITY POLICE

Building 74, 805 756-2281

www.Police.calpoly.edu

Cal Poly's Police Department is a full service police agency certified by the California Department of Justice. It has the same responsibilities and authorities as municipal, county or other state law enforcement agencies and has state-wide authority. It includes a 9-1-1 emergency dispatch center.

Parking, a major function of the University Police, includes the management of 8,800 parking spaces, three parking structures, parking and event planning and traffic flow.

Commuter and Access Services provide resources for alternative transportation in partnership with local transit, regional RideShare, and bicycle organizations. The Escort Van Service provides free transportation for students, faculty and staff on campus and close vicinity of Cal Poly during evening hours.

Student Affairs

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

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

Mission Statement

The mission of the Student Affairs Division is to cultivate student learning and success. Together with others in the University, the Student Affairs Division is committed to the principle of integrating Student Affairs programs and services into the student's total learning environment, and fostering within each student respect and responsibility for self and members of the greater community.

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

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

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

- Associated Students, Inc.
- Career Services
- Dean of Students
- Disability Resource Center
- Health and Counseling Services
- Office of Student Rights and Responsibilities
- Parent Program
- Student Academic Services
- Student Life and Leadership
- Testing Services
- University Housing

ASSOCIATED STUDENTS, INC. (ASI)

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

Mission Statement

The mission of Associated Students, Inc. is to enrich the quality of student life and to complement the educational mission of Cal Poly through shared governance, student employment, student advocacy and a broad spectrum of programming, services and opportunities for leadership and social interaction.

Vision Statement

Associated Students, Inc. will be every student's connection to the ultimate college experience.

ASI Student Government

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

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

Three student officers guide the organization: the ASI President, Chair of the Board, and Chair of the University Union Advisory Board. These officers and the Board of Directors are elected in spring quarter and are the recognized representatives of Cal Poly students. The ASI Chief of Staff is an appointed leader who guides the ASI Executive Cabinet in supporting the goals of the ASI President.

The Board of Directors oversees the policy development of ASI, a \$12 million nonprofit corporation. ASI collects quarterly fees, commercial revenue and grants, which support a wide range of campus clubs as well as student programs and services.

PROGRAMS AND SERVICES OF ASI

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

ASI Business Office

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

The ASI Business Office provides internal business services to all ASI programs and services, including administrative support, fiscal services, human resources, project management, and information technology.

JULIAN A. MCPHEE UNIVERSITY UNION (UU)

The Julian A. McPhee University Union is a central place for students, faculty, staff, alumni and guests to meet, relax and exchange ideas. Facilities include: UU Plaza, UU Epicenter, two student lounges: Bishop's Lounge and San Luis Lounge, UU Gallery, ASI Events, Poly Escapes, ASI Craft Center, Mustang Lanes, BackStage Pizza, Starbucks, Student Life & Leadership, Student Community Services, Multicultural Center, Women's Center, ASI Student

Government Office, Chumash Auditorium and UU Reservations.

UU Epicenter

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

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

The UU Epicenter provides services to Cal Poly clubs and independent student organizations.

ASI Events

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

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

UU Gallery

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

The UU Gallery is located in the UU Epicenter and is designed to give students and community members the opportunity to showcase artwork with exhibits of painting, photography, sculpting and more.

ASI Craft Center

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

The ASI Craft Center offers a wide variety of fun, non-academic craft classes and workshops. The facility includes ceramics, surfboard-shaping, skateboard deck-building and stained glass areas, a bike repair room, woodworking power tools, glass bead-making lab, poster-making tables with pens and paper, and a retail store.

Poly Escapes

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

For more than 30 years ASI's Poly Escapes has been sponsoring outdoor trips and programs with students at the core of its leadership program. With a zest for spontaneous adventure and the desire to explore the unknown, Cal Poly students have looked to Poly Escapes to take them on "once in a lifetime adventures." Poly Escapes provides trip coordination, educational experiences, a climbing wall, resource library and roughly 20 trips each fall, winter and spring. Students may also rent equipment such as tents, sleeping bags, backpacks, cross-country skis, surfboards and ice cream makers at reasonable prices.

Cal Poly Rose Float

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

One of the most exciting activities on the Cal Poly campus is building the annual Rose Parade float. Since 1949, a team of students at the Cal Poly San Luis Obispo and Pomona campuses has produced floats annually. For more than 60

consecutive years, students from all academic majors have enjoyed the thrill of watching a float they designed, built and decorated make its way down Colorado Boulevard on New Year's Day in the Tournament of Roses Parade.

Not only is the Cal Poly float a one-of-a-kind venture for college students, it is also an opportunity for students to develop new innovations such as computer-controlled animation, hydraulics systems for movement, and more.

ASI CHILDREN'S PROGRAMS

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

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

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

ASI RECREATIONAL SPORTS

Recreation Center (43)

805 756-1366 (Main), 805-756-PLAY (Hotline)

www.asi.calpoly.edu/get_active

ASI Recreational Sports offers opportunities for all students to participate in aquatics, exercise and instructional classes, personal training, intramural sports, informal recreation and special events.

Registered Cal Poly students have free access to the Recreation Center, which is open seven days a week. ASI's Recreational Sports Program employs more than 160 students each year. Student and full-time staff members are available to assist with any questions or concerns about Recreational Sports programs.

Rec Sports Programs:

Aquatics classes are designed for all levels of swimmers, from beginning to masters. Scuba courses, stroke clinics and lifeguard training are just a few of the classes offered.

Personal Training provides the opportunity to get fit with certified personal trainers in a fun, safe environment. Individuals learn how to work out and use equipment properly from personal trainers who provide focused attention on each client.

Fitness and Instructional programs are designed for individuals to acquire new skills in a relaxed and enjoyable

setting. Programs offered include an extensive aerobic schedule, spin classes, martial arts, pilates and yoga. Nationally certified personal trainers are on staff to assist in meeting fitness goals.

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

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

CAREER SERVICES

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

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

Career Counseling

Students are guided through the exploration and formation of personal career plans. Students considering a change of major are particularly encouraged to utilize Career Services so that they may become better informed about career options. With the assistance of a career counselor, students may take advantage of interest inventories; utilize computerized career guidance systems, and review current literature on career profiles, trends and work environments.

Job Search Exploration

Students are guided through the job search process which includes identifying and researching employers, developing resumes/cover letters, preparing for the interview, and networking with employers through career fairs, information sessions and other career related events.

Student employment opportunities are available to all currently-enrolled students. Positions are centralized on-line through *Mustang Jobs* through the On-Campus Interview Program or Job Listing Service. This includes local part-time jobs (on campus and off campus), Co-op, internships, summer, seasonal and career jobs.

Cooperative Education

Cooperative Education is a joint partnership between employers, Career Services and Cal Poly's academic programs. Students are able to secure professional-level work experience related to their majors, obtain professional contacts in industry, affirm career goals, obtain marketable skills, develop self-confidence, and integrate what is learned in the classroom within the world of work. Co-op assign-

ments are primarily full-time paid positions, three to six months in duration, offered to junior- and senior-level students. Students earn academic credit for their participation.

Graduate School Exploration

Students are guided through the graduate school admission process, which includes identifying, researching and contacting potential graduate programs; preparing personal statements; and completion of applications and tests.

Students are encouraged to take advantage of the Career Resource Center, which contains a variety of career resources, annual reports, salary trend information, alumni network files, and student workstations allowing Internet research and computer-assisted career exploration programs.

DEAN OF STUDENTS

Health Services Bldg. (27), Room 188, 805 756-0327

The Dean of Students Office provides leadership to support student success, strengthen campus community relations, and provide the initiatives for future student-centered programs that foster the development of the student academically, socially and ethically.

The Dean of Students supports student learning and service through:

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

Students with questions or concerns are encouraged to stop by or contact the office. The staff answers questions, advocates when appropriate, investigates student complaints of discrimination, and directs students to the appropriate campus or community resource as needed.

DISABILITY RESOURCE CENTER

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

The Disability Resource Center's mission is to assist in creating an accessible university community where students with disabilities have an equal opportunity to fully participate in all aspects of the educational environment. The Center cooperates through partnerships with students, faculty, and staff to cultivate student learning and success.

Students wishing to use disability-related services and accommodations complete an Application for Services, submit disability documentation, and then meet with an

access specialist who determines eligibility and accommodations. Advance planning is strongly encouraged.

For detailed information please see www.drc.calpoly.edu.

HEALTH AND COUNSELING SERVICES

Student Health Center (27), 805 756-1211

The goal of Health and Counseling Services is to support the physical and psychological well-being of all students attending Cal Poly. A variety of services are offered for students including ambulatory care, laboratory testing, on-site x-rays, prescription medications, dental consultations, individual and group counseling, and health education programs. Health and Counseling Services assists students by minimizing class time lost due to illness, injury, or personal problems.

Health Services

Student Health Center (27), 805 756-1211

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

Outpatient medical services are available, year-round, Monday through Friday, 8:00 a.m. to 4:30 p.m. except Wednesday, 9:00 a.m. to 4:30 p.m., and includes primary physician and nursing services, men's/women's health care, laboratory and routine x-ray procedures.

- **Health education** offers three programs: Educational Resources On Sexuality (EROS), Thoughtful Lifestyle Choices (TLC), and Health Enrichment Action Team (HEAT) which provides education regarding nutrition; they are provided by staff professionals and students trained as peer health educators. Programs include nutrition counseling, alcohol and drug awareness, sexuality and lifestyle wellness.
- **Additional health services** are available at a low cost: prescriptions, over-the-counter items, outside lab tests, immunizations, orthopedic supplies, and optometry consultations.

Major medical insurance coverage for off-campus services is strongly recommended. Students are encouraged to have their own coverage for major medical, surgical and emergency expenses. **Due to a shortage of doctors in the community in certain specialty areas, students requiring specialty medical care are encouraged to call for appointments with local specialists well in advance.**

Counseling Services

Student Health Center (27), 805 756-2511

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

OFFICE OF STUDENT RIGHTS AND RESPONSIBILITIES

Student Services Bldg (124), 805 756-2794

www.osrr.calpoly.edu

The Office of Student Rights and Responsibilities administers the California State University Standards for Student Conduct. This office ensures a fair and impartial administration of the disciplinary process, while educating students about their responsibilities and protecting the rights of all members of the university community. The Office addresses student behavioral problems in a developmental and educational manner with the goal of fostering the ethical development and personal integrity of students. The Standards for Student Conduct and disciplinary process are available at www.osrr.calpoly.edu.

PARENT PROGRAM

Student Services Bldg (124), Room 210

Parent Helpline: 805 756-6700

www.parent.calpoly.edu

e-mail: calpolyparent@calpoly.edu

The Cal Poly Parent Program is dedicated to helping families effectively support their students' transition and success and providing opportunities for them to stay connected to the university community. All of the Parent Program's services are designed to serve as resources for parents and families as they discover the best ways to support their sons or daughters, while also enabling their students' independence and personal responsibility.

Parents are encouraged to sign up for the Parent E-newsletter. This monthly service provides links to University news and important dates, and features timely tips and articles for parents and supporters.

The University's Parent Program Advisory Council serves in an advisory capacity to the Parent Program and offers the Cal Poly parent community experienced parent perspectives and avenues for involvement. In addition, the Parent Program welcomes parents at orientation events, hosts an annual Parents' Weekend, and encourages support of Cal Poly and its programs through the Cal Poly Fund.

STUDENT ACADEMIC SERVICES

Hillcrest (81), 805 756-2301

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

Supplemental workshops and study sessions are available for key content courses in first- and second-year curricula.

An additional emphasis of SAS is to offer support to students from backgrounds that have been traditionally underrepresented in the California State University System.

The goal of SAS is to ensure that all students have equal opportunity to achieve academic success and graduation. Student Academic Services incorporates the following:

Academic Skills Center

Kennedy Library (35), Room 112, 805 756-1256

The Academic Skills Center (ASC) offers a variety of academic retention programs and campus support services, including study skills seminars, study sessions, an on-line study skills library and tutor referral services.

College Bound

Hillcrest (81), 805 756-2301

The purpose of EOP College Bound is to motivate and assist in the preparation of students from low-income, first-generation college families for application and entrance to Cal Poly or another post-secondary institution of their choice. The program offers various educational outreach strategies to high school students.

Connections for Academic Success

University Union (65), Room 217A-2, 805 756-6774

Connections for Academic Success (CAS) was originally established via a joint venture between the University and Cal Poly's student government, ASI (Associated Students, Incorporated). CAS provides support services to students in Cal Poly's Partners Program and Allensworth Mentoring Program as well as students who are referred by faculty and staff. The program offers services to help students plan and achieve their academic and personal goals.

Educational Opportunity Program (EOP)

Hillcrest (81), 805 756-2301

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

Educational Talent Search

Hillcrest (81), 805 756-2301

Cal Poly Educational Talent Search (ETS) is a federally funded program that serves students in grades seven through twelve in local targeted area schools. The goal of ETS is to assist junior high and high school youth, who are low-income and/or potential first-generation college students, to graduate from high school and enter college. ETS offers various educational outreach strategies designed to develop participant motivation and increase their college awareness, including interactive school site workshops and informational sessions led by program staff, university field trips, parent information workshops and

pre-college advising focused on college entrance requirements and financial aid.

Partners Program

University Union (65), Room 217A-2, 805 756-6774

The Partners Program is a recruitment and access feeder program which collaborates with a select number of California high schools. The University has established formal partnerships with high schools throughout the state. For those students who enroll at Cal Poly, the Connections for Academic Success program (CAS) collaborates with the Admissions Office, University Housing, College Advising Centers, as well as faculty and staff, to provide support to Partner students with their transition from high school and in making progress towards their degree.

The program is designed to assist students with acquiring information about support services such as tutoring, employment and academic advising; becoming knowledgeable about academic policies and procedures relevant to their majors; accessing financial aid resources; and understanding how to register for classes.

Student Support Services

Student Services Bldg (124), Room 119, 805 756-1395

Student Support Services program, a federally funded TRIO program of the U.S. Department of Education, is designed to assist program participants (low-income, first-generation or disabled college students) with enhancing their academic skills, increasing their retention and graduation rates, and promoting graduate and professional school programs.

Summer Institute

Hillcrest (81), 805 756-2301

Summer Institute (SI) is an academic scholars' program held annually at Cal Poly. Selected newly-admitted freshman students have the opportunity to participate in this mini academic quarter residential program geared at helping make a successful transition from high school to the more rigorous Cal Poly environment.

Upward Bound

Hillcrest (81), 805 756-2301

Upward Bound (UB) is a federally funded TRIO program which provides a college preparatory program for low-income and/or potential first-generation college students. This program motivates and academically prepares local high school students for college. The academic program and residential summer school session at Cal Poly offer tutoring, career advising and supplemental instruction, as well as cultural and recreational activities.

STUDENT LIFE AND LEADERSHIP

University Union (65), Room 217, 805 756-2476

www.studentlife.calpoly.edu

Student Life and Leadership offers opportunities to develop leadership skills, contribute to the community, experience diversity, participate in group dynamics, and mentor new

students. Its mission is to advance and encourage the learning and personal development of students, and its programs are integrated into the student's total learning environment.

The department is responsible for the oversight of student clubs and organizations on campus including chartering, membership roster certification and judicial review and sanctioning.

Cal Poly Clubs

There are close to 300 active clubs and organizations affording students the opportunity to become active in campus life. Clubs include academic and professional organizations, hobby-interest clubs, honor societies, service clubs, residential groups, multicultural organizations and spiritually based groups.

Commencement

Commencement ceremonies are coordinated by Student Life and Leadership staff, in collaboration with the Commencement Committee, and are held each December and June.

Community Service Programs

The **Community CENTER** at Cal Poly represents the University's commitment to community involvement and civic engagement. It is dedicated to helping each individual, as well as student clubs, find meaningful and satisfying service experiences through both volunteer service and service related to academic learning.

Student Community Services provides volunteer service programs that address a variety of social issues, concerning children, homeless individuals, mentally disabled adults, seniors, animals, and the environment. Each year, thousands of students participate in service activities. Annual events include Make a Difference Day, WOW Day of Service, Hunger Awareness Week, Homeless Awareness Week, Change the Status Quo Conference, Martin Luther King, Jr. Day of Service, and César Chávez Day of Service.

Service-learning courses integrate community service with course curriculum to enhance learning outcomes. Each quarter, hundreds of students are involved in community service as part of their academic coursework. The Community CENTER provides support for faculty and students in developing and implementing service learning.

The Community CENTER assists the University in recognizing students for outstanding service in a variety of ways. Each year, the University President awards the President's Community Service Award to outstanding students, clubs, and faculty. Students can have their service hours noted on their official university transcripts.

Gender Equity Center

The Gender Equity Center is a campus resource where the Cal Poly community can connect for information, educational events, and leadership programs related to

gender equality and identity. The center is a place for all individuals interested in working towards social justice. The Center is committed to fostering a comfortable and all-encompassing Cal Poly experience for everyone regardless of gender, sexual orientation, or race.

SAFER. Student Alliance for Ending Rape, known as SAFER, aims to promote, empower and educate students on essential information regarding sexual assault. The purpose of this program is to create a community which fights to end sexual assault and relationship violence by raising awareness, providing resources and offering presentations, events and workshops.

Women's Programs is dedicated to educating the Cal Poly community on local, national and global women's issues including gender equality, body image, the wage gap, feminism, women's history, and violence against women. Women's Programs' mission is to create and sustain a university environment that promotes the personal, educational and professional growth of women.

Men and Masculinity Programs' mission is to educate the Cal Poly community concerning local, national and global men's issues including masculinity, influences of the media and sexual assault. The intent of Men and Masculinity Programs is to cultivate a community for men that positively affects their campus and surrounding areas, through service and personal example.

Greek Organizations

There are more than 30 fraternities, sororities, and cultural Greek organizations affiliated with Cal Poly. Many of the social sororities and fraternities own or lease housing near the campus. Some organizations provide lodging and meals for their members.

Multicultural Center

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

Orientation Programs

Open House encompasses many activities showcasing the excellence of Cal Poly and the surrounding community. An event preview is hosted on Thursday night at the popular Farmers' Market, and on Friday, conditionally admitted students and their supporters are invited to campus. On Saturday, campus is open to the public with many events, including the Poly Royal parade, open ceremonies, kids' fair, and an exciting club booth and activity area with more than 200 student clubs participating.

Student Orientation, Advising and Resources (SOAR) is an academic advising session that helps new students and their families learn how to navigate the Cal Poly environment. The University invites new students to participate in SOAR to get connected to information specific to the students' majors. Families and students learn about available resources and what to expect during their time at Cal Poly.

The **Week of Welcome (WOW)** orientation program is coordinated by staff and operated by students, for students, with a peer-helping method that creates a combination of excitement, learning, and new experiences for new students and their families in a fun, comfortable atmosphere. First-year and transfer students are placed in small groups that participate in activities introducing them to the campus and community for the week prior to fall classes.

The WOW experience is designed to assist new students with a successful academic, social and emotional transition to university life. Parent orientation programs provide parents with an opportunity to celebrate their student's transition as well as have their own questions and concerns addressed during Family Orientation Weekend. During this weekend, programs are also provided for first-year students, transfer students, non-traditional students, and parents and younger siblings of new students.

WOW also hosts the parents' Coffee House during Open House, summer advising sessions for parents, non-traditional student orientation day, and welcome activities for new students starting during winter and summer quarters. WOW is an exciting environment in which to meet new people, become familiar with Cal Poly and San Luis Obispo, and prepare to start a college career.

Pride Alliance: LGBT (lesbian, gay, bisexual, transgender) Center

The LGBT Center is a resource center for the entire campus community. Its mission is to provide programming, networking and resources that raise awareness and educate students of diverse backgrounds about LGBT and related issues. The Center's Ally Training program prepares members of the campus community to support and be sensitive to, the needs of LGBT people.

Sport Club Program

The Sport Club program offers the campus community a wide variety of competition, instruction, and development in the form of 24 sport clubs and related activities. The program currently has over 900 students who participate in various sports clubs and features a competitive level above the traditional intramural program. The members compete against clubs from other universities, improve their skills through instruction, and develop leadership skills through the management of their organizations. Students of all skill levels are encouraged to participate.

TESTING SERVICES

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

Testing Services administers standardized tests of admission, placement and certification, such as the Law School Admission Test and Medical College Admission Test, and coordinates the administration of the CSU English Placement (EPT) and Entry Level Math (ELM) test programs. Testing Services provides general proctoring services to the campus community, and operates an ETS Computer-Based Testing Center that offers such tests as the GRE, TOEFL and PPST.

UNIVERSITY HOUSING

Building 031, 805 756-1226

Living on campus can be a unique and rewarding experience. For the majority of first-year students, it is the first experience in a shared community living environment. Learning in the classroom is extended into on-campus residence halls and apartments through the "Living/Learning," "Connections," and "Transitions" Programs.

Returning students and new transfers have an opportunity to live in on-campus apartments in an environment which provides programmatic support with the goal of retention and academic success.

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

Staff

Community programs and activities are administered by full-time live-in professionals (Coordinators of Student Development), who are available to assist residents with counseling, crisis intervention, general referrals, and judicial actions. The Coordinators of Student Development also supervise front desk services and the Resident Advisors/Community Advisors.

Resident Advisors and Community Advisors, known as RAs and CAs, are typically upper-division students who understand the challenges faced by new students and try to make living on campus a positive and memorable experience for all residents. The RAs and CAs are trained in advising, event planning, and crisis intervention to assist students through their first year.

Residential Life Programs

Living/Learning Halls

The Living/Learning Residence Halls are for freshmen and are centered around Cal Poly's academic colleges. Faculty, administrators, and alumni meet with the students in an informal setting. The programming focuses on four fundamental areas: academic development and support, personal development, professional affiliation, and

leadership development. This provides many advantages for residents including direct faculty contact, study groups, and events relating to the student's major and career planning.

The Connections Program

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

The “Transitions” Program

“Transitions” offers programs and activities in the on-campus Cerro Vista Apartments for first-year, transfer and returning students who are comfortable and experienced with a more independent lifestyle. Students living here are expected to be independent and have abilities and experience to live and cook on their own. The Honors Community is located within the Cerro Vista Apartments.

The “Sophomore Success” Program

The Poly Canyon Village Apartments and the “Sophomore Success” Program are offered to returning residents through a lottery process. Student programming and activities support retention and overall academic success.

Community Involvement

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

ResNet

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

Applying for On-Campus Housing

www.housing.calpoly.edu

Information about the on-campus housing program and timeline to apply can be found at the Housing web site. Housing is offered to university-admitted students; however, spaces are limited. On-campus housing is secured on a first-come/first-served payment basis and cannot be guaranteed to all incoming freshmen due to the variance of new students admitted each year. Conditionally admitted students who have accepted their offers of admission submit housing applications via an online process through the my.calpoly.edu portal, printing the Housing License Agreement, and submitting payments to Cal Poly.

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

All Housing fees are payable in advance. Quarterly installment plans are available. All fees listed below reflect 2010-11 prices and are subject to change:

Residence Hall Rooms – Double Occupancy (academic year license)	\$5,653
Residence Hall Meal Plan (mandatory)	\$4,339
Apartments – Private Rooms (academic year license)	\$725/month (approx.)

Off-Campus Housing Resources

www.housing.calpoly.edu

The Housing Office maintains information regarding the rental of off-campus houses and apartments, and an extensive list of private and shared rooms. Information is available at the Housing website. The University does not inspect, approve or disapprove of any housing offered through these rental resources.

Intercollegiate Athletics

Mott Gym/Physical Education Bldg. (42), Room 207
805 756-2924
Athletic Advising: 805 756-2762

Don Oberhelman, Director of Athletics

Head Coaches

John Azevedo	Paul Holocher
Hugh Bream	Larry Lee
Joe Callero	Justin McGrath
Scott Cartwright	Tom Milich
Jenny Condon	Faith Mimnaugh
Mark Conover	Jon Stevenson
Alex Crozier	Tim Walsh

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

All twenty teams compete at the NCAA Division I level. The football program competes in the Great West Football Conference (FCS) in 2011, and the Big Sky Conference in 2012. Wrestling and men's swimming compete in the PAC 10 Conference, and women's indoor track and field and women's swimming compete in the Mountain Pacific Sports Federation. The balance of the men's and women's programs competes in the Big West Conference.

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

Colleges, Departments, Units and Course Prefixes

COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENTAL SCIENCES

Agriculture	AG
Agribusiness	AGB
Agricultural Education and Communication	AGC, AGED
Animal Science	ASCI
BioResource and Agricultural Engineering	BRAE
Dairy Science	DSCI
Earth and Soil Sciences	ERSC, SS
Food Science and Nutrition	FSN
Horticulture and Crop Science	CRSC, EHS, FRSC, HCS, PPSC, VGSC , WVIT
Military Science	MSL
Natural Resources Management	NR
Recreation, Parks, and Tourism Administration	RPTA

COLLEGE OF ARCHITECTURE AND ENVIRONMENTAL DESIGN

Environmental Design	EDES
Architectural Engineering	ARCE
Architecture	ARCH
City and Regional Planning	CRP
Construction Management	CM
Landscape Architecture	LA

ORFALEA COLLEGE OF BUSINESS

Business	BUS
Economics	ECON
Graduate Programs	GSA, GSB
Industrial Technology	IT

COLLEGE OF ENGINEERING

Aerospace Engineering	AERO
Biomedical and General Engineering	BMED
Civil and Environmental Engineering	CE, ENVE
Computer Engineering	CPE
Computer Science	CSC
Electrical Engineering	EE
Industrial and Manufacturing Engineering	IME
Materials Engineering	MATE
Mechanical Engineering	ME

COLLEGE OF LIBERAL ARTS

Art and Design	ART
Communication Studies	COMS
English	ENGL
Ethnic Studies	ES
Graphic Communication	GRC
History	HIST
Humanities	HUM
Journalism	JOUR
Modern Languages and Literatures	CHIN, FR, GER, ITAL, JPNS, MLL, SPAN
Music	MU
Philosophy	PHIL, RELS
Political Science	POLS
Psychology and Child Development	CD, PSY
Social Sciences	ANT, GEOG, SOC, SOCS
Theatre and Dance	DANC, TH
Women's and Gender Studies	WGS

COLLEGE OF SCIENCE AND MATHEMATICS

Science and Mathematics	SCM
School of Education	EDUC
Biological Sciences	BIO, BOT, MCRO, ZOO
Chemistry and Biochemistry	CHEM
Kinesiology	KINE
Liberal Studies	LS
Mathematics	MATH
Physics	ASTR, GEOL, PHYS, PSC
Statistics	STAT

CONTINUING EDUCATION

.....	DMHS, GS, IS
UNIVERSITY-WIDE	
Athletics	PEM, PEW
University Honors	HNRS, HNRC
University Studies	UNIV

Course Descriptions

PREFIX TITLE

AERO	Aerospace Engineering
AG	Agriculture
AGB	Agribusiness
AGC	Agricultural Communication
AGED	Agricultural Education
ANT	Anthropology
ARCE	Architectural Engineering
ARCH	Architecture
ART	Art
ASCI	Animal Science
ASTR	Astronomy and Astrophysics
BIO	Biology
BMED	Biomedical Engineering
BOT	Botany
BRAE	BioResource and Agricultural Engineering
BUS	Business
CD	Child Development
CE	Civil Engineering
CHEM	Chemistry
CHIN	Chinese
CM	Construction Management
COMS	Communication Studies
CPE	Computer Engineering
CRP	City and Regional Planning
CRSC	Crop Science
CSC	Computer Science
DANC	Dance
DMHS	Disaster Management and Homeland Security
DSCI	Dairy Science
ECON	Economics
EDES	Environmental Design
EDUC	Education
EE	Electrical Engineering
EHS	Environmental Horticultural Science
ENGL	English
ENGR	Engineering
ENVE	Environmental Engineering
ERSC	Earth Sciences
ES	Ethnic Studies
FPE	Fire Protection Engineering
FR	French
FRSC	Fruit Science
FSN	Food Science and Nutrition
GEOG	Geography
GEOL	Geology

PREFIX TITLE

GER	German
GRC	Graphic Communication
GS	Graduate Studies
GSA	Graduate Studies–Accounting
GSB	Graduate Studies–Business
HCS	Horticulture and Crop Science
HIST	History
HNRC	Honors Contract
HNRS	Honors
HUM	Humanities
IME	Industrial and Manufacturing Engineering
IS	Interdisciplinary Studies
IT	Industrial Technology
ITAL	Italian
JOUR	Journalism
JPNS	Japanese
KINE	Kinesiology
LA	Landscape Architecture
LAES	Liberal Arts and Engineering Studies
LS	Liberal Studies
MATE	Materials Engineering
MATH	Mathematics
MCRO	Microbiology
ME	Mechanical Engineering
MLL	Modern Languages and Literatures
MSL	Military Science Leadership
MU	Music
NR	Natural Resources
PEM	Physical Education: Men
PEW	Physical Education: Women
PHIL	Philosophy
PHYS	Physics
POLS	Political Science
PPSC	Plant Protection Science
PSC	Physical Science
PSY	Psychology
RELS	Religious Studies
RPTA	Recreation, Parks and Tourism Administration
SCM	College of Science and Mathematics
SOC	Sociology
SOCS	Social Sciences
SPAN	Spanish
SS	Soil Science
STAT	Statistics
TH	Theatre
UNIV	University Studies
VGSC	Vegetable Science
WGS	Women's and Gender Studies
WVIT	Wine and Viticulture
ZOO	Zoology

AERO–AEROSPACE ENGINEERING

AERO 102 General Aviation (4)

Fundamentals of flight aerodynamics and principles. Introduction to power systems, instrumentation, flight planning, modern air navigation, weather data interpretation, flight computer uses, meteorology. Hands-on cockpit/taxi familiarization. Private pilot's examination preparation. Not a technical elective for engineering students. Field trip may be required. 4 lectures.

AERO 103 Instrument Aviation (4)

Introduction to advanced aircraft instrumentation, flight planning, interpretation of weather data, and meteorology. Instrument navigation, uses of flight computer, subjects covered in instrument pilot's examination. Not acceptable as technical elective to engineering students. 4 lectures. Prerequisite: Private pilot certification.

AERO 121 Aerospace Fundamentals (2)

Introduction to the engineering profession including the aeronautical and aerospace fields. Engineering approach to problem-solving and analysis of data obtained from experiments. Basic nomenclature and design criteria used in the aerospace industry. Applications to basic problems in the field. 1 lecture, 1 laboratory.

AERO 200 Special Problems for Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of department head.

AERO 215 Introduction to Aerospace Design (2)

Introduction to problem solving techniques and team-centered design projects in aerospace engineering. Primary emphasis on the solution of design problems in aerospace engineering using computers. 2 laboratories. Prerequisite: AERO 121, MATH 143. Recommended: CSC 111, IME 144.

AERO 240 Additional Engineering Laboratory (1–4) (CR/NC)

Total credit limited to four units. Credit/No Credit grading. 1-4 laboratories.

AERO 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

AERO 300 Aerospace Engineering Analysis (5)

Analytical methods for aerospace engineering problems. Topics include vector calculus, linear algebra, differential equations, Laplace transforms and Fourier series. Computer tools and numerical methods as applied to problems in aerodynamics, structures, stability and control and astronautics. 4 lectures, 1 laboratory. Prerequisite: PHYS 133, ME 211. Corequisite: MATH 244.

AERO 301, 302, 303 Aerothermodynamics I, II, III (4) (4) (4)

Properties and characteristics of fluids, fluid statics and dynamics, the thermodynamic relations, laminar and turbulent flows, subsonic and supersonic flows as applied to flight vehicles. Introduction to heat transfer. 4 lectures, fall, winter and spring. AERO 301 prerequisite: ME 211 and AERO 300. AERO 302 prerequisite: AERO 301. AERO 303 prerequisite: AERO 302.

AERO 304 Experimental Aerothermodynamics (2)

Laboratory experiments verify the momentum and energy equations. Mass flow rate, fan performance, boundary layer measurements, diffuser performance, and induction pump performance experiments are evaluated. 1 lecture, 1 laboratory. Prerequisite: ENGL 149.

AERO 306 Aerodynamics and Flight Performance (4)

Introduction to theoretical aerodynamics. Primary emphasis in the subsonic region, including compressibility effects. Basic aerodynamic theory: Airfoil theory, wing theory, lift and drag. Team-centered aerodynamic design. Flight performance. 4 lectures. Prerequisite: AERO 215, AERO 301. Concurrent: AERO 302.

AERO 307 Experimental Aerodynamics (2)

Wind tunnel testing of basic aerodynamic properties of airfoils, finite wings, aircraft or spacecraft models, and vehicle flight performance. Emphasis on both static and dynamic responses of aircraft. Various measurement techniques, data reduction schemes, and analysis methods. 2 laboratories. Prerequisite: AERO 302, AERO 306, ENGL 149.

AERO 310 Air and Space (4)

Technological innovations that have led to modern aircraft and spacecraft as viewed from an historical perspective. Development of aerodynamics, propulsion systems, light-weight structures, and control systems. How aviation has affected, and been affected by, history. Impact of aviation on society, including civil and military aircraft/spacecraft. Federal regulation of aviation, including air traffic

GE Area F

control and airlines. Future developments in air and space technology. 4 lectures. Prerequisite: Junior standing and completion of GE Area B. *Crosslisted as AERO/HNRS 310.* Fulfills GE Area F.

AERO 320 Fundamentals of Guidance and Control (4)

Introduction to state-space and transfer function models for aircraft, spacecraft, missiles, and helicopters. Elementary classical and modern analysis techniques using computers. 4 lectures. Prerequisite: AERO 215, AERO 300. Concurrent: ME 212.

AERO 331 Aerospace Structural Analysis I (4)

Deflection analysis. Principles of fictitious displacement, virtual work, and unit load method. Energy methods: Castigliano's theorem, Maxwell-Betti reciprocal theorem, minimum principles, Rayleigh-Ritz's method and Galerkin's method. Stress analysis of aircraft and spacecraft components. 4 lectures. Prerequisite: AERO 300, CE 207, and ME 212.

AERO 360 Creative Problem Solving in Engineering Design (2)

The creative problem solving process for an engineering design team. How to explore context and causes as part of defining a design problem; the principles of brainstorming, synthesis, and judgment. Role of iteration, implementation, and communication. Importance of a diverse view, including: customers, products, processes, systems, ethics, and professional responsibility. Team-based applications to case studies and real-world engineering design problems. 2 laboratories. Prerequisite: PSY 350.

AERO 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units. Prerequisite: Consent of instructor.

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, CHEM 124.

AERO 405 Supersonic and Hypersonic Aerodynamics (4)

Review of gas dynamics, shock-wave and boundary-layer interaction, aerodynamic design. 2-dimensional supersonic flows around thin airfoil; finite wing in supersonic flow. Local surface inclination methods for high-speed flight, boundary-layer and aerodynamic heating, viscous interactions. 4 lectures. Prerequisite: AERO 303, AERO 306.

AERO 407 Reentry Aerodynamics (4)

Near planet environments. Transition from orbital to aero-dynamic motion. Aerodynamic heating and effects on design. 4 lectures. Prerequisite: AERO 405. Concurrent: AERO 451.

AERO 409 Flight Test (4)

Overview of flight tests, test equations, and supporting facilities. Principles of team-centered flight testing with applications to performance, stability and control, and avionics systems testing. Test planning, instrumentation, data analysis and reports. 2 lectures, 2 laboratories. Prerequisite: AERO 306. Concurrent: AERO 320.

AERO 416 Principles of Rotary Wing Flight (4)

Introduction to analysis of rotary wing aircraft. Overview of avionics systems. Performance figures of merit. Stability and control of helicopters. Equations of motion for forward flight. 4 lectures. Prerequisite: AERO 306, AERO 300.

AERO 419 Simulation of Aerospace Vehicles and Systems (4)

Overview of flight simulators, aerospace avionics systems, and supporting facilities including simulation equations for flight mechanics and land navigation. Team-centered projects, reports, and presentations are emphasized with a strong focus on computer simulation of piloted flight. 2 lectures, 2 laboratories. Prerequisite: AERO 420.

AERO 420 Stability and Control of Aerospace Vehicles (4)

Stability and control derivatives, reference frames, steady-state static analysis and perturbed dynamic analysis for aircraft and spacecraft. Transfer function, state-space, and modal representations of system dynamics in response to control inputs. Design guidelines and introduction to augmentation systems. 4 lectures. Prerequisite: AERO 306, AERO 320, and ME 212.

AERO 421 Experimental Integrated Control System Analysis (1)

Implementation of elementary control analysis techniques to design and build control systems for integrated aerospace vehicles, structures and thermal systems. Analysis of sensors and actuators as applied to control problems and data acquisition. Extended use of modern computational controller design tools and data analysis. 1 laboratory. Prerequisite: AERO 420.

AERO 425 Aircraft Performance (4)

Fundamentals of propeller and jet aircraft performance. Steady and accelerated flight. Equations of motion. Level flight, gliding, climbing, driftdown. Takeoff and landing. Federal Aviation Regulations (FARs). Range and endurance. Payload-range diagram. Maneuvering. V-n diagram. Turning and pull-ups. Stall and spin behavior. Energy methods. 4 lectures. Prerequisite: ME 212, AERO 306, AERO 300.

AERO 431 Aerospace Structural Analysis II (4)

Basic equations of elasticity with applications to typical aerospace structures. Concepts studied include analysis of aircraft and aerospace structures; airworthiness and airframe loads; structural constraints; elementary aeroelasticity; structural instability; introduction to modern fatigue; fracture mechanics; and composite structures analysis. 4 lectures. Prerequisite: AERO 331.

AERO 432 Advanced Composite Structures Analysis (4)

Review of isotropic material behavior. Behavior of unidirectional fiber composites. Properties of short-fiber composites and orthotropic lamina. Analysis of laminated composites. Stresses and strains of composites. Strength and hygrothermal behavior of composite materials. 3 lectures, 1 laboratory. Prerequisite: AERO 331.

AERO 433 Experimental Stress Analysis (1)

Employing the knowledge of stress analysis and aerospace structural analysis in an individual and group design project dealing with aerospace structures. 1 laboratory. Prerequisite: AERO 331, AERO 431.

AERO 435 Aerospace Numerical Analysis (4)

Taylor series. Finite difference calculus. Interpolation and extrapolation. Finite difference method. Basic equations of elasticity. Global stiffness matrix. Rayleigh-Ritz method. Galerkin method. Bernoulli-Euler beam element. Finite element formulation. Dynamic analysis. 3 lectures, 1 laboratory. Prerequisite: AERO 300, AERO 331.

AERO 443, 444, 445 Aircraft Design I, II, III (4) (3) (3)

Preliminary layout of a typical aircraft vehicle using design and calculation techniques developed in previous aerospace engineering courses. Design of a flight vehicle, including its structures and systems. Preparation of necessary drawings and a report. AERO 443: 2 lectures, 2 laboratories. AERO 444 and AERO 445: 3 laboratories. Prerequisite: Senior standing, IME 144, AERO 215, AERO 303, AERO 306, AERO 331, AERO 405, AERO 420, AERO 431. Concurrent: AERO 401. Open to students enrolled in the multidisciplinary design minor.

AERO 446 Introduction to Space Systems (4)

Basic satellite types and their applications. Major subsystems of a satellite system. Space environment, propulsion system, power system, structural design, spacecraft dynamics and attitude control, orbit mechanics, thermal control, communications, and ground segments. Spacecraft integration and testing. May also be available to offsite locations (Distance Education). 4 lectures. Prerequisite: ME 212, AERO 320.

AERO 447, 448, 449 Spacecraft Design I, II, III (4) (3) (3)

Preliminary layout of typical space vehicle using design and calculation techniques developed in previous aerospace engineering courses. Design of selected components and preparation of necessary drawings. AERO 447: 2 lectures, 2 laboratories. AERO 448 and AERO 449: 3 laboratories. Prerequisite: IME 144, AERO 215, AERO 303, AERO 331, AERO 420, AERO 431, AERO 446, AERO 451, senior standing. Concurrent: AERO 401. Open to students enrolled in the multidisciplinary design minor.

AERO 450 Introduction to Aerospace Systems Engineering (4)

Aerospace systems and subsystems. Systems integration. Development of system requirements. Analysis, modeling and simulation of complex systems. Project management. Cost analysis. Optimization and trade studies. 4 lectures. Prerequisite: Senior standing or consent of instructor.

AERO 451 Spaceflight Dynamics I (4)

Motion of a body in a central force field. Keplerian orbits. Orbital maneuvers. Launch vehicle trajectories. Rigid spacecraft attitude dynamics. Kinematic variables: Euler angles and quaternions. 4 lectures. Prerequisite: ME 212, AERO 215, AERO 300, AERO 320.

AERO 452 Spaceflight Dynamics II (4)

Orbital motion, perturbing forces. Asphericity of the Earth, aerodynamic drag, third-body tidal forces, etc. Enke and Cowell solution techniques. Restricted 3-body problem. Satellite attitude dynamics, rigid body-symmetric and asymmetric

semirigid bodies. Attitude control, spinning/fixed gravity gradient. 4 lectures. Prerequisite: AERO 451.

AERO 461, 462 Senior Project I, II (2) (3)

Selection and completion of a project which is typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

AERO 463, 464 Senior Project Laboratory I, II (2) (3)

Selection and completion of a project by individuals or team which is typical of problems which graduates must solve in their fields of employment. Project involves, but is not limited to, physical modeling and testing of integrated design and may include students from other disciplines. Formulation of outline, literature review, and project schedule. AERO 463: 2 laboratories. AERO 464: 3 laboratories. Prerequisite: Senior standing. Note: although AERO 463, 464 substitute for AERO 461, 462, students may not use repeat credit for the purpose of increasing GPA.

AERO 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

AERO 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

AERO 493 Cooperative Education Experience (2) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units. Prerequisite: Sophomore standing and consent of instructor.

AERO 494 Cooperative Education Experience (6) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units. Prerequisite: Sophomore standing and consent of instructor.

AERO 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

AERO 500 Individual Study (1-4)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limited to 12 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

AERO 510 Systems Engineering I (4)

Project management. Scheduling and budgeting. Queuing theory. Process control and life-cycle cost analysis. Contracts and negotiation. 4 lectures. Prerequisite: Graduate standing or consent of instructor. *Crosslisted as AERO/IME 510.*

AERO 511 Systems Engineering II (4)

Risk management. Design strategies to meet system/mission requirements. Design for supportability, manufacturability, reliability, etc. Quality function development and quality control concepts. 4 lectures. Prerequisite: AERO 510 or IME 510, graduate standing or consent of instructor. *Crosslisted as AERO/IME 511.*

AERO 512 Aerospace Vehicle Software Applications (4)

Computer system requirements for aerospace vehicles. Typical aerospace vehicle computer architectures. Software testing, verification and validation. Vehicle automatic systems. Risks and benefits of vehicle autonomous operations. Integration of software with vehicle subsystems. Software development cost/schedule estimation. 4 lectures. Prerequisite: AERO 450, AERO 446. Graduate standing or consent of instructor.

AERO 515 Continuum Mechanics (4)

Vectors and tensors stress analysis. Analysis of deformation. Velocity fields and compatibility conditions. Constitutive equations. Isotropy. Mechanical properties of real fluids and solids. Field equations and boundary conditions in fluid mechanics problems and applications in elasticity. Active remodeling of structures. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AERO 517 Multidisciplinary Design and Optimization (4)

Numerical optimization applied to the design of complex systems. Multi-criteria decision making, unconstrained and constrained optimization methods, system sensitivity analysis, system decomposition techniques, and multidisciplinary design optimization. 4 lectures. Prerequisite: Familiarity with programming in Matlab. Graduate standing or consent of instructor.

AERO 519 Fundamentals of Vehicle Dynamics and Control (4)

Fundamentals of particle and rigid body dynamics as they apply to aerospace vehicles. Kinematic variables and coordinate transformations. Attitude dynamics. Fundamentals of feedback control and its application to aerospace systems. Stability analysis. Numerical simulation. 4 lectures. Prerequisite: Graduate standing or consent of instructor. Not open to students with credit in AERO 451 and AERO 452.

AERO 520 Applied Airplane Aerodynamics (4)

Fundamentals of analytic aerodynamics; potential flow, Kutta-Joukowski theorem. Schwarz-Christoffel transformation, lifting line theory, thin wing theory, three-dimensional lift and drag of wings, slender body theory. Panel methods. Boundary-layer effects on aerodynamics. Viscous flow. 4 seminars. Prerequisite: AERO 306, MATH 502, graduate standing or consent of instructor.

AERO 521 Missile and Launch Vehicle Aerodynamics (4)

The aerodynamics of missile configurations in subsonic, transonic, supersonic, and hypersonic flows. Slender bodies and wings at high angles of attack. Asymmetric flow separation and vortex shedding. Wing-body interactions. Control effectiveness. Drag prediction methods and aerodynamic heating. The impact of low observability on aerodynamic design. Missile configuration design. 4 lectures. Prerequisite: AERO 405, graduate standing, or consent of instructor.

AERO 522 Boundary-Layer Theory (4)

Concept of boundary-layer. Boundary-layer equations, similarity transformation, integral and differential methods for steady, two-dimensional laminar and turbulent boundary layers. 4 lectures. Prerequisite: AERO 302, graduate standing or consent of instructor.

AERO 523 Turbulence (4)

Flow physics of turbulence. Turbulence scales and structures. Reynolds equations. Vorticity dynamics. Energy production, convection, and dissipation. Similarity rules and turbulence modeling for jets, wakes, mixing and boundary layers. Effect of turbulence on noise, combustion, heat transfer, and flow control. 4 lectures. Prerequisite: AERO 302, graduate standing or consent of instructor.

AERO 524 Low Gravity Fluid Dynamics and Heat Transfer (4)

Low gravity environment. Mass, momentum and energy transport equations. Free and forced convections. Materials processing. Two-phase flows. Combustion and flame propagation. Turbulence. Fluid management in space. Students are expected to do self-study and make a presentation for the seminar. 3 lectures, 1 seminar. Prerequisite: AERO 301, AERO 302, and AERO 303, graduate standing or consent of instructor.

AERO 525 Computational Fluid Dynamics (4)

Classification of partial differential equations. Numerical methods applicable to the solution of elliptic, parabolic, and hyperbolic partial differential equations. Consideration of accuracy and stability of numerical methods. Application to the fundamental equations of fluid dynamics, grid generation, turbulence modeling. 4 lectures. Prerequisite: AERO 303, graduate standing or consent of instructor.

AERO 526 Spacecraft Thermal/Fluid Control (4)

Satellite thermal/fluid control hardware. Governing equations for flow and heat transfer. Surface tension and liquid/vapor interface. Heat transfer by free convection, forced convection and radiation in low-gravity environment. Heat pipes. Capillary-pumped loops. Cryogenic systems. Fluid management in space. 4 lectures. Prerequisite: AERO 301, AERO 302, and AERO 303, or graduate standing.

AERO 530 Inelastic Structural Analysis (4)

Inelastic stress analysis. Yield criteria. Strain hardening. Plastic straining and bending. Elastic-plastic problems. Plastic instability. Slip-line fields for plains. Plastic strain problems and analysis and introduction to viscoplasticity. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

AERO 532 Advanced Aerospace Composite Design (4)

Behavior of composite materials. Bending, buckling, and vibration of laminated plates. Fatigue and fracture mechanics analysis of composite structures. Optimum design of composite pressure vessels. 2 seminars, 2 laboratories. Prerequisite: Graduate standing or consent of instructor.

AERO 533 Finite Elements for Aerospace Structural Analysis (4)

Overview of theoretical and applied methods of finite element analysis for aerospace structures including composite and light weight structures. Topics include basic equations of elasticity, solutions of linear systems of equations transformation, global stiffness matrix, Bernoulli-Euler element, plane stress triangles, finite element formulation, isoparametric elements, alternative formulation, eigenvalue problems and dynamic analysis. 3 lectures, 1 laboratory. Prerequisite: AERO 431.

AERO 534 Aerospace Structural Dynamics Analysis (4)

Fundamentals of structural dynamics and aeroelasticity of flight vehicles. Undamped and damped, free and forced vibration of a single and multi degree-of-freedom linear systems. Finite elements and vibrational analysis. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

AERO 535 Advanced Aerospace Structural Analysis (4)

Types of failure. Theories of failure. Stability of structures. Advanced flight vehicle and fracture mechanics analysis and design. Fundamentals and applications of modern fatigue analysis in the aerospace industry. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

AERO 540 Elements of Rocket Propulsion (4)

Thrust and impulse equations, propellant composition and mixture ratios, nozzle expansion ratios, solid and liquid propellant combustion, internal ballistics, thermo-chemical computations, chemical kinetics, and combustion instability, nozzle design and exhaust plumes. 4 seminars. Prerequisite: AERO 303, AERO 401, graduate standing or consent of instructor.

AERO 541 Air Breathing Propulsion (4)

Aerothermodynamics of propulsion systems, power plant selection and design, on-off design performance, component characterization, component design, component matching, optimization, and introduction to power plant and airframe integration systems for aircraft. 4 seminars. Prerequisite: AERO 401, graduate standing or consent of instructor.

AERO 550 Analysis and Design of Flight Control Systems (4)

Fundamental principles of flight control design and the application of the Cooper-Harper test and evaluation tool to modern aerospace vehicles. Human factors, issues, and automation, case study of the space shuttle. 3 lectures, 1 laboratory. Prerequisite: AERO 420, graduate standing or consent of instructor.

AERO 551 Global Positioning Satellite Navigation Systems (4)

Principles of Global Positioning Satellite navigation systems. Kalman filter design and application to integrated navigation and guidance systems. Statistical evaluation and test methods in aerospace. Interactive computer simulations. 3 lectures, 1 laboratory. Prerequisite: AERO 420, graduate standing or consent of instructor.

AERO 552 Advanced Control of Spacecraft and Aircraft (4)

Model following and digital control of aerospace craft, including dynamic estimation of vehicle states using Kalman filters and adaptive compensation. Team-centered projects involving optimal attitude control in deep space, hovering vehicles, and aeroelastic systems. Survey of non-linear, fuzzy, and neural net controllers for aerospace applications. 2 lectures, 2 laboratories. Prerequisite: AERO 420, graduate standing or consent of instructor.

AERO 553 Advanced Linear Control Theory (4)

Advanced linear control theory techniques and analytic and computational analysis. State space system representation, solutions to linear dynamic systems, stability analysis, full-state and output feedback, controllability and observability and advanced control topics. Computational methods applied to problems in stability and control of dynamic systems. 4 lectures. Prerequisite: AERO 320, graduate standing or consent of instructor.

AERO 555 Piloted Flying Qualities of Aerospace Vehicles (4)

Flying qualities prediction from flight test data and reduced-order analytical models of vehicles, systems, and human pilots. Application of the Cooper-Harper flight test scale to fly-by-wire aircraft, the space shuttle, and remotely controlled vehicles include rotorcraft. Team-centered projects, reports, and presentations are required. 2 lectures, 2 laboratories. Prerequisite: AERO 420.

AERO 557 Advanced Orbital Mechanics (4)

N-body orbit interactions, computer simulations, orbit determination, orbit and transfer optimization, libration points, halo orbits, and orbit perturbations. 4 lectures. Prerequisite: AERO 451, graduate standing, or consent of instructor.

AERO 560 Spacecraft Dynamics and Control (4)

Orbit determination and control. Orbit maneuvering and rendezvous. Attitude control of rigid spacecraft via reaction wheels, control moment gyros and thrusters. Modeling, analysis and control of flexible spacecraft. 4 lectures. Prerequisite: AERO 420, AERO 452, AERO 553, graduate standing or consent of instructor.

AERO 561 Vehicle Integration and Testing (2)

Space vehicle integration requirements and procedures. Clean room requirements and operations. Quality control and inspection. Qualification and acceptance testing requirements. Test equipment. Vibration and shock testing. Space environment and thermal-vac testing. Development of test procedures. 1 lecture, 1 laboratory. Prerequisite: AERO 446. AERO 450 recommended. Graduate standing or consent of instructor.

AERO 562 Space Operations (2)

Launch operations and vehicle integration with launch vehicle. In-orbit operations and maneuvers. Spacecraft tracking. Telemetry and command. Ground systems. Failure detection and identification. Emergency operations. 1 lecture, 1 laboratory. Prerequisite: AERO 446. AERO 450 recommended. Graduate standing or consent of instructor.

AERO 565 Advanced Topics in Aircraft Design (4)

Application of advanced analytic engineering methods to aircraft design problems. Analysis and synthesis of advanced topics related to design of aircraft. 4 lectures. Prerequisite: AERO 522, AERO 530 and AERO 550, graduate standing or consent of instructor. Concurrent: AERO 520.

AERO 566 Advanced Topics in Spacecraft Design (4)

Application of advanced engineering tools to the design of space vehicles. System architecture and mission design. Concept of operations. Requirements development and flow down. System and subsystems trade studies and preliminary design. 4 lectures. Prerequisite: AERO 450, AERO 446, graduate standing or consent of instructor.

AERO 567 Launch Vehicle and Missile Design (4)

Basic launch vehicle/missile types. Launch vehicle subsystems and their interactions. Vehicle requirements development and flow down. Payload accommodations. System and subsystems trade studies and preliminary design. 4 lectures. Prerequisite: AERO 401, AERO 450, AERO 446, graduate standing or consent of instructor.

AERO 570 Selected Advanced Topics (4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

AERO 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

AERO 572 Topics in Aircraft Manufacturing and Fabrication (1)

Selected topics for assembling aircraft and aircraft components, including empennage, wing fuselage, engine, flight controls, avionics, finishing work, and flight testing. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

AERO 593 Cooperative Education Experience (2) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

AERO 594 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

AERO 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed

formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

AERO 599 Thesis (Design Project) (1-9)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

AG-AGRICULTURE**AG 100 Orientation to the College of Agriculture, Food and Environmental Sciences (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.

AG 200 Special Problems for Undergraduates (1-2) (CR/NC)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit can only be used to satisfy free electives. Credit/No Credit grading only. Prerequisite: Consent of rodeo coach/instructor.

AG 243 Competitive Intercollegiate Rodeo (2) (CR/NC)

Beginning through advanced skills in the event areas of college rodeo. Areas include saddle bronc, bareback, and bull riding; calf, team, and breakaway roping; steer wrestling, goat tying, and barrel racing. Minimum of 10 hours of laboratory per week. Total credit limited to 8 units. Credit/No Credit grading. Enrollment limited to those qualified to compete in intercollegiate rodeo. Consent of coach required.

AG 301 Agriculture and American Life (4)

Overview of agriculture and effect on American life; wise use of natural resources; animal and plant production; role of machines, labor, and chemicals in producing food and fiber; processing and marketing of commodities; nature of farm life; leadership development in agriculture. Not open to students with majors in agriculture. 4 lectures. Prerequisite: Junior standing.

AG 315 Organic Agriculture (4)

Origins, application, regulation and technology of organic agriculture. Theoretical and practical issues surrounding organic agriculture from a cross-disciplinary perspective. Topics include the history of the organic movement; current regulation and certification; and field management practices and technologies. Features industry guest lecturers. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Area B. Fulfills GE Area F.

GE Area F**AG 330 Cal Poly Land: Nature, Technology and Society (4) GE Area F**

Scientific investigation of the natural features of the Cal Poly landscape and their transformations by land management technology. Analysis of the environmental, economic, social, and political effects of agricultural, resource extraction and construction technology on that landscape. Emphasis on the educational, land-use and long term planning issues of technology presented by this case study. 4 lectures. Prerequisite: Junior standing and completion of GE Areas A and B. *Crosslisted as AG/HUM/UNIV 330.* Fulfills GE Area F.

AG 339 Internship in Agriculture (1-12) (CR/NC)

Selected students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading. Prerequisite: Consent of internship instructor.

AG 350 The Global Environment (4)

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Areas A and B. *Crosslisted as AG/BUS/EDES/ENGR/HUM/SCM/UNIV 350.* Fulfills GE Area F.

GE Area F**AG 360 Holistic Management (4)**

Application of holistic management, a goal-oriented, value-driven framework for making decisions that are ecologically, economically, and socially sound. Impact of technology and other tools on ecosystem processes. Holistic approach to management, especially of land-based resources, aimed toward greater biodiversity and sustainability. 3 lectures, 1 laboratory. Prerequisite: Junior standing and completion of GE Area B. Not open to students with credit in AG 450. Fulfills GE Area F.

GE Area F

AG 400 Special Problems for Advanced Undergraduates (1-2) (CR/NC)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of rodeo coach/instructor.

AG 439 Internship in Integrated Ranch Operations (6-12) (CR/NC)

Work experience in all activities/projects associated with the production of crops, livestock and timber at Swanton Pacific Ranch. Students will be responsible for all activities associated with ranch operation including supervising. For students working and living at Swanton Pacific Ranch. Credit/No Credit grading only. Total credit limited to 18 units. Prerequisite: Senior or graduate standing and consent of instructor.

AG 450 Applied Holistic Management (4)

Application of holistic management, a goal-oriented, value-driven framework for making decisions that are ecologically, economically, and socially sound. Impact of technology and other tools on ecosystem processes. Holistic approach to management, especially of land-based resources, aimed toward greater biodiversity and sustainability. 3 lectures, 1 laboratory. Prerequisite: One GE Area B2 course, and junior standing. Not open to students with credit in AG 360.

AG 452 Issues Affecting California Agriculture (4)

Interactive seminars with speakers from government and industry covering policy and regulations affecting California agriculture. Students develop an understanding of agricultural policy and work in teams to develop a public presentation and position paper on a significant issue. Field trip to Sacramento required. 4 seminars. Prerequisite: Junior standing.

AG 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 12 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. No major credit allowed; total credit limited to 24 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

AG 500 Individual Study (1-6)

Advanced independent study planned and completed under the direction of a member of the college faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

AG 539 Graduate Internship in Agriculture (1-9)

Application of theory to the solution of problems of agricultural production or related businesses in the field. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

AG 581 Graduate Seminar (1) (CR/NC)

Advanced topics in agriculture and natural resources. Group study of current research and industry trends. Invited speakers covering a variety of topics. Total credit limited to 3 units. 1 hour seminar. Prerequisite: Graduate standing or consent of instructor.

AG 585 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

AG 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

AG 598 Reading and Conference (1-12) (CR/NC)

Systematic development of an agricultural thesis research project including literature searches, reports and experimental design. Repeatable for up to 12 units. Credit/No Credit grading only. Prerequisite: Graduate standing and instructor consent.

AG 599 Thesis (1-9)

Systematic research of a significant problem. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.

AGB-AGRIBUSINESS**AGB 101 Introduction to Agribusiness (4)**

Orientation to the agribusiness sector of agriculture. An overview of the breadth, size, scope and management aspects of the agricultural business complex. Agribusiness students are required to complete this within the first year of the major. Not open to students with more than 60 units, including transfer credit. 4 lectures.

AGB 200 Special Problems for Undergraduates (1-2) (CR/NC)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit can only be used to satisfy free electives. Credit/No Credit grading only. Prerequisite: Consent of department head.

AGB 202 Sales, Communication and Leadership in Agribusiness (4)

Self management, communication, and interpersonal skills necessary in developing managerial abilities, leadership qualities, and facilitating teamwork within the agribusiness sector. Industry opportunities ranging from input and output products and services along with government and special interest groups will be surveyed. 4 lectures. Prerequisite: AGB 101 or AGC 102 or AGED 102 or sophomore standing.

AGB 212 Agricultural Economics (4)

Theoretical development of factors affecting demand and supply for food and fiber and for agricultural inputs. Methods of selecting optimal levels of agricultural production and consumption variables. Evaluation of market structure and price formulation for agricultural products and resources. 4 lectures.

AGB 214 Agribusiness Financial Accounting (4)

Principles of financial accounting in agribusiness. Preparation for understanding and interpreting financial statements. Exploration of financial reporting standards to provide an understanding of how financial events are reflected in financial statements. The importance of social responsibility in accounting. The accounting cycle, from transactions posting to financial statements through spreadsheet applications. 3 lectures, 1 activity.

AGB 260 Agribusiness Information Technology (4)

Using data and analysis in making decisions related to agribusiness. Developing basic and intermediate spreadsheet skills necessary to organize, analyze, and summarize information. Development of data management and analysis as tools to assist in agribusiness problem-solving. 4 lectures. Prerequisite: AGB 101 or consent of instructor. *Formerly AGB 360.*

AGB 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

AGB 301 Food and Fiber Marketing (4)

Food and fiber marketing, examining commodity, industrial, and consumer product marketing from a managerial viewpoint. A global perspective in understanding consumer needs and developing the knowledge of economic, political, social and environmental factors that affect food and fiber marketing systems. 4 lectures. Prerequisite: AGB 212 or ECON 201.

AGB 303 Introduction to the Horse Racing Industry (4)

Descriptive analysis of horse racing industry: breeding farms, race tracks, trade associations, training issues, and auction sales. Industry structure, economic flows, contributions to state and local taxes, and racing law. Cultural influences of racing in Europe, Australasia, and Latin America. 4 lectures. Prerequisite: Junior standing.

AGB 310 Agribusiness Credit and Finance (4)

Financing California's agricultural industry. Sources of credit and types of loans used by agribusinesses. Costs of credit. Financial analysis of agricultural

borrowers. Future and present value techniques used in evaluating agricultural investments. Agricultural financial management. Financial capital markets and leasing. 4 lectures. Prerequisite: AGB majors: AGB 214; non-AGB majors: AGB 214 or BUS 212 or BUS 214.

AGB 312 Agricultural Policy (4)

Agricultural policy objectives and formulation, resource allocation and production adjustments. Survey of State and Federal agricultural policies as they influence the planning and practices of agribusiness. 4 lectures. Prerequisite: AGB 212 and 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 and MATH 221.

AGB 314 Fair and Fair Facility Management (4)

Fundamentals of the year round operation of a fair facility to include rental opportunities, master planning, and maintenance. Principles and procedures in planning, organizing, operating, and evaluating a fair. One day field trip required. 4 lectures. Prerequisite: Upper division standing.

AGB 315 Land Economics (4)

Economics of agricultural and rural land use. Incorporates production economics with welfare theory to explore society's implicit and explicit land use decisions and problems in California, the West and nationwide. Incorporates land use planning and its implicit economic content. 4 lectures. Prerequisite: AGB 312 and AGB 313.

AGB 318 Global Agricultural Marketing and Trade (4)

Analysis of international marketing opportunities for agricultural products. Strategies for enhancing the performance of U.S. agricultural exports/ imports. Impact of government trade policies and regulations, distribution systems, and the changing consumer. 4 lectures. Prerequisite: AGB 301 and 312.

AGB 321 Farm Records (4)

Fundamentals of record keeping, kinds of records, inventory, depreciation, payrolls, cash and accrual basis of income tax reporting, financial statements and analysis. 3 lectures, 1 activity. Prerequisite: AGB 212/ECON 201.

AGB 322 Principles of Agribusiness Management (4)

Organization and operation of agribusinesses. Identification of factors affecting profitability. Evaluation of the business for increased efficiency and profit. Application of budgeting to representative firms and independent analysis of an agribusiness. 3 lectures, 1 activity. Prerequisite: AGB 212 and AGB 214 or AGB 321.

AGB 323 Agribusiness Managerial Accounting (4)

Agribusiness management with an emphasis on using accounting procedures that will provide useful information in making management decisions, setting objectives, and controlling operations. 3 lectures, 1 activity. Prerequisite: AGB 214.

AGB 324 Agricultural Property Management and Sales (4)

Economic, legal and real estate principles in the investment, development, mortgaging and transferring of agricultural real estate. 3 lectures, 1 activity. Prerequisite: AGB 310 or consent of instructor.

AGB 326 Rural Property Appraisal (4)

Methods of rural appraisal, including farms, ranches and other rural properties, use of county records, appraisal practice on different types of rural properties, discussions with professional appraisers. 3 lectures, 1 activity. Prerequisite: AGB 310.

AGB 331 Farm Accounting (4)

Application of commercial accounting process to farm and ranch accounting problems. Emphasis on accounting systems that facilitate financial statement presentation, tax preparation and ADP enterprise analysis. Income tax laws pertaining to agriculture. 3 lectures, 1 activity. Prerequisite: AGB 214.

AGB 339 Internship in Agribusiness (1-12) (CR/NC)

Selected students will spend up to 12 weeks with an approved agricultural firm engaged in production or related agribusiness. Time will be spent applying and developing agribusiness functional and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

AGB 370 World Food Economy (4)

International agricultural production, economics, and distribution. Comparative and competitive advantage in world agriculture. Food security issues and

regional analysis of agriculture policies. The future of agriculture from a global perspective. 4 lectures. Prerequisite: AGB 312 and AGB 313.

AGB 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head or instructor.

AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (4)

USCP

Agricultural labor trends and problems as determined by changes occurring in farming and farm related industries. Labor-management relations in agriculture; principles and procedures in organizing and managing the agricultural business personnel program. 4 lectures. Prerequisite: Senior standing. Fulfills USCP.

AGB 404 Food Retail Management (4)

Uses and techniques in management of perishable and non-perishable food commodities at the retail level. Issues in traditional versus new models of retail with emphasis on the marketing mix. Introduction to vendor, category and shelf management. 4 lectures. Prerequisite: AGB 301.

AGB 405 Agribusiness Marketing Research Methods (4)

Agricultural marketing research data collection and analysis. Emphasis on food sector market segmentation, product positioning, new product testing, sales forecasting, and marketing plan development through secondary and primary data sources. Experimental research design and implementation. 4 lectures. Prerequisite: STAT 221 and AGB 301.

AGB 406 Agribusiness Marketing Planning (4)

Client centered course where self-managed teams develop agribusiness marketing plan. Emphasis on developing presentation skills. Integration of marketing mix, particularly promotional elements in developing agribusiness marketing strategy emphasized. 4 lectures. Prerequisite: AGB 301, AGB 310, AGB 312, AGB 313, AGB 323 and AGB 405.

AGB 407 Agribusiness Marketing Plan Internship (4)

A minimum of 120 hours spent with an approved agricultural marketing firm. Development of an agribusiness marketing plan. Integration of marketing mix, particularly promotional elements in developing agribusiness marketing strategy emphasized. Presentation of the marketing plan to corporate management and instructor. Prerequisite: AGB 405; corequisite: AGB 339.

AGB 409 California Agricultural Law (4)

Historical and current sources of law, examination of judicial systems, application of contracts, agency, labor law, torts, property, air and water law, business organizations, agricultural cooperatives, debtor and creditor rights and regulations that impact agricultural enterprises. 4 lectures. Prerequisite: BUS 207, senior standing or consent of instructor.

AGB 410 Agricultural Lending (4)

Structure and performance of the agricultural lending industry. Advanced agricultural loan analysis and risk assessment. Agricultural loan documentation, securitization of farm loans, and farm bankruptcy. Exploration of interest rate impacts on agricultural lending. 4 lectures. Prerequisite: AGB 301, AGB 310, AGB 312, AGB 313, AGB 323, and AGB 405 or AGB 421 or AGB 422 or AGB 433 or AGB 435.

AGB 412 Advanced Agricultural Policy (4)

Agricultural resource allocation issues with emphasis on policies that impact the production of food and fiber and inputs used in their production. Special topics in agricultural resource allocation stressing issues and policies emphasizing economic externalities. 4 lectures. Prerequisite: AGB 312, AGB 315, AGB 370, and AGB 421 or AGB 433.

AGB 421 Agribusiness Operations Analysis (4)

Principles and procedures in agricultural business operations analysis and research. Evaluation of programs and problems to achieve optimal decisions. Production and financial data, statistics, pricing, costs, inventories, production level, and plant expansion or contraction. 4 lectures. Prerequisite: STAT 221 and AGB 313.

AGB 422 Logistics in Global Agribusiness (4)

Scope and elements of the agribusiness logistics system including supply and distribution channels, transportation, inventory, warehousing, packaging, and order processing. 4 lectures. Prerequisite: AGB majors: STAT 221; non-AGB majors: STAT 218 or STAT 221.

AGB 433 Agricultural Price Analysis (4)

Application of statistical tools for price analysis. Emphasis on price making process for specific agricultural commodities. Utilization of USDA and CDFR market price reports and production estimate data in price forecasting and analysis. 2 two-hour lectures. Prerequisite: STAT 221 and AGB 313.

AGB 435 Linear Programming in Agriculture (4)

Application of linear programming to decision making by contemporary farm businesses. Solutions by graphical and mathematical models including appropriate computer software. Economic interpretation of solutions. Applications for multi-product, multi-function farms. Includes introduction to goal and risk programming, transportation models, and multi-period programming. 4 lectures. Prerequisite: STAT 221 and AGB 313.

AGB 440 Field Studies in Agribusiness (2)

Visitation to selected agribusinesses. Organization, operation, services and problems considered. Prerequisite: Senior standing or consent of instructor. Can only be taken once for credit in the major.

AGB 443 Branded Wine Marketing (4)

Wine pricing as it relates to quality, packaging, and service. Distribution options with emphasis on the three tier system, promotional strategies, including public relations, mass media advertising, personal selling, and direct marketing. Domestic and international marketplaces. 4 lectures. Prerequisite: AGB 301 or BUS 346 or consent of instructor.

AGB 444 Wine Compliance and Market Analysis (4)

Legal aspects of wine marketing with emphasis on Federal (BATF) requirements. Application of statistical theory to the collection, interpretation, and forecasting of wine and grape industry data with emphasis on production and sales. Introduction to standard accounting ratios. 4 lectures. Prerequisite: STAT 221 or STAT 252 or equivalent.

AGB 445 Produce Marketing (2)

Directed group study of fresh fruit and vegetable marketing. Includes analysis of terminal markets, retail marketing (supermarkets, farmer's markets, roadside stands), limited preserving and ripening, grading and inspection, economics of transportation, international marketing. 2 seminars. Prerequisite: Senior standing and AGB 301.

AGB 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: AGB 301, AGB 310, AGB 312, AGB 323, and AGB 405 or AGB 421 or AGB 422 or AGB 433 or AGB 435.

AGB 451 Strategy and Cases in International Agribusiness (4)

Exploration of environment, opportunities, and strategic challenges in the rapidly changing global food and fiber system. Developing coordination and control, challenges of worldwide management of functional areas of agribusiness. Focus is practical and managerial through extensive use of case studies. 4 lectures. Prerequisite: Senior standing, AGB 318, AGB 323.

AGB 452 Agricultural Market Structure and Strategy (4)

Development of skills for quantity and price determination in a noncompetitive setting. Emphasis on examining the agribusiness industry structures that exist and their effects on decision-making. The use of game theory demonstrated as a strategy formulation tool. 4 lectures. Prerequisite: AGB 301, AGB 310, AGB 312, AGB 313, AGB 323, and AGB 405 or AGB 421 or AGB 422 or AGB 433 or AGB 435.

AGB 455 Advanced Fair Management Seminar (2)

Advanced studies in fair management with emphasis on budgets, contracts, entertainment, carnivals, exhibit programs, crowd control, master planning maintenance. 2 seminars. Prerequisite: AGB 314.

AGB 456 Crop Management Problems (2)

Management problems of crop farms and orchards. Crop enterprise costing procedures, equipment costing and replacement, scheduling of operations to obtain efficiencies. Determination of most profitable rotations and levels of input use. Includes whole farm budget development and analysis. 4 lectures. Prerequisite: AGB 301, AGB 310, AGB 312, AGB 313, AGB 323, and AGB 405 or AGB 421 or AGB 422 or AGB 433 or AGB 435.

AGB 457 Livestock Management Problems (4)

Analysis of actual livestock enterprise. Budgeting a ranch by enterprises. Analysis of internal problems such as bull purchase economics, feed buying chart, feedyard economics, cattle price relationships, livestock systems. Includes whole farm budget development and analysis. 4 lectures. Prerequisite: AGB 322 and senior status.

AGB 458 Dairy Management Problems (4)

Analysis of actual dairy enterprise. Budgeting a dairy farm by enterprises. Analysis of problems such as load by load milk-feed analysis, value of milk quotas, most profitable concentrate to hay feeding. Includes whole farm budget development and analysis. 4 lectures. Prerequisite: AGB 322 and senior status.

AGB 460 Research Methodology in Agribusiness (2)

Empirical application of the scientific method as it relates to the design and development of Senior Project. Research plan is developed. First quarter of Senior Project. 2 seminars. Prerequisite: Senior standing and AGB 313 or senior standing in WVIT.

AGB 461 Senior Project (2)

Completion of a project under faculty supervision. Research topics or projects typical of problems which graduates must solve in the agricultural, food and fiber industries. Project results are presented in a formal report. Minimum 60 hours total time. Prerequisite: Senior standing and AGB 460.

AGB 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

AGB 485 Cooperative Education Experience in Agribusiness (6) (CR/NC)

Part-time work experience with an approved Agribusiness firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

AGB 495 Cooperative Education Experience in Agribusiness (12) (CR/NC)

Full time work experience with an approved Agribusiness firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 24 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

AGB 500 Individual Study in Agribusiness (1-6)

Advanced independent study planned and completed under the direction of a member of the Agribusiness faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

AGB 514 Agribusiness Managerial Leadership and Communication (4)

Current issues in agriculture addressed through the case analysis method. Emphasis on communication skills and leadership qualities, identifying key success requirements. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGB 539 Graduate Internship in Agribusiness (1-9)

Application of theory to the solution of problems of agricultural production or related business in the field of Agribusiness. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

AGB 543 Agribusiness Policy and Program Analysis (4)

Economic, political, and social objectives of domestic agricultural policies and programs. Consequences of government's policies and programs to control production, allocate resources, support market prices, and provide benefits to food and fiber producers, marketers, and consumers. Topical analysis of current effort of government to direct agriculture. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGB 554 Food System Marketing (4)

Major issues facing the food system marketer. Vertical and horizontal linkages, pricing in agricultural markets, management of price risk through futures markets and hedging, and public policy and consumer impacts on the system. Student involvement through case studies simulations, and presentations. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGB 555 Technological and Economic Change in Agribusiness (4)

Ramifications and impacts in agribusiness firms from technological and economic changes. Emphasis on specific agribusiness firms and their managerial process of dealing with problems and opportunities in the operational environments of economic, technology, political, global, domestic and marketing. 4 seminars. Prerequisite: Graduate standing, or consent of instructor.

AGB 563 International Agribusiness Trade and Development (4)

Agricultural trade dynamics in a world economy. Evaluation of multinational firms and unilateral and multinational government policy strategies in interacting with and expanding markets for agricultural trade. Agribusiness opportunities with social and institutional limitations; emphasis on environmental and

sustainable trade issues. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGB 570 Selected Topics in Agribusiness (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGB 571 Selected Advanced Laboratory in Agribusiness (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

AGB 585 Cooperative Education Experience in Agribusiness (6) (CR/NC)

Advanced study, analysis and part-time work experience in the field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

AGB 595 Cooperative Education Experience in Agribusiness (12) (CR/NC)

Advanced study, analysis and full-time work experience in the field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

AGB 599 Thesis in Agribusiness (1–9)

Systematic research of a significant problem in Agribusiness. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.

AGC–AGRICULTURAL COMMUNICATION

AGC 102 Orientation to Agricultural Communication (2)

Orientation to the communication sector of agriculture. Overview of professional opportunities and skills needed for success in agricultural communications. Preparation of press releases and short articles, and development of a planned program of study. 2 lectures.

AGC 200 Special Problems in Agricultural Communication (1–4)

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

AGC 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

AGC 339 Internship in Agricultural Communication (1–12) (CR/NC)

Selected Agricultural Communication students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

AGC 400 Advanced Special Problems in Agricultural Communication (1–4)

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

AGC 407 Agricultural Publications (4)

Integration of writing, editing, and layout skills in producing agricultural publications. Emphasis on using computer applications in desktop publishing. Total credit limited to 9 units; may be in same term. 2 lectures, 2 activities. Prerequisite: JOUR 205. Recommended: CSC 113.

AGC 426 Presentation Methods in Agricultural Communication (4)

Development, delivery and evaluation of effective means of communication by use of a variety of presentation methods and the use of technology for effective communication. 2 lectures, 2 activities. Prerequisite: Completion of GE A2, junior standing.

AGC 461 Senior Project I (1)

Empirical application of the scientific method as it relates to the selection of a project under faculty supervision. Projects typical of problems that graduates must solve in their field of employment. Minimum 30 hours total time. Prerequisite: AGED 460.

AGC 462 Senior Project II (1)

Completion of a project begun in AGED 461 under faculty supervision. Projects typical of problems that graduates must solve in their field of employment. Project results are presented in a formal report. Minimum 30 hours total time. Prerequisite: AGED 461 or consent of instructor.

AGC 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

AGC 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

AGC 500 Individual Study in Agricultural Communication (1–3)

Advanced independent study planned and completed under the direction of a member of the Agricultural Education and Communication faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

AGC 539 Graduate Internship in Agricultural Communication (1–9)

Application of theory to the solution of problems of agricultural production or related business in the field of Agricultural Communication. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

AGC 570 Selected Topics in Agricultural Communication (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGC 571 Selected Advanced Laboratory in Agricultural Communication (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

AGC 580 Special Problems in Agricultural Communication (1–3)

Individual study of modern issues and problems conducted through research, planning and development. Field problems and in-service study in agricultural industry encouraged. Final written report required. Total credit limited to 9 units with not more than 3 units in any one quarter. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

AGC 581 Graduate Seminar in Agricultural Communication (3)

Group study of selected developments, trends and issues in the field of Agricultural Communication. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

AGED–AGRICULTURAL EDUCATION

AGED 102 Introduction to Agricultural Education (2)

Overview of agricultural education career pathways including goals and purposes. Kinds of classes and types of programs. Qualifications essential to success in teaching agriculture. Planned program of studies to meet requirement for teaching agricultural science and related disciplines. 2 lectures.

AGED 200 Special Problems in Agricultural Education (1–4)

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8

units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

AGED 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 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

AGED 330 FFA and Supervised Agriculture Programs (6)

Implementation processes and operational procedures for initiating, conducting and integrating FFA activities and Supervised Agricultural Experience (SAE) Programs appropriate to community, school and student needs. Demonstration, application and observation of practices and techniques utilized by agriculture instructors in conducting organized classroom, shop, school farm, laboratory and home visit instruction in agriculture, FFA and SAE activities. 3 activities, and supervised work. Prerequisite: AGED 102.

AGED 331 Field Experience in Urban Agricultural Education Programs (3)

Evaluation of agricultural curriculum offerings, leadership development opportunities, experiential learning/project involvement, student demographics, socioeconomic influences, and school environment in urban schools. Visitation to selected agriculture programs in urban centers require travel; alternative assignments may be available. 2 lectures, 1 activity. Prerequisite: AGED 102 and AGED 330.

AGED 339 Internship in Agricultural Education (1–12) (CR/NC)

Selected Agricultural Education students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

AGED 400 Advanced Special Problems in Agricultural Education (1-4)

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

AGED 404 Agricultural Leadership (3)

Emphasis upon equipping current and prospective leaders in agriculture with the background and skills to achieve their potential. Class members will assess their status as leaders and identify means to improve their effectiveness. Focus on the theoretical underpinnings of human motivation, personal leadership, and organizational development. 2 lectures, 1 activity. Prerequisite: Completion of GE D4, junior standing.

AGED 410 Computer Applications in Agricultural Education (2)

Development of computer literacy for teaching agriculture. Analysis and specialization of hardware. Instruction in digital technology, TI network systems and software applicable to vocational agriculture. Will be Level I certified, which is required for teaching credential candidates. Prerequisite: AGED 102. Recommended: AGED 330.

AGED 422 Organizing and Teaching K-6 Standards (4)

Objectives, content, techniques, materials, and recent trends of successful application of agricultural literacy and awareness to K-6 grade level standards. Ongoing projects, individual and group, allow for exploration and understanding of agriculture as a theme to teach all of the content areas, as well as assist in understanding the educational standards accompanying each lesson. 4 lectures. Prerequisite: LS 230, LS 250.

AGED 424 Organizing and Teaching Agriculture (3)

Determining course objectives, content, and calendar for use by the teacher in classroom, shop and field instruction while assigned to community schools. Concurrent with student teaching. 3 activities. Prerequisite: AGED 438 and consent of instructor.

AGED 438 Instructional Processes in Agricultural Education (4)

Principles of specific agricultural teaching methods and developmentally appropriate pedagogy. Daily and unit lesson plans that adopt content, teaching methods, and assessment for English Learners and students with special needs. Class demonstrations in teaching procedures, analysis, assessment and reflection. 2 lectures, 2 activities. Prerequisite: AGED 330, EDUC 410, EDUC 412 and EDUC 414 or consent of instructor.

AGED 440 Student Teaching in Agricultural Education (6–12) (CR/NC)

Off-campus assignment to a selected cooperating public school. Participation in all phases of agriculture teacher duties and activities including departmental organization and administration. Prior approval and appointment necessary. Total credit limited to 18 units. Credit/No Credit grading only.

AGED 441 Student Teaching Practicum (2)

Problems encountered and practices applied during student teaching. Methods, procedures and materials adapted for use by the teacher concurrent with student teaching. 2 activities. Prerequisite: Consent of instructor.

AGED 460 Research Methodology in Agricultural Education and Communication (1)

Introduction of the research process and topic selection as it relates to the design and development of the senior project within the Agricultural Sciences major. 1 lecture. Prerequisite: Junior standing.

AGED 461 Senior Project I (1)

Empirical application of the scientific method as it relates to the selection of a project under faculty supervision. Projects typical of problems that graduates must solve in their field of employment. Minimum 30 hours total time. Prerequisite: AGED 460.

AGED 462 Senior Project II (1)

Completion of a project begun in AGED 461 under faculty supervision. Projects typical of problems that graduates must solve in their field of employment. Project results are presented in a formal report. Minimum 30 hours total time. Prerequisite: AGED 461 or consent of instructor.

AGED 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

AGED 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

AGED 481 Developing Digital Presentations for Instruction in Agricultural Education (1)

Directed group study and individualized projects in the design and development of digital presentations in technical agriculture for use in teaching and program public relations. Total credit limited to 3 units. 1 laboratory. Prerequisite: Senior standing.

AGED 482 Teaching Resources and Curriculum Design (1)

Traditional academic and student-centered approaches to gaining resources and curriculum design. Methods of using, and the development of the knowledge and skills related to planning, implementation and assessing the high school agriculture curriculum. Organization and management and their relationship to education effectiveness and productivity. 1 lecture. Prerequisite: Senior standing.

AGED 500 Individual Study in Agricultural Education (1–3)

Advanced independent study planned and completed under the direction of a member of the Agricultural Education and Communication faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

AGED 513 Field Experience–Vocational Agriculture (1–3)

Practice and techniques in management and supervision of vocational agriculture programs. Relationships among students, staff, community and school groups. Budgeting, staffing, records, reporting. Student activities and Future Farmers of America programs. Total credit limited to 6 units. Prerequisite: Prior approval and appointment.

AGED 520 Program Development in Agricultural Education (3)

Development of up-to-date approaches to a total integrated program based on occupational opportunities and community needs. Philosophy, organization and administration of agricultural education programs. Development in such areas as curriculum, supervised occupational experience, Future Farmers of America, and summer programs. 3 seminars. Prerequisite: Senior standing.

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. Prerequisite: Senior standing.

AGED 525 Organizing Instruction for Growing and Selling Horticulture Products (3)

Skills and techniques of propagation and production of horticulture crops. Scheduling, growing media, construction and use of forcing structures, and plant identification. Marketing plans and promotions. Teaching methods, curriculum development, and identification of resources and materials for horticultural instruction. 3 lectures. Prerequisite: HCS 120 or EHS 230, and senior or graduate standing. Open to agricultural educators or credential students only.

AGED 530 Developing FFA and Supervised Agricultural Experience Programs in Secondary Education (3)

Integrating FFA and supervised agricultural experience programs into the curriculum. Career development event implementation; record book usage; officer and committee training; recruitment; retention; retreat and leadership training. Current national and state initiatives and experiential learning opportunities in the workplace and entrepreneurial settings. 3 lectures. Prerequisite: Senior or graduate standing. Not open to students with credit in AGED 330.

AGED 536 College Teaching in Agriculture (3)

Selection and use of various teaching strategies, methods/approaches, and techniques when planning, delivering, and evaluating instruction. For graduate students interested in pursuing a faculty position in agriculture at post-secondary institutions. 3 seminars. Prerequisite: Graduate standing.

AGED 537 Enhancing Instruction in Agricultural Biology (3)

Teaching methods of important biological concepts using agriculture as the context. Assisting agriculture teachers in identifying proper pedagogical strategies to integrate activities and laboratories into existing agriculture biology courses, including leadership development opportunities and activities. Emphasis on appropriate teaching methods and techniques, curriculum integration and application, and classroom resources. 3 seminars. Prerequisite: AGED 438 or consent of instructor, enrollment in agriculture teaching credential program or MS degree in Agricultural Education, or current agriculture teacher; undergraduate biology course (BIO 111 or equivalent).

AGED 538 Laboratory Integration in Agricultural Education (3)

Teaching important science concepts using agriculture as the context. Assisting current agriculture teachers in identifying proper pedagogical strategies to integrate agriscience activities and laboratories into existing high school agriculture courses. Emphasis on appropriate teaching methods and techniques, curriculum integration and application, and classroom resources. 3 seminars. Prerequisite: BIO 112 or BIO 115 or BIO 161; AGED 438; and either enrollment in MS degree in Agricultural Education or currently teaching agriscience.

AGED 539 Graduate Internship in Agricultural Education (1–9)

Application of theory to the solution of problems of agricultural production or related business in the field of Agricultural Education. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

AGED 570 Selected Topics in Agricultural Education (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGED 571 Selected Advanced Laboratory in Agricultural Education (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

AGED 580 Special Problems in Agricultural Education (1–3)

Individual study of modern issues and problems conducted through research, planning and development. Field problems and in-service study in agricultural

industry encouraged. Final written report required. Total credit limited to 9 units with not more than 3 units in any one quarter. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

AGED 581 Graduate Seminar in Agricultural Education (3)

Group study of selected developments, trends and issues in the field of Agricultural Education. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

ANT-ANTHROPOLOGY**ANT 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.

ANT 201 Cultural Anthropology (4)**GE D3**

Contemporary human cultures throughout the world. General patterns sought within the diversity of individual cultures. Includes such topics as: family organization; gender roles; adaptation to the environment; systems of economic exchange; political organization and leadership; religious beliefs and values; ethnicity and cultural pluralism; impact of Western culture on the developing world. 4 lectures. Fulfills GE D3.

ANT 202 World Prehistory (4)**GE D3**

Development of the diverse human cultures of both the Old and New Worlds from the emergence of the first human ancestors (hominins) to the dawn of history; biological evolution, global cultural development, and adaptation before the advent of writing. 4 lectures. Fulfills GE D3.

ANT 250 Biological Anthropology (4)**GE B2**

Biological aspects of human unity and diversity. Primate and human evolution, including anatomical, physiological and behavioral adaptations. Origin and diversity of modern races. 4 lectures. Fulfills GE B2.

ANT 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

ANT 309 Elements of Archaeology (4)

Archaeological method and theory covering the history and development of archaeological thought, approaches to data recovery, dating and analysis of artifacts and ecofacts, the construction of models of prehistoric human behavior through application of archaeological and anthropological theories. 4 lectures. Prerequisite: ANT 202 or consent of instructor.

ANT 310 Archaeological Field Methods (4)

Hands-on introduction to the methods and techniques of archaeology with an emphasis on excavation. Training in artifact and ecofact identification with a focus on lithic technology. Practical field experience with hand tools, and stratigraphic interpretation. Methodological approaches to both academic research questions and compliance with environmental planning mandates. 3 lectures, 1 laboratory. Prerequisite: ANT 202 or ANT 309, or consent of instructor.

ANT 311 Archaeological Laboratory Methods (4)

Hands-on introduction to the methods employed in post-field processing, classification, analysis, and preservation of archaeological materials. Compilation of quantitative and qualitative information in data base format to assist in the classification and interpretation of faunal remains and artifacts. 3 lectures, 1 laboratory. Prerequisite: ANT 309 or ANT 310.

ANT 312 Introduction to Cultural Resources Management (4)

Introduction to federal, state, and local legislation pertinent to the identification, evaluation, and treatment of cultural resources. A history of preservation legislation, culminating with detailed discussion of Section 106 of the National Historic Preservation Act and the California Environmental Quality Act. Practical experience in orienteering, map-reading, and simple cartography. 4 lectures. Prerequisite: ANT 201, ANT 202 or ANT 309, or consent of instructor.

ANT 320 California's Native Past (4)

Overview of the paleoenvironment, prehistory, archaeology, and ethnography of Native California. The last 12,000 years of California's past from the arrival of the first human beings to the establishment of Spanish settlements in 1769, and the demise of native societies. 4 lectures. Prerequisite: ANT 202 or consent of instructor.

ANT 325 Precolumbian Mesoamerica (4)**GE D5**

Cultures of Mesoamerica (Mexico and Central America) from earliest times to the Spanish Conquest. Olmec, Teotihuacano, Zapotec, Maya and Aztec civilizations. Major topics include religion, politics, warfare, art, writing, calendrics, ecology and trade. 4 lectures. Prerequisite: Completion of GE Area A, one course in D2 and one course in D3. Recommended: Junior standing. Fulfills GE D5 except for Social Sciences majors.

ANT 330 Indigenous South Americans (4)**GE D5**

Indigenous peoples of South America from the past to the present. Cross-cultural study of small band societies, tribes and large civilization states located from the Amazon basin to the Altiplano. Comparison of current state of indigenous rights and place in modern society. 4 lectures. Prerequisite: Completion of GE Area A and two lower-division Area D courses. Recommended: Junior standing. Fulfills GE D5 except for Social Sciences majors.

ANT 344 Sex, Death, and Human Nature (4)**GE D5**

How Darwinian processes of differential reproduction and mortality influence human interests, passions and behaviors. Theories of inclusive fitness, parental investment and senescence. Sex differences, sexual attraction, life histories, violence and aggression, including rape, homicide and infanticide. 4 lectures. Prerequisite: Completion of GE Areas A, D3, and B2. Recommended: Junior standing. Fulfills GE D5 except for Social Sciences majors.

ANT 345 Human Behavioral Ecology (4)**GE D5**

Biological and cultural influences of natural and sexual selection on individual behavior. Ecological effects on human behavior to reproduce and acquire resources. Scientific method for understanding foraging behavior, group living, social skills, kinship, parenting, religion, and mating. Cross-cultural, cross-sex, and cross-species comparisons. 4 lectures. Prerequisite: Junior standing; completion of GE Area A, one course in B2 and one lower-division Area D course. Fulfills GE D5 except for Social Sciences majors.

ANT 360 Human Cultural Adaptations (4)**GE D5**

Social and cultural evolution from Paleolithic times to the present. Interactions of demographic, economic and ecological factors are emphasized. Main topics include human nature/culture, sex and gender, cooperation and conflict, the "agricultural revolution", state formation, social inequality and globalization. 4 lectures. Prerequisite: Completion of GE Area A, one course in D2 and one course in D3. Recommended: Junior standing. Fulfills GE D5 except for Social Sciences majors.

ANT 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.

ANT 401 Culture and Health (4)

Global perspective on the relationship between culture and health. Ecological factors influencing health and illness. Origins of disease and impact of diseases on society. Diet and nutrition. Classifications of illness causation. Kinds of curers. Relationship of gender and reproduction to illness. Pharmacology. Mental illness. Global health problems. Alternative health care modalities. Health-care needs of U.S. ethnic groups. 4 lectures. Prerequisite: Junior standing; completion of ANT 201 and ANT 250; OR graduate standing.

ANT 402 Nutritional Anthropology (4)

Interrelationships of sociocultural and ecological factors and their influence on nutrition and human health in developing and developed country contexts. Topics include human adaptation, nutritional assessment, food production and allocation, the effect of development on diet and health. 4 lectures. Prerequisite: Junior standing; completion of GE Area A and ANT 201, or consent of instructor. Recommended: ANT 250.

ANT 415 Native American Cultures (4)**USCP**

Survey of Native American cultures from earliest times to present, emphasizing regional diversity in traditional lifeways. Origins of New World peoples, domestication, war, social organization, trade and gender roles. 4 lectures. Prerequisite: One upper division ANT course or consent of instructor. Fulfills USCP.

ANT 455 Anthropology-Geography Research Design and Methods (4)

Development of knowledge and skills needed to conduct original scientific anthropology-geography research and prepares students for senior projects. Various empirical methodologies highlighted, with a focus on quantitative design and measurement of human culture, biology, behavior, environment and ecology. 3 lectures, 1 laboratory. Prerequisite: Completion of one GE B2 and two upper division ANT or GEOG classes. *Crosslisted as ANT/GEOG 455.*

ANT 461, 462 Senior Project I, II (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing or consent of instructor.

ANT 464 Professional Preparation for Anthropologists/Geographers (1) (CR/NC)

Preparation for professional advancement in the fields of anthropology and geography. Supervised career planning emphasizing resume development, selection of an internship or international experience, exploration of career options and graduate programs. Lectures from outside, practicing professionals. Credit/No Credit grading only. 1 seminar. Prerequisite: Junior standing, ANT 201, GEOG 150.

ANT 465 Internship (3–8) (CR/NC)

Supervised training, research, and work in public and private organizations. Credit/No Credit grading only. Total credit limited to 18 units. Prerequisite: ANT 464, senior standing and/or consent of instructor.

ANT 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ARCE-ARCHITECTURAL ENGINEERING

Note: All ARCE majors must obtain a grade of C- or better in ARCE courses that are prerequisites for other ARCE courses.

ARCE 211 Structures I (3)

Introduction to the role of structures in the making of buildings. Introduction to statics and creation of simple three-dimensional structures. Development of skills to analyze structures composed of axial force (truss) members. 2 lectures, 1 activity. Prerequisite: For ARCE majors: PHYS 141, MATH 142; for ARCH and CM majors: PHYS 121 or PHYS 141, MATH 142 or MATH 182.

ARCE 212 Structures II (3)

Introduction to the role of structures in the making of buildings. Introduction to shear and moment diagrams using the principles of statics and the application of the diagrams to simple three-dimensional structures. Development of skills, particularly free body diagrams, to analyze structures composed of bending (beams) members. 2 lectures, 1 activity. Prerequisite: ARCE 211.

ARCE 221 Elementary Structures (3)

Forces on building structures. Static equilibrium and stability of structural systems. Shear and bending moment diagrams. 3 lectures. Prerequisite: PHYS 141, MATH 142.

ARCE 222 Introduction to Mechanics of Structural Members (3)

Stress-strain relationships. Stresses and deformations in structural members due to axial force, shear, torsion, and moment. 3 lectures. Prerequisite: ARCE 221.

ARCE 223 Mechanics of Structural Members (3)

Advanced topics of stresses in beams. Plastic bending, unsymmetrical bending. Combined stresses. Stress transformation. Buckling. Deflection of beams. 3 lectures. Prerequisite: ARCE 212 or ARCE 222. Concurrent for ARCE majors: ARCE 224 and ARCE 351.

ARCE 224 Mechanics of Structural Members Laboratory (1)

Experimental investigations of material properties. Experimental studies of stresses and deflections in beams, including plastic bending, and unsymmetrical bending. Stress transformations via strain gages for combined loading cases. Culminating lab experience: A student run, self-designed experiment. 1 laboratory. Concurrent: ARCE 223.

ARCE 225 Dynamics (3)

Dynamics of particles and rigid bodies. Introduction to vibrations of spring/mass/damper systems. 3 lectures. Prerequisite: ARCE 211 or ARCE 221 and MATH 241.

ARCE 226 Structural Systems for Architects (3)

Description, behavior and comparison of structural building systems. Concepts of structural stability, load flow, framing schemes and building configuration related to vertical and lateral loads. For architecture and construction management students. 3 lectures. Prerequisite: ARCE 212 or ARCE 222.

ARCE 227 Structures III (2)

Continuation of selected concepts covered in ARCE 211 and ARCE 212. Advanced topics in two-dimensional and three-dimensional equilibrium of structural building systems. 2 lectures. Prerequisite: ARCE 222 or ARCE 212.

ARCE 240 Additional Engineering Laboratory (1–2)

Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

ARCE 257 Structural CAD for Building Design (2)

Emphasis on the use of computer graphics software to represent a building's structural system and its individual elements. 1 lecture, 1 laboratory.
Prerequisite: ARCH 133, CM 115.

ARCE 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

ARCE 302 Structural Analysis (4)

Analysis of statically indeterminate structures using virtual work, slope deflection, the force method and moment distribution. Analysis of structural systems using approximate methods and influence lines. 4 lectures. Prerequisite: ARCE 223 and ARCE 227. Concurrent for ARCE majors: ARCE 352.

ARCE 303 Steel Design I (3)

Analysis and design of steel structural members subjected to bending, shear and axial forces. 3 lectures. Prerequisite: ARCE 223. Corequisite for ARCE majors: ARCE 371. Corequisite for ARCE minors: ARCE 226.

ARCE 304 Timber Design (3)

Analysis and design of timber structural members subjected to bending, shear, and axial forces. Wood diaphragms, shear walls and their connections. 3 lectures. Prerequisite: For ARCE majors: ARCE 371. For ARCE minors: ARCE 223 and ARCE 226.

ARCE 305 Masonry Design (2)

Design of load-bearing walls, shear walls, columns and beams in masonry. 2 lectures. Prerequisite: For ARCE majors: ARCE 371. For ARCE minors: ARCE 223 and ARCE 226.

ARCE 306 Matrix Analysis of Structures (3)

Analysis of statically indeterminate structures by direct stiffness method including continuous beams, plane trusses, and frames. Introduction to finite-element methods. 3 lectures. Prerequisite: ARCE 302. Concurrent: ARCE 353.

ARCE 311 Structures for Landscape Architects (3)

Structural concepts related to landscape architecture. Design of retaining walls, decks, trellises, bridges and large-scale covered spaces. 3 lectures.

ARCE 315 Small Scale Structures (4)

Introduction to structures that use timber and steel as the primary construction material. Introduction to gravity load carrying systems and lateral load resisting systems using steel and timber elements. Development of skills to analyze structures using free body diagrams and the concept of load flow. 4 lectures. Prerequisite: ARCE 226.

ARCE 316 Large Scale Structures (4)

Introduction to structures that use steel and concrete as the primary construction material. Introduction to gravity load carrying systems and lateral load resisting systems using steel and concrete elements. Development of skills to analyze structures using free body diagrams and the concept of load flow. 4 lectures. Prerequisite: ARCE 315.

ARCE 351 Structural Computing Analysis I (1)

Computer calculations, programming basics and technical reporting. Emphasis on use of spreadsheets as a tool to analyze structural elements. 1 laboratory. Prerequisite: ARCE 212 or ARCE 222. Concurrent: ARCE 223.

ARCE 352 Structural Computing Analysis II (1)

Computer calculations, programming and technical reporting. Emphasis on use of two-dimensional structural analysis software to analyze a building's structural system and its individual elements. 1 laboratory. Concurrent: ARCE 302.

ARCE 353 Structural Computing Analysis III (1)

Emphasis on the use of nonplanar structural analysis software to analyze a building's structural system and its individual elements. 1 laboratory. Prerequisite: ARCE 352. Concurrent: ARCE 306.

ARCE 354 Numerical Analysis Laboratory (1)

An intensive survey of numerical analysis techniques used for solving engineering problems. Topics include integration, ordinary differential equations, and the eigenproblem. 1 laboratory. Prerequisite: MATH 244 and ARCE 353. Concurrent: ARCE 412.

ARCE 371 Structural Systems Laboratory (3)

Studies in the relationship of structural framing to overall building geometry. Emphasis on the stability of structural configurations, calculation of building

loads and development of a complete gravity and lateral load path. 3 laboratories. Prerequisite: ARCE 223, ARCE 227, and third year standing in Architectural Engineering. Corequisite: ARCE 302.

ARCE 372 Steel Structures Design Laboratory (3)

Steel framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Prerequisite: ARCE 257, ARCE 302, ARCE 303, ARCE 352 and ARCE 371. Cannot be taken concurrently with ARCE 451 or ARCE 452.

ARCE 400 Special Problems for Advanced Undergraduates (1–3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of instructor and department head.

ARCE 403 Advanced Steel Structures Laboratory (3)

Advanced topics in design and construction of steel structures, such as: plate girders, plastic design of beams and frames, and composite beam design, load and resistance factor design, and advanced topics related to moment frames and braced frames. 3 laboratories. Prerequisite: ARCE 372.

ARCE 410 Integrated Building Envelopes (4)

Multidisciplinary exploration of the value and collaboration required of an integrated project team approach to the design and construction of sophisticated building envelopes. Team taught by instructors and practitioners from each of the following disciplines: architecture, architectural engineering and construction management. 4 lectures. Prerequisite: Fourth year standing or consent of instructor. Recommended: Third year design and analysis courses; ARCE 302, ARCE 372.

ARCE 412 Dynamics of Framed Structures (3)

Analysis of structures subjected to dynamic loads with single- and multi-degrees of freedom. Development of techniques for analysis of structures in response to time varying loads. 3 lectures. Prerequisite: ARCE 225 or ME 212, MATH 244, and ARCE 306. Concurrent: ARCE 354.

ARCE 414 Precast Concrete (3)

Precast and prestressed concrete principles, materials and techniques of construction. Design of basic precast elements and connections and prestressed concrete fundamentals as applied to precast concrete. Design potentials, aesthetics, cost and construction time as related to buildings and other structures. 3 laboratories. Prerequisite: ARCE 444.

ARCE 415 Interdisciplinary Capstone Project (5)

Team based interdisciplinary capstone / senior project course. Analysis and evaluation of interdisciplinary challenges associated with integrating the design and construction processes to deliver a project with respect to the design, budget, schedule, quality, and performance expectations of a client. 5 laboratories. Prerequisite: ARCE 303, ARCE 304, ARCE 305, ARCE 444, ARCE 372 or ARCE 451, or consent of instructor.

ARCE 421 Soil Mechanics (3)

Principles of soil mechanics, including rudiments of geology, soil classification, gravimetric and volumetric relations, compaction, methods and testing, shear strength of soil and strength theories. 2 lectures, 1 laboratory. Prerequisite: ARCE 212 or ARCE 222, GEOL 201.

ARCE 422 Foundation Design (3)

Soil-bearing capacity; sizing and design of spread footings. Design and analysis of earth-retaining structures. Analysis of the stability of slopes. 3 lectures. Prerequisite: ARCE 421.

ARCE 423 Advanced Foundation Design (3)

Design, analysis, and construction issues related to shallow and deep foundation systems, mat foundations, retaining walls, and grade beams. Studies investigation the impact of sub-grade structural systems on building behavior and cost. 3 laboratories. Prerequisite: ARCE 422 and ARCE 444.

ARCE 444 Reinforced Concrete Laboratory (3)

Theory and design of basic reinforced concrete elements: non-slender columns, beams, tee beams and one way slabs. 3 laboratories. Prerequisite: ARCE 371 and ARCE 302.

ARCE 445 Prestressed Concrete Design Laboratory (3)

Design and analysis of prestressed concrete structures. 3 laboratories. Prerequisite: ARCE 444.

ARCE 446 Advanced Structural Systems Laboratory (3)

Concepts and issues involved in the design of complex structures including tall buildings, shells, arches and tension structures. 3 laboratories. Prerequisite: ARCE 226 or ARCE 371.

ARCE 447 Advanced Reinforced Concrete Laboratory (3)

Advanced topics in the design of reinforced concrete structures with emphasis on isolated and combined foundations, retaining walls, seismic-resistant ductile frames and yield line theory. 3 laboratories. Prerequisite: ARCE 444.

ARCE 448 Seismic Rehabilitation Laboratory (3)

Overview of the general rehabilitation process and philosophy. Evaluation and analysis of existing structures to determine expected performance due to seismic loads. Development of basic rehabilitation strategies for buildings. 3 laboratories. Prerequisite: ARCE 303, ARCE 304, ARCE 305, ARCE 412, ARCE 444.

ARCE 449 Cold Formed Steel Design Laboratory (3)

Analysis and design of cold formed steel structural members subjected to bending, shear, and axial forces. Project based design and constructability of cold formed structural systems including gravity framing, diaphragms, shear walls and their connections. 3 laboratories. Prerequisite: ARCE 303 and ARCE 451.

ARCE 451 Timber and Masonry Structures Design and Constructability Laboratory (3)

Timber and masonry framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Prerequisite: ARCE 257, ARCE 304, ARCE 305, and ARCE 371. Cannot be taken concurrently with ARCE 372 or ARCE 452.

ARCE 452 Concrete Structures Design and Constructability Laboratory (3)

Cast in place concrete framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Prerequisite: ARCE 257, ARCE 444, and ARCE 372 or ARCE 451. Cannot be taken concurrently with ARCE 372 or ARCE 451.

ARCE 453 Interdisciplinary Senior Project Laboratory (3)

Interdisciplinary projects by interdisciplinary teams under faculty supervision that go beyond topics covered in the ARCE curriculum. Projects must include integration with other disciplines outside of structural or architectural engineering. 3 laboratories. Prerequisite: ARCE 372, ARCE 451, ARCE 452, ARCE 483 or consent of instructor and department head.

ARCE 460 Collaborative Design Laboratory (2)

Investigation of the collaborative nature of the design process as it relates to the architectural engineer and related disciplines. Development of skills necessary to create a successful design team through the development of specific projects. Total credit limited to 4 units. 2 laboratories. Prerequisite: ARCE 372 or ARCE 451 and consent of instructor.

ARCE 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Consent of instructor.

ARCE 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

ARCE 473 Advanced Timber and Masonry Structures Laboratory (3)

Emphasis on long span industrial/warehouse type buildings. Use of steel in timber/masonry construction and constructability. Holes in diaphragms, out-of-plane wall behavior and sub-diaphragms, perforated wood and masonry shear walls, pre-manufactured shear walls, masonry retaining walls, connections including post-installed anchors. 3 laboratories. Prerequisite: ARCE 372, ARCE 422, ARCE 444 and ARCE 451.

ARCE 480 Senior Seminar (1)

Discussion of selected topics that are of current interest to the structural engineering profession. 1 seminar. Prerequisite: Senior standing.

ARCE 483 Seismic Analysis and Design (4)

Introduction to dynamic response analysis of building structures with emphasis on earthquake ground motion. Earthquake resistant design of buildings in accordance with building codes. Application of computer programs and physical models for seismic design. Laboratory studies utilizing physical models for studying the behavior of building structures subjected to simulated ground motions. 3 lectures, 1 activity. Prerequisite: ARCE 372, ARCE 412.

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. No major credit allowed; total credit limited to 12 units. Credit/No Credit grading only. Credits to not count toward graduation in the ARCE Degree Program. Prerequisite: Sophomore standing and consent of department head.

ARCE 490 History of Structures (3)

Understanding the social, scientific, and symbolic importance of landmark structures. Emphasis on post industrial revolution structures; Gothic cathedrals also studied. 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. No major credit allowed; total credit limited to 24 units. Credit/No Credit grading only. Credits to not count toward graduation in the ARCE Degree Program. Prerequisite: Sophomore standing and consent of instructor.

ARCE 501 Advanced Structural Mechanics (3)

Principles, concepts, and techniques of advanced structural mechanics. Studies of displacement, strain, stress, strain-displacement relation and constitutive models in three dimensions. Failure criteria. Introduction into energy principles and approximate solutions. 3 lectures. Prerequisite: ARCE 306, ARCE 353.

ARCE 502 Nonlinear Structural Behavior I (3)

Principles, concepts, and behavior of structures loaded beyond their linear-elastic limit. Elastic-plastic behavior of truss, beam, and frame structures. Buckling and post-buckling behavior of columns. Behavior of beam-columns and the principle of superposition. Second-order elastic behavior of frames. 3 lectures. Prerequisite: ARCE 306 and ARCE 353.

ARCE 503 Nonlinear Structural Behavior II (3)

Principles, concepts, and techniques of nonlinear structural analysis currently used in practice. Classification of nonlinear problem types. Investigation of typical iterative solution strategies. Studies in material and geometric nonlinearities in spring, truss, and frame elements. Use of current nonlinear analysis software. 3 lectures. Prerequisite: ARCE 502.

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 seminars. Prerequisite: MATH 244, ARCE 306, ARCE 501.

ARCE 511 Structural Systems Behavior (3)

Design, performance, and construction issues related to structural systems. Further development of design and analysis techniques necessary for performance based engineering of structural systems. Assessment of advantages and limitations of different structural forms and systems. 3 laboratories. Prerequisite: ARCE 371, ARCE 403, ARCE 452, ARCE 483.

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.

ARCE 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing or consent of instructor.

ARCE 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

ARCE 598 Structural Engineering Design Project (3)

Independent development, research, and conclusion of a graduate project by individuals or teams specializing in the area of architectural or structural engineering. Projects may include graduate students from other disciplines. Students shall enroll in 3 quarters. Total credit limited to 9 units. 3 laboratories. Prerequisite: ARCE 371, ARCE 403, ARCE 452, ARCE 483.

ARCH-ARCHITECTURE**ARCH 101 Survey of Architectural Education and Practice (1) (CR/NC)**

Exploration of the major paradigms which have guided the development of architectural education and the profession. Survey of the roles of the architects and an introduction to curricula and programs designed to prepare students for careers in architecture. Credit/No Credit grading only. Total credit limited to 3 units. 1 lecture.

ARCH 105 Architectural Practice 1 (1)

Shop safety, machine and tool operation and small-scale design and construction. 1 laboratory.

ARCH 106 Materials of Construction (2)

Use and application of construction processes and materials. 2 lectures.

ARCH 111 Introduction to Drawing and Perspective (3)

Basic techniques used in graphic communication. Orthographic and isometric projection. Mechanical perspective, shades and shadows. 3 laboratories.

ARCH 121 Design and Drawing 1.1 (3)

An introduction to the issues, concepts, processes and skills pertaining to two- and three-dimensional design and the freehand and constructed representation and visual communication of ideas, objects and environments. 3 laboratories. Concurrent: EDES 101.

ARCH 122 Design and Drawing 1.2 (3)

Continuation of ARCH 121 plus the issues, concepts, processes and skills pertaining to color theory and the design and visual communication of architectural space. 3 laboratories. Prerequisite: ARCH 121 or ARCH 131.

ARCH 123 Design and Drawing 1.3 (3)

Continuation of ARCH 121 and ARCH 122 plus the issues, concepts, processes and skills pertaining to the analysis and design of architectural form, space and organizations. 3 laboratories. Prerequisite: ARCH 122 or ARCH 132.

ARCH 131 Design and Visual Communication 1.1 (4)

An introduction to the issues, concepts, processes and skills pertaining to two- and three-dimensional design and the freehand, constructed and digital representation and visual communication of ideas, objects and environments. Purchase of a laptop computer, software and peripherals is highly recommended to participate in this course. 4 laboratories. Concurrent: EDES 101.

ARCH 132 Design and Visual Communication 1.2 (4)

Continuation of ARCH 131 plus the issues, concepts, processes and skills pertaining to color theory and the design and visual communication of architectural space. Purchase of a laptop computer, software and peripherals is highly recommended to participate in this course. 4 laboratories. Prerequisite: ARCH 131.

ARCH 133 Design and Visual Communication 1.3 (4)

Continuation of ARCH 131 and ARCH 132 plus the issues, concepts, processes and skills pertaining to the analysis and design of architectural form, space and organizations. Purchase of a laptop computer, software and peripherals is highly

recommended to participate in this course. 4 laboratories. Prerequisite: ARCH 132.

ARCH 160 Digital Tools for Architecture (4)

Substantive introduction to the use of digital tools in architectural design and visual communication in the areas of 3-D modeling, 2-D drawing, image editing and page layout. 4 seminars.

ARCH 202 Creative Problem-Solving (3)

Techniques for stimulating creative behavior applied to general and environmental problems. Development of problem-solving and decision-making skills and knowledge. 3 lectures.

ARCH 204 Architectural Theory (3)

Theories of architectural design. 3 lectures. Prerequisite: EDES 101.

ARCH 207 Environmental Control Systems 1 (4)

Theory and application of climate, energy use and comfort as determinants of architectural form in small-scale buildings. Emphasis on architectural methods of ventilating, cooling, heating, and lighting for envelope-load dominated buildings. 2 lectures, 2 activities. Prerequisite: ARCH 242; concurrent: ARCH 253.

ARCH 217 History of World Architecture:**Prehistory – Middle Ages (4)****GE C3**

Architecture and urbanism in the ancient world, from prehistory to the Middle Ages. Social, cultural and physical conditions that influenced the built environment to the Mediterranean basis, plus Europe, Asia, Africa and Pre-Columbian America. 4 lectures. Fulfills GE C3.

ARCH 218 History of World Architecture:**Middle Ages – 18th Century (4)****GE C3**

World architecture and urbanism from the Middle Ages until the end of the 18th century Baroque. Social, cultural and physical conditions which influenced the built environment of Europe, Asia, and the Pre-Columbian and Colonial Americas. 4 lectures. Fulfills GE C3.

ARCH 219 History of World Architecture:**18th Century – Present (4)****GE C3**

Architecture and urbanism of the modern world, from the 18th century to the present. Social, cultural and physical conditions influencing the built environment of Europe, Asia, Africa and the Americas. 4 lectures. Fulfills GE C3.

ARCH 221 Architectural Design Fundamentals 2.1 (3)

Continuation of ARCH 123 or ARCH 133 in terms of materiality, structure and function and the theories, concepts, processes and skills pertaining to the design of architectural form, space and organizations. 3 laboratories. Prerequisite: ARCH 123 or ARCH 133.

ARCH 222 Architectural Design Fundamentals 2.2 (3)

Continuation of ARCH 221 plus the theories, concepts, processes and skills pertaining to site, context and climate as determinants that shape the built environment. 3 laboratories. Prerequisite: ARCH 221.

ARCH 231 Architectural Practice (3)

Wood construction methods and processes. Construction documents used as communication medium for such methods and processes. 1 lecture, 2 activities. Prerequisite: ARCH 106 plus ARCH 122 or ARCH 132 or ARCH 111. Corequisite: ARCH 252.

ARCH 240 Additional Architectural Laboratory (1-2)

Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

ARCH 241 Architectural Practice 2.1 (4)

The language, principles and materials of construction with an emphasis on the origin, history, and application of traditional and emergent materials. 2 lectures, 2 activities. Prerequisite: ARCH 123 or ARCH 133. Corequisite: ARCH 251.

ARCH 242 Architectural Practice 2.2 (4)

A continuation of ARCH 241 with an emphasis on the fundamental aspects of construction systems and the basics of construction documentation. 2 lectures, 2 activities. Prerequisite: ARCH 241. Corequisite: ARCH 252.

ARCH 250 Computer Applications (3)

Introduction to the application of computers in architecture. History of computing and its use in architectural practice, hardware options, operating systems, electronic mail, databases, programming languages, graphics systems, survey and use of selected applications in architecture. 2 lectures, 1 laboratory.

ARCH 251 Architectural Design 2.1 (5)

Continuation of ARCH 123 or ARCH 133 in terms of materiality and the theories, concepts, processes and skills pertaining to the analysis and design of

architectural form, space and organizations to communicate intended concepts and meanings. 5 laboratories. Prerequisite: ARCH 123 or ARCH 133; corequisite: ARCH 241.

ARCH 252 Architectural Design 2.2 (5)

Continuation of ARCH 251 plus the theories, concepts, processes and skills pertaining to light, construction and function as determinants that shape the built environment and support the communication of intended concepts and meanings. 5 laboratories. Prerequisite: ARCH 251, ARCH 241; corequisite: ARCH 242.

ARCH 253 Architectural Design 2.3 (5)

Continuation of ARCH 251 and ARCH 252 plus the theories, concepts, processes and skills pertaining to context, structure and climate as determinants that shape the built environment and support the communication of intended concepts and meanings. 5 laboratories. Prerequisite: ARCH 252 and ARCH 242; corequisite: ARCH 207.

ARCH 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Open to first-, second-, third-year students. Total credit limited to 8 units. 1 to 4 lectures.

ARCH 302 Theories of Architectural Design (3)

Theories of architecture and their application in architectural design. 3 lectures. Prerequisite: ARCH 253.

ARCH 307 Environmental Control Systems 2 (4)

Theory and application of climate, energy use and comfort as determinants of architectural form in large-scale buildings. Emphasis on architectural and mechanical methods of ventilating, cooling, heating, lighting, acoustics, and water and waste systems for internal-load dominated buildings. 2 lectures, 2 activities. Prerequisite: ARCH 207. Concurrent: ARCH 352.

ARCH 310 Architectural Design Methods and Theories (4)

Analysis of design process, methods of analysis, synthesis, and evaluation in design. Relation between methods used and theories of design. 4 lectures. Prerequisite: ARCH 253.

ARCH 313 Advanced Delineation (2)

Development of proficiency in architectural presentation. Projects and critiques. 2 laboratories. Prerequisite: ARCH 253.

ARCH 316 California Architecture and the California Dream (3)

Development of California Architecture as the symbolic expression of the myth of the California Dream. Focus on tracing California's unique contribution to architecture and urban patterns in the United States. 3 lectures. Prerequisite: ENGL 134.

ARCH 320 Topics in Architectural History (4) GE C4

In-depth examination of a significant region, movement or period in architectural history, theory and criticism. The material covered will vary depending upon the topic. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: GE Area A1 and one of the following Area C3 courses: ARCH 217, 218, 219, or ART 112. Fulfills GE C4 except for Architecture majors.

ARCH 326 Native American Architecture and Place (4) GE C4 USCP

The role of culture and setting in the construction of spatial, material and landscape concepts and artifacts, through the introduction of selected North American cultures, with focus from 1300 AD through contemporary time. 4 lectures Prerequisite: Junior standing; completion of GE Areas A , C1 and C2. *Crosslisted as ARCH/ES 326.* Fulfills GE C4 except for Comparative Ethnic Studies majors. Fulfills USCP.

ARCH 337 Photographic Presentation (2)

Media presentations in architecture with emphasis on black and white and color print photographic presentations, formats, and techniques applicable to architecture subjects and to design communication. 1 lecture, 1 laboratory. Prerequisite: ARCH 123 or ARCH 133.

ARCH 339 Video Presentations in Architecture (2) (CR/NC)

Media presentations in architecture with emphasis on video format and creative camera and editing techniques as applicable to subjects in architecture and design communication. Open to students in CAED. Credit/ No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: ARCH 123 or ARCH 133.

ARCH 340 Architectural Photography (4)

Photography specifically related to architecture and design. Advancement of students' technical skills in communicating design through the medium of photography. 2 lectures, 2 laboratories. Prerequisite: ARCH 337.

ARCH 341 Architectural Practice 3.1 (4)

Concepts, methods and processes pertaining to the detailing and construction of masonry, steel, concrete and combination structures. 2 lectures, 2 activities. Prerequisite: ARCH 242 and ARCH 253. Corequisite: ARCH 351.

ARCH 342 Architectural Practice 3.2 (4)

Continuation of ARCH 341 content plus the concepts, methods and processes pertaining to the preparation of outline specifications, production of design development drawings, life safety, systems integration and cost estimating. 2 lectures, 2 activities. Prerequisite: ARCH 341. Corequisite: ARCH 353.

ARCH 351 Architectural Design 3.1 (5)

Continuation of ARCH 253. Development and exploration of architectural theories, building systems, and design processes involved in creating appropriate architecture on a sensitive site; implications of the site as building form generator. 5 laboratories. Prerequisite: ARCE 212, ARCH 253, ARCH 207 and PHYS 122 or PHYS 132, or consent of department head. Corequisite: ARCH 341.

ARCH 352 Architectural Design 3.2 (5)

Continuation of ARCH 351. Development and exploration of architectural theories, building systems, and design processes involved in creating appropriate sustainable architecture with an emphasis on ecological and environmental concerns. 5 laboratories. Prerequisite: ARCH 351, ARCH 341. Corequisite: ARCH 307.

ARCH 353 Architectural Design 3.3 (5)

Continuation of ARCH 352. Development and exploration of architectural theories, building systems, and design processes involved in creating appropriate architecture with an emphasis on socio-cultural and space planning/life safety concerns. 5 laboratories. Prerequisite: ARCH 352, ARCH 307. Corequisite: ARCH 342.

ARCH 363 Off-Campus Orientation Seminar (2) (CR/NC)

Preparation for off-campus architectural study programs includes cultural orientation, an introduction to basic language skills, travel and housing protocols as well as academic and financial advising. Credit/No Credit grading only. Total credit limited to 4 units, with a maximum of 2 units per quarter. 2 seminars. Prerequisite: Consent of instructor.

ARCH 400 Special Problems for Advanced Undergraduates (1–2) (CR/NC)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of instructor.

ARCH 401 Toward a Barrier-Free Environment (3)

Exploring the interface between the built environment and human behavior. Physical and psychological design determinants. Attitudes towards deviancy, accessible environments and persons with disabilities. Legal, ethical, human factors. 3 lectures. Prerequisite: Junior standing or consent of instructor.

ARCH 407 Environmental Control Systems 3 (4)

Theory and application of mechanical and electrical systems for comfort. Emphasis on internal-load dominated buildings. Consideration of artificial lighting, H.V.A.C. systems, acoustics, water and waste systems. 4 lectures. Prerequisite: ARCH 307.

ARCH 413 The Built Environment: Issues and Education (3)

Identification of major issues in the design and creation of the built environment. Strategies for developing instructional units related to critical thinking and problem solving in the K-12 school setting. 1 lecture, 2 activities. Prerequisite: Junior standing.

ARCH 420 Seminar in Architectural History, Theory and Criticism (4)

Special topics based on the exploration of specific approaches, periods of time, and cultural or geographic areas. The Schedule of Classes will list topic selected. Total credit limited to 12 units; repeatable in same term. 4 seminars. Prerequisite: ARCH 217, ARCH 218, and ARCH 219.

ARCH 443 Professional Practice (4)

A critical analysis of the roles and responsibilities of the architect in providing comprehensive services to the client from project acquisition and inception to project delivery and closeout and the process and requirements for internship development and attaining registration. 2 lectures, 2 activities. Prerequisite: ARCH 342, ARCH 353.

ARCH 445 Urban Design in Architecture (3)

Design role of the urban architect. Economic, environmental and technological forces impacting on architectural practice in urban areas. 3 lectures. Prerequisite: ENGL 134.

ARCH 446 The Small Scale Master Builder (4)

Principles of practice as owner-designer-builder, selling or leasing products. Comparison with traditional practice. Potential income, constraints on design decisions, and ethics. Analysis of factors and methods relevant to such practice, including financing, taxes, accounting, market analysis, and development potential. Starting with little or no capital. 4 lectures. Prerequisite: Fourth-year standing.

ARCH 447 Design Regulations (4)

Practical application of fundamental zoning, subdivision, design/development standards, and building codes in the design review process, either in the form of a proposed development project or preparation of ordinances, codes, standards, and/or guidelines to apply to a project. 4 lectures. Prerequisite: Senior standing, or graduate standing, or consent of instructor. *Crosslisted as ARCH/CRP 447.*

ARCH 450 Digital Design and Visualization (5)

Theory, principles and techniques of computer aided architectural or product design, visualization, and digital animation. Utilization of desk-top computers and 2-D and 3-D software as integrated tools for development of a comprehensive computer enhanced design process. 5 laboratories. Prerequisite: For architecture majors, all prerequisites required by the year and course level for which the student is seeking credit; for non-architecture majors, junior standing or permission of instructor; for local professionals not seeking academic credit, permission of instructor.

ARCH 451 Architectural Design 4.1 (5)

Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multifunction singular buildings. 5 laboratories. Prerequisite: ARCE 316, ARCH 353, ARCH 342.

ARCH 452 Architectural Design 4.2 (5)

Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multibuilding, multifunctional projects. 5 laboratories. Prerequisite: ARCE 316, ARCH 353, ARCH 342.

ARCH 453 Architectural Design 4.3 (5)

Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multifunctional projects in an urban context. Total credit limited to 10 units and may substitute for ARCH 451 or ARCH 452. 5 laboratories. Prerequisite: ARCE 316, ARCH 353, ARCH 342.

ARCH 457 Computer Graphics in Architecture (4)

Two-dimensional drawing systems in architectural practice with particular emphasis on office productivity in the production side of the design process; includes drawing database administration, local area networks, management and cost issues. 2 lectures, 2 laboratories. Prerequisite: Fourth year standing.

ARCH 460 Advanced Computer Graphics in Architecture (3)

Advanced methods in the application of computer graphics and multi-media techniques in architectural design. 2 lectures, 1 activity. Prerequisite: ARCH 133 or ARCH 160 or consent of instructor.

ARCH 461 Advanced Computer-Aided Design in Architecture (3)

Advanced applications of computers in architectural design with emphasis on utilizing intelligent tools in the design process. 2 lectures, 1 activity. Prerequisite: ARCH 457 or equivalent and consent of instructor.

ARCH 462 Topics in Architectural Practice (3-4)

Selected topics addressing various aspects of Architectural Practice for advanced students in CAED. Topics may include strategic planning, managing quality, ethics, and legal considerations. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units; repeatable in same term. 3-4 lectures. Prerequisite: ARCH 342 or consent of instructor.

ARCH 463 Undergraduate Seminar (2) (CR/NC)

Discussion and lectures on problems of practice in architecture. Total credit limited to 6 units. 2 seminars. Prerequisite: Fourth-year standing in architecture. Credit/No Credit grading only.

ARCH 464 Computer Applications in Design (3)

Exposure to all aspects of two-dimensional computer-aided design. Introduction to three-dimensional CAD through the use of AUTOCAD 12 software. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

ARCH 465 Design Related Media (3)

The role of various media of visual communication as tools of documentation, analysis and creation in the design visual environment. Skills in graphics, photography, product design, film, video techniques, and printmaking graphics will be developed in specific relation to environmental design study and presentation. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

ARCH 466 Topics in Architectural History and Theory (3)

Design from its beginning with the crafts design period to its expression of industrial design in its present form. Various stages in the evolution of design explored through analyzing the influences and contributions of leading artists. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

ARCH 467 Undergraduate Research (3)

Architecture and urban theoretical intentions and results in the context of the Capitol of the United States – Washington, DC. This theoretical and historical study will not occur within the confines of the classroom, but directly within the “laboratory” of the city. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

ARCH 468 Advanced Environmental Building Systems (3)

Technologies which provide a “well building” environment by engaging in: weather protection; thermal/moisture control; natural and artificial lighting; and electrical and other “energy source” utility service. 3 lectures. Prerequisite: Junior standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

ARCH 469 Topics in Design Methods (3)

Relationship of art and architecture addressed to encourage critical debate. Historically, the “art” and the “architecture” were not as polarized as today. Both historical perspective and practical issues concerning collaboration. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior standing and current participation in the Washington Alexandria Architectural Consortium off-campus program.

ARCH 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ARCH 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

ARCH 472 Housing Concepts (3-4)

For students preparing for further study relating to housing, development density, and community design. Concepts of housing and community introduced in the context of triple bottom line development. Addresses housing design concepts and objectives; current theories in housing form; mixed-use projects; housing affordability; and fundamentals of economic development. 3-4 lectures. Prerequisite: Third-year standing or consent of instructor.

ARCH 477 Advanced Topics in Environmental Architecture (4)

Theory and application of methods used to address energy and ecological issues of integrated building and site design. The Schedule of Classes will list topic selected. Total credit limited to 12 units, repeatable in same term. 4 seminars. Prerequisite: ARCH 307.

ARCH 480 Special Studies in Architecture (1-12)

Special issues and problems through research, field trips, design projects, and other forms of investigation and involvement. Course requirements are determined prior to each individual project through a contractual agreement between students and department. The departmental Off Campus Study Guidelines apply except when superseded by guidelines and practices of the London Study Program of the College of Liberal Arts. Total credit limited to 36 units. Prerequisite: Junior standing.

ARCH 481 Senior Architectural Design Project (5)

Comprehensive building design and research project in an architectural concentration area. Demonstration of professional competency in integration of architectural theory, principles and practice with creative, organizational and technical abilities in architectural programming, design and design research.

Total credit limited to 15 units. 5 laboratories. Prerequisite: ARCH 451, ARCH 452 and ARCH 453.

ARCH 485 Cooperative Education Experience (4 or 8) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid. Formal report and evaluation by work supervisor required. Major credit limited to 20 units; total credit limited to 24 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ARCH 486 Internship Education Experience (4 or 8) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are unpaid and usually require relocation. Formal report and evaluation by work supervisor required. Major credit limited to 20 units; total credit limited to 24 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ARCH 492 Senior Design Thesis (3)

Development of the framework and format of a thesis project proposal related to the specific design option. Work to include: research topic, intent, scope, methodology, assumptions, outline of work program and documentation. To be taken concurrently with first quarter of ARCH 481. 3 seminars. Prerequisite: ARCH 451, ARCH 452 and ARCH 453. Concurrent: First quarter of ARCH 481.

ARCH 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid. Formal report and evaluation by work supervisor required. Major credit limited to 20 units; total credit limited to 24 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ARCH 496 Internship Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are unpaid and usually require relocation. Formal report and evaluation by work supervisor required. Major credit limited to 20 units; total credit limited to 24 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ARCH 501 Environmental Control Systems (3)

Comparative analysis and evaluation of mechanical and electrical building systems in high-rise and special purpose low-rise buildings. 3 seminars. Prerequisite: ARCH 407.

ARCH 510, 511 Environmental Design Methods 1, 2 (3) (3)

Application of systematic, step-by-step procedures to rational and intuitive judgmental tasks. Methods for formulation, idea production, evaluation, and testing applied to planning, testing, design information systems, communication between designer and client, user participation in design, and other current topics. 511 focuses on specific problem area among topics and may be repeated up to 9 units. 3 lectures. Prerequisite: Graduate standing.

ARCH 513 Natural Architectural Lighting (3)

Perception and awareness of light; natural light as generator of urban spaces and building forms. Principles of design in lighting fundamentals and techniques. 3 lectures. Prerequisite: ARCH 407 or consent of instructor.

ARCH 519 Theory of Architecture (3)

Comparative analysis of the major historic influences which have contributed to the development of architectural design theories. The Schedule of Classes will list topic selected. Total credit limited to 9 units. 1 lecture, 2 seminars. Prerequisite: Graduate standing.

ARCH 521 Graduate Architectural Design Project (5)

Comprehensive building design and research project in an architectural concentration area. Demonstration of professional competency in integration of architectural theory, principles and practice with creative, organizational and technical abilities in architectural programming, design and design research. Total credit limited to 15 units. 5 laboratories. Prerequisite: ARCH 407, ARCH 451, ARCH 452, ARCH 453 and 5th-year standing.

ARCH 531 Habitability (3)

Habitability standards and concepts significant for architectural design and practice. Behavioral analysis of habitats, facilities and urban systems. Design and development of structures and systems responsive to human needs. Habitability and environmental specifications, human factors, human engineering, behavioral sciences. 3 seminars. Prerequisite: Graduate standing.

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 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing or consent of instructor.

ARCH 580 Seminar in Theory of Architecture (3)

Directed group study of selected topics in the theory of architecture for graduate students. The Schedule of Classes will list topic selected. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing.

ARCH 592 Graduate Design Thesis (3)

Development of the framework and format of a thesis project proposal related to the specific design option. Work to include: research topic, intent, scope, methodology, assumptions, outline of work program and documentation. To be taken concurrently with first quarter of ARCH 521. 3 seminars. Prerequisite: 5th year standing or consent of instructor.

ARCH 598 Master's Design Project (3-6)

Completion of a master project demonstrating in-depth research ability at a graduate level. Total credit limited to 9 units. 3 or 6 laboratories. Prerequisite: Consent of graduate advisor.

ARCH 599 Master's Thesis (1-9)

Completion of a thesis embodying original research in an area of environmental design. Total credit limited to 9 units. Prerequisite: Consent of graduate advisor.

ART

ART 101 The Fundamentals of Drawing (4)

GE C3

Introduction to the artistic practice and cultural value of drawing from the Renaissance to the 21st Century. Emphasis and expansion of the practical skills of observation, rendering, and understanding the signs of meaning produced in visual art. Development of formal techniques, media experimentation, and content creation through personal expression. Exercises to encourage growth in technical skill, conceptual innovation, critical thinking, and visual communication. 3 lectures, 1 laboratory. Fulfills GE C3.

ART 105 Foundation: Color Theory (4)

Beginning color theory covering hue, value, intensity and complementary mixtures. Spatial effects, cultural context and psychological aspects of color. 3 lectures, 1 laboratory.

ART 106 Foundation: 2-Dimensional Design (4)

Elements and principles of design, the interrelationship between form and content and creative problem solving strategies. 3 lectures, 1 laboratory. Prerequisite: ART 105.

ART 107 Foundation: 3-Dimensional Design (4)

Elements, principles and criticism of three-dimensional design. Historical, contemporary and multidisciplinary topics. 3 lectures, 1 laboratory. Prerequisite: ART 106.

- ART 111 Introduction to Art (4)** **GE C3**
Designed to acquaint the non-art major with painting, sculpture, drawing, crafts, architecture and printmaking. Development of vocabulary, analytic skills, and research techniques for the understanding of art objects. 4 lectures. Fulfills GE C3.
- ART 112 Survey of Western Art (4)** **GE C3**
History of major art movements in western civilization from ancient art to the twentieth century. Representative periods of western culture, such as the ancient world, the Middle Ages, the Renaissance, and the modern world. 4 lectures. Fulfills GE C3.
- ART 121 Basic Digital Photography (4)**
Fundamental techniques in photography. Mechanics of digital cameras and equipment, optics, composition, filters, and subject content. Understanding photographic principles. Digital camera required. 3 lectures, 1 laboratory.
- ART 148 Beginning Sculpture (4)** **GE C3**
Exploration of three dimensional form through problems in modeling, casting, carving, and techniques of assembly. Historical and contemporary concepts as applied to the discipline of sculptural styles. 3 lectures, 1 laboratory. Fulfills GE C3.
- ART 182 Photographic Manipulation and Design (4)**
Introduction to photographic image manipulation software for design, photography and studio students. Fundamental technical skills of current software and their potential for content creation, invention and expression. 3 lectures, 1 laboratory.
- ART 183 Digital Illustration and Design (4)**
Introduction to digital illustration. Fundamental technical skills and their potential for content creation, invention and expression. 3 lectures, 1 laboratory. Prerequisite: ART 182.
- ART 184 Digital Book Making and Design (4)**
Introduction to book making. Fundamental technical skills of current software as well as their potential for content creation, invention, and expression. Desktop publishing as well as the creation of fine art books. 3 lectures, 1 laboratory. Prerequisite: ART 182.
- 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 (4)**
Development of additional drawing techniques with emphasis on form content, pictorial space, B/W media, color, mixed media and composition. 3 lectures, 1 laboratory. Prerequisite: ART 101, 106, or consent of instructor.
- ART 203 Art Theory and Practice (4)**
Contemporary issues in art and design, linking "ideas" to development of concepts. Emphasis on individual creative process, and problem solving. Focus on contemporary critical thinking regarding aesthetics, techniques, and vocabulary. 3 lectures, 1 laboratory. Prerequisite: ART 101 and ART 106, or consent of instructor.
- ART 209 Beginning Painting (4)**
Introduction to technical and formal problems in painting. Exploration of pictorial space, light, and color from observation. Physical characteristics of paint, various tools, studio methods, and styles of painting. 3 lectures, 1 laboratory. Prerequisite: ART 101 and ART 105 or consent of instructor.
- ART 211 Art History—Ancient to Renaissance (4)**
Development of art from antiquity to the early stages of the Renaissance in Europe. Particular emphasis on European art with appropriate references to sources from antiquity which have been particularly influential on European painting and sculpture. Comparison of relevant parallel examples of the art of non-European cultures. 4 lectures.
- ART 212 Art History—Renaissance through Baroque Eras (4)**
The significant visual expressions of Northern and Southern European art of the Renaissance and Baroque period. Relevant parallel examples of the art of non-European cultures. 4 lectures.
- ART 222 Black and White Photography (4)**
Control of tonal range using 35mm cameras and available daylight illumination. Assignments encourage development of composition and visual communication skills. Emphasis on "photographic seeing" and professional quality enlargements. 2 lectures, 2 laboratories.
- ART 224 Introduction to Artificial Lighting for Photography (4)**
Studio lighting is used to introduce the student to contemporary professional studio photography. Quality developing and printing skills are required. Introduction to current examples of professional studio lighting. 3 lectures, 1 laboratory.
- ART 227 Lifestyle Photography (4)**
Studio and environmental portraiture. Emphasis on light ratios/patterns; posing; personality portrayal. 3 lectures, 1 laboratory. Prerequisite: ART 224.
- ART 237 Graphic Design I (4)**
Exploration of the technical and conceptual underpinnings of graphic design. Focus on the design process and how raw ideas are translated into professional work. For Art and Design majors only. 3 lectures, 1 laboratory. Prerequisite: ART 107 and ART 184, or consent of instructor.
- ART 238 Typography I (4)**
Fundamentals of theory, practice, technology and history of typography. Exercises include the study of letterforms, type with image, proportion and grids, hierarchy, and legibility. For Art and Design majors only. 3 lectures, 1 laboratory. Prerequisite: ART 237 or consent of instructor.
- ART 241 Introduction to Glass Fusing and Forming (4)**
Studio course in the creative processes of fusing, forming, and assembling glass. Introduction to the use of line, color, and texture related to glass as a transparent or opaque material. Total credit limited to 8 units. 1 lecture, 3 activities. Prerequisite: ART 101 and ART 107 or ART 148 or consent of instructor.
- ART 245 Ceramics I (4)**
Studio course in basic clay working with emphasis on design quality, hand building, and use of the potter's wheel. 3 lectures, 1 laboratory. Prerequisite: ART 107 or consent of instructor.
- ART 260 Art Critique and Discourse (4)**
Developing an individual "body" of artwork. Rigorous critiques, lectures, and seminar-style discussions aimed at forming a "process" for discussing artwork. Art writing, research, and individual conceptual and formal development. 4 lectures. Prerequisite: ART 101 and ART 107.
- ART 270 Selected Topics (1–4)**
Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.
- ART 301 Advanced Drawing (4)**
Development of advanced methods and techniques in rendering form, composing pictorial space, expanding formats, color, content, and contemporary issues in drawing as a discipline. Emphasis on problem-solving and finished works for a student's portfolio. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: ART 201 or ART 302.
- ART 302 Life Drawing I (4)**
Development of advanced drawing methods and techniques in the study of the human form and structure as it relates to proportion, anatomical analysis, and figure/ground relationships. Understanding materials, techniques, and ideas in the practice of contemporary figure drawing. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: ART 101.
- ART 309 Intermediate Painting (4)**
Continuation of study of technical and formal problems in painting. Emphasis on the creative process, development of individual ideas, and the connection between form and content. Contemporary issues in painting introduced. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: ART 209, or consent of instructor.
- ART 310 Art History—American Art (4)**
Major historical periods of American art from the colonial period to the present. Special emphasis will be given to the broader notion of American art as a process of developing an identity of the varied historical and sociological forces that have shaped images in American art. 4 lectures. Prerequisite: ART 112 or ART 211 or ART 212 or consent of instructor.
- ART 311 Art History—Nineteenth Century Art (4)** **GE C4**
History of painting and sculpture from the French Revolution to the beginning of the 20th century. Focuses on significant movements such as Neo-Classicism, Romanticism, Realism, Impressionism and Post-Impressionism. 4 lectures. Prerequisite: Junior standing; completion of GE Area A and ART 111 or ART 112 or ART 211 or ART 212. Fulfills GE C4 except for Art and Design majors.
- ART 312 Art History—Modern Art, 1900-1945 (4)**
History of visual arts from the beginning to the middle of the twentieth century. Focus on significant European movements such as Fauvism, German

Expressionism, Cubism, Dada, and Surrealism, as well as American Modernism. 4 lectures. Prerequisite: ART 111 or ART 112 or ART 211 or ART 212, or consent of instructor.

ART 313 Design History (4)

Survey of design from the Victorian era to the present, including major philosophies and movements, political, social, cultural, and technological trends that influenced designers in the 20th century. 4 lectures. Prerequisite: ART 112 or ART 211 or ART 212 or consent of instructor.

ART 314 History of Photography (4) GE C4

In-depth survey of the artistic and cultural achievements in photography from its invention to the present day. Significant photographers, the evolution of aesthetic criteria in the context of other visual arts as well as social/cultural impact. 4 lectures. Prerequisite: Completion of GE Areas A and C3. Recommended: Junior standing. Fulfills GE C4 except for Art and Design majors.

ART 315 Art History--Art Since 1945 (4)

History of visual art from 1945 to the present. Focus on significant movements such as Abstract, Expressionism, Pop art, minimalism, conceptual art, earthworks, feminism, and postmodernism. Also focus on new media such as performance, video, and installation. 4 lectures. Prerequisite: ART 111 or ART 112 or ART 211 or ART 212, or consent of instructor.

ART 316 Women as Subject and Object in Art History (4)

Exploration of the role of women in the visual arts. Women as artists, women as portrayed in art, and feminist theory as it applies to the study of the visual arts and art history. 4 lectures. Prerequisite: ART 111, ART 112 or ART 211 or ART 212, or consent of instructor. *Crosslisted as ART/WGS 316.*

ART 317 Asian Art Survey (4)

Survey of the traditional arts of Asia – primarily India, China and Japan. Emphasis on the connections between the visual arts in Asia and the philosophical, social and cultural environments in which they arose. 4 lectures. Prerequisite: ART 111 or ART 112 or ART 211 or ART 212, or consent of instructor.

ART 318 Asian Art Topics: National, Religious, and Intellectual Movements (4) GE C4

In-depth examination of significant art movements in Asia. Each topic will focus on the development of art in Asia within the context of a specific geographical or theoretical framework. Details will vary depending on topic. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Junior standing; completion of GE Areas A and C3. Fulfills GE C4 except for Art and Design majors.

ART 324 Photographic Expression (4)

Emphasis on personal expression and developing style, introduction to symbology, visual source development and the work of contemporary creative photographers. 2 lectures, 2 laboratories. Prerequisite: ART 222.

ART 325 Advanced Camera Techniques (4)

Advanced camera techniques using large format film and/or digital cameras. Use of architectural exteriors, interiors, landscapes and simple studio set-ups to assist mastery of large format cameras. Other topics include perspective and sharpness correction, lighting (available and artificial), digital imaging and studio equipment. High quality imaging for commercial application emphasized. 3 lectures, 1 laboratory. Prerequisite: ART 224.

ART 329 Editorial Photography (4)

Creating, lighting and executing editorial assignments. Producing photography for corporate needs, i.e. annual reports, brochures and in-house publications. Emphasis on selecting subject matter and handling lights. 3 lectures, 1 laboratory. Prerequisite: ART 325.

ART 330 Book Arts (4)

Numerous traditional book structures and derivations including accordion, pamphlet, stab, and multiple signature construction. Emphasis on both craftsmanship and experimentation. Hands-on experience and a broad historical overview of paper and book arts. 3 lectures, 1 laboratory. Prerequisite: ART 107, or consent of instructor.

ART 334 Illustration I: Techniques and Tools (4)

Introduction to the basic practices of commercial illustration as used in the visual communications industry. Emphasis on the generation of ideas, rendering techniques and tools, and self marketing methods, with an overview of the history of illustration. 3 lectures, 1 laboratory. Prerequisite: ART 101 or consent of instructor.

ART 336 Exhibition Design/Museum Studies (4)

Theory and applied principles of exhibition design for art objects in the museum or gallery setting. Class responsible for planning and installing actual gallery exhibitions. 3 lectures, 1 laboratory. Prerequisite: ART 107, or consent of instructor.

ART 337 Graphic Design II (4)

Exploration of identity design problems through the use of symbolism and metaphor. Design and implementation of corporate logos. For Art and Design majors only. 3 lectures, 1 laboratory. Prerequisite: ART 237 and ART 238.

ART 338 Typography II (4)

Exploration of typography in the form of text. Application of different typefaces, composition, layout and page systems for the design of periodicals and books. For Art and Design majors only. 3 lectures, 1 laboratory. Prerequisite: ART 238.

ART 341 Glassblowing (4)

Survey of history of glass and introduction to contemporary glass art, presented through visual examples in slide/lecture format. Development of tools and forming processes introduced while student develops 3-dimensional projects. Total credit limited to 8 units. 3 lectures, 1 activity. Prerequisite: ART 101 and ART 148, or consent of instructor.

ART 345 Ceramics II (4)

Studio course in hand, wheel, mold, extruder, jigger, and press forming skills. Design of single and multiple forms and kiln firing procedures. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: ART 107 and ART 148, or ART 245, or consent of instructor.

ART 348 Intermediate Sculpture (4)

Intermediate sculpture course in expressive use of form with modeling, casting, carving, and/or assembly. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: ART 107 and ART 148, or consent of instructor.

ART 353 Intermedia/Art (4)

Studio course emphasizing individual and collaborative creative exploration with project content derived from student's experience. Focus on using traditional as well as new genres of artistic expression such as site specific installations, video art, book works, and performance art. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: ART 101, ART 106, and ART 148, or consent of instructor.

ART 360 Professional Practices (2)

Professional practices in the art, photography, and design fields, including legal and ethical issues, taxes, contracts, fees and copyrights. Current job opportunities are researched and a business plan is prepared. Course lectures augmented by visiting professionals. For Art and Design majors only. 2 lectures. Prerequisite: Junior standing.

ART 370 Michelangelo (4) GE C4

The art and life of Michelangelo (1475-1564), the renowned painter, sculptor, architect, and poet, with reference to early biographies, his artistic development, and the demands of his patrons. 4 lectures. Prerequisite: Completion of GE Area A, and one course from Area C3 or ART 211 or ART 212. Recommended: Junior standing. Fulfills GE C4 except for Art and Design majors.

ART 371 Topics in Renaissance Art (4) GE C4

A thematic analysis of Renaissance Art (1300-1600) with special attention paid to politics, patronage, myth, religion, and the development of new genres and subject matter. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Area A, and one course from Area C3 or ART 211 or ART 212. Recommended: Junior standing. Fulfills GE C4 except for Art and Design majors.

ART 380 Design Principles for the Web (4)

Exploration of design principles in the development of websites that are interactive, dynamic, and visually imaginative. Emphasis on color, typography, organization, and content. For Art and Design majors only. 3 lectures, 1 laboratory. Prerequisite: ART 237 and ART 238.

ART 383 Digital Video (4)

Video and computer generated multimedia presentation scripting, editing, storyboarding and sound cutting. Emphasis on effective communication using presentation techniques and application software to create high impact applications. 2 lectures, 2 laboratories. Prerequisite: ART 182.

ART 384 Digital 3D Modeling and Design (4)

Development of skills and techniques in the use of three-dimensional design and modeling via digital technology. Capabilities of current software in the design and modeling of three-dimensional form. 2 lectures, 2 activities. Prerequisite: ART 107 and ART 182, or consent of instructor.

ART 388 Web Design (4)

Planning and implementation of web sites. Focus on site structure, navigation, HTML, animation, and design considerations. Art and Design majors only. 3 lectures, 1 laboratory. Prerequisite: ART 182, ART 238, or consent of instructor.

ART 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Senior standing and consent of instructor.

ART 402 Life Drawing II (4)

Advanced problems in life drawing. Advanced methods and techniques in the study of the human form as it relates to proportion, anatomy analysis and composition. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: ART 302.

ART 406 Contemporary Issues in Painting (4)

Focused investigation into contemporary topics in painting, with connections made to traditional approaches. Formal concerns (color, space, light, composition) balanced with conceptual development. Topics may include, but are not limited to, the human figure, landscape, and technological influences. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: ART 309 or consent of instructor.

ART 409 Advanced Painting (4)

Advanced problems in painting. Emphasis on the creative process from concept to finished art. Investigation of traditional, non-traditional and explorative work. To encourage development of personal approach. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: ART 309, or consent of instructor.

ART 410 Art History Methodologies and Research (4)

Current and historical methods for the study of art history including formalism, social history, semiotics, feminism, cultural diversity. Completion of a major research paper or writing project on an art historical topic. 4 seminars. Prerequisite: Completion of GE Area A and two art or architectural history courses, including one at the 300- or 400-level.

ART 425 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 427 Advertising Photography (4)

Applied principles of design and color to produce a photograph that sells an idea, product, or service. Both traditional and digital applications used. Joint projects with ART 432, Advertising Design. Emphasis on thinking, planning, interpreting, and presenting an idea photographically. 3 lectures, 1 laboratory. Prerequisite: ART 325 and senior standing.

ART 432 Advertising Design (4)

Development of print advertising from concept to final presentation. Emphasis on art direction, photo direction and copywriting. For Art and Design majors only. Computer applications are required for appropriate problems. 3 lectures, 1 laboratory. Prerequisite: ART 337 and ART 338 and senior standing or consent of instructor.

ART 434 Illustration II (4)

Advanced development of concepts and illustration techniques and skills, both as analogue and digital, for use in a variety of graphic design applications such as editorial/publication, retail, educational, technical, or advertising purposes. For Art and Design majors only. 3 lectures, 1 laboratory. Prerequisite: ART 334, ART 209, or consent of instructor.

ART 437 Graphic Design III (4)

Advanced graphic design. The creation of basic 3-D structures, and the application of graphics in 3-D environments (such as package design and signage). Emphasis on integrative communication activity of all elements including: color, graphics, 3-D forms, typography, and constructions, and includes market research. For Art and Design majors only. 3 lectures, 1 laboratory. Prerequisite: ART 337 and ART 338.

ART 438 Typography III (4)

Advanced exploration of communication and structural aspects of typography. Focus on experimentation and expressively using type to enhance meaning. For Art and Design majors only. 3 lectures, 1 laboratory. Prerequisite: ART 338 or consent of instructor.

ART 439 Type in Motion (4)

Sequential organization of typographic information in time and how ideas such as intonation, proximity, pacing, rhythm and progression can influence and shape

meaning. Focus on animated typography for a range of applications. For Art and Design majors only. 3 lectures, 1 laboratory. Prerequisite: ART 438, ART 488.

ART 440 Advanced Selected Topics in Glass (4)

Continued exploration into the expressive use of glass as a creative medium. Topics may include glass casting, glass blowing, cane work, mold making, and kiln work. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 2 lectures, 2 activities. Prerequisite: ART 241 or ART 341, or consent of instructor.

ART 448 Advanced Topics in Sculpture (4)

Studio course specializing in three-dimensional form. Materials include clay, plaster, metal, or wood. Course content will be selected from various topics that are representational, abstraction, non-objective, or conceptual. The Schedule of Classes will list topic selected. Total credit limited to 8 units; may be in same term. 3 lectures, 1 laboratory. Prerequisite: ART 348.

ART 462 Senior Portfolio Project (2)

Preparation of portfolio system for entrance into the professional job market or graduate school. 2 activities. Prerequisite: Senior standing and ART 360.

ART 468 Portfolio Production (1)

Physical production of final portfolio for the graduating senior. 1 laboratory. Prerequisite: Senior standing; concurrent enrollment in ART 462 required.

ART 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ART 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

ART 474 Collaborative Studio: Rendering, Animation and Modeling (4)

A collaborative visualization and design studio focusing on rendering, animation and modeling. Modeling and animation software for design conceptualization and expression. Collaboration in teams. Total credit limited to 8 units. 2 lectures, 2 activities. Prerequisite: ART 384 or consent of instructor.

ART 484 Animation, Video, and Interactive Design (4)

Creation of in-depth animations and interactive presentations. Advanced scripting, storyboarding, video production, and interactive communication techniques. 3 lectures, 1 laboratory. Prerequisite: ART 182.

ART 486 Photography: Image and Idea (4)

Advanced communication and expression through primarily digital methods. Emphasis on the development of conceptual skills and problem solving methods and technical skills aimed toward the development of a creative voice. Analysis of contemporary practice in the field of photography and other visual media. 3 lectures, 1 laboratory. Prerequisite: ART 222, ART 314.

ART 488 Advanced Web Design (4)

Conceptual and technical objectives: the development of the theoretical skills necessary to design a successful web user interface, information architecture and visual identity for digital projects, and the development of technical skills necessary to design advanced interactivity with Macromedia Flash and JavaScript. 3 lectures, 1 laboratory. Prerequisite: Art and Design majors only, ART 388, or consent of instructor.

ART 489 Advanced Interactive Media Art (4)

Advanced topics in the digital media field such as interface design, information architecture techniques, digital typography and interactive storytelling. Survey of new applications of design for the new media, and the development of digital portfolio pieces. 3 lectures, 1 laboratory. Prerequisite: ART 488, or consent of instructor.

ART 494 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 12 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. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 12

units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ASCI-ANIMAL SCIENCE

ASCI 101 Introduction to the Animal Sciences (2) (CR/NC)

Economic, environmental and societal impact of the livestock, poultry and horse industries. Basic terminology, anatomy, and physical requirements of animals. Career and academic planning. Co-curricular, extra-curricular, and post-graduate opportunities. Required of all first-time students in the Animal Science Department. Credit/No Credit grading only. 2 lectures.

ASCI 112 Principles of Animal Science (4)

Economic and environmental roles of animal production and companionship to society. Introductory nutrition, genetics, reproduction, behavior, growth and development, animal products, biosecurity, and food processing and safety of animals. 4 lectures. Fulfills GE B2 except for ASCI and AGSC majors.

GE B2

ASCI 200 Special Problems for Undergraduates (2-3) (CR/NC)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of instructor.

ASCI 203 Animal Parasitology (3)

Identification, life cycles, prevention and control of the common external and internal parasites causing economic loss in livestock. 3 lectures. Prerequisite: BIO 111 or BIO 161.

ASCI 211 Meat Science (4)

Muscle food processing methods and operations. Conversion of muscle to meat. Meat inspection, grading, composition, curing, preservation, food safety and related topics. Carcass beef, pork, and lamb processed into consumer ready products. 3 lectures, 1 laboratory.

ASCI 212 Livestock Show Management (3)

Application of the management and operations of Cal Poly's Western Bonanza Livestock Show. Principles and procedures in planning, organizing, financing, promoting and managing a major livestock show and the fair industry. Total credit limited to 6 units. 1 lecture, 2 activities. Not open to students with credit for ASCI 412 or ASCI 413.

ASCI 214 Equine Management (2)

Application of safety, risk reduction, horsemanship skills. Develop a working equine/human relationship. Selection and application of nutrition, equipment, preventive health and farrier program, and equitation skills. 2 laboratories. Prerequisite: Consent of instructor.

ASCI 216 Meat Grading and Evaluation (2)

Factors related to carcass quality and yield. USDA meat grading principles and practices. Judging of carcass and wholesale cuts. Field trip to meat packing plants required. 1 lecture, 1 laboratory. Prerequisite: ASCI 211.

ASCI 220 Introductory Animal Nutrition and Feeding (4)

Nutrient digestion and absorption; basic functions of major nutrient classes; NRC feed classification and feedstuff characteristics; Van Soest system of fiber analysis and practical applications; feed processing: effects on feeds and nutrient availability; nutrient requirements of animals; diet formulation techniques. 3 lectures, 1 laboratory. Prerequisite: ASCI 112.

ASCI 221 Introduction to Beef Production (4)

Survey of industry characteristics, breeds, market classes, production systems, and current issues facing the beef industry. 3 lectures, 1 laboratory. Prerequisite: ASCI 112.

ASCI 222 Systems of Swine Production (4)

Structure of the pork industry in the U.S.; production standards and new technologies; breed systems. Market classification, product quality and quality assurance. Swine behavior and husbandry systems; biosecurity, health and feeding systems and management. 3 lectures, 1 laboratory. Prerequisite: ASCI 112.

ASCI 223 Systems of Sheep Management (4)

Sheep industry overview, populations, trends, cultural implications, breed identification, nutritional, reproductive, health, and marketing management of sheep. 3 lectures, 1 laboratory. Prerequisite: ASCI 112.

ASCI 224 Equine Science (4)

History, status of the horse industry, breeds. Application of management skills, safety, conformation evaluation, hoof and leg conformation and care.

Understanding equine behavior. Insurance and tax ramifications. Pedigree analysis. Alternate therapies. 3 lectures, 1 laboratory. Prerequisite: ASCI 112.

ASCI 225 Introduction to Poultry Management (4)

Introduction to modern techniques in poultry production, processing, marketing and price discovery. Consumption trends, breeds and consumer grades. Laboratory application of management skills, health care, keeping of production and accounting records and processing techniques. 3 lectures, 1 laboratory.

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 227 Companion Animal Science (4)

Companion animal anatomy and physiology, reproduction, nutrition, behavior, management, common parasites, and infectious diseases. Scientific method in studying the human-animal bond. Application of biological concepts to problems related to companion animals. Trends in pet industry including animal welfare issues. 3 lectures, 1 laboratory.

ASCI 228 Equine Evaluation (2)

Appraisal of equine breeds at halter and in performance classes. Evaluate horse classes, decide their order of placement, and then orally justify these decisions to a judge. The relationship of equine anatomy and physiology on competitive performance. 2 laboratories.

ASCI 229 Anatomy and Physiology of Farm Animals (4)

Comprehensive overview of the principal systems of farm animals using an integrative, systemic approach to learning the homeostasis of mammalian organisms so the information can be applied to their daily care and management. 3 lectures, 1 laboratory.

ASCI 232 General Animal Science Laboratory (1)

Basic handling skills of livestock; introductory selection of livestock; basic feedstuff identification and processing; and health care practices. 1 laboratory.

ASCI 260 Preparation of Livestock for Shows and Sales (3)

Techniques, equipment and knowledge necessary in order to properly condition, groom, and present beef cattle or horses for evaluation and merchandising. 3 activities.

ASCI 265 Equine Behavior and Training (3)

Training of weanling and yearling horses at halter. Selection of proper attire for the handler and equipment for the horse. Application of safe, behavioral training techniques enabling the horse to accept handling, farrier and health care. 3 activities.

ASCI 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

ASCI 290 Animal Production and Management Enterprise (1-5) (CR/NC)

Beginning field experience in animal production systems. May include health, nutrition, reproduction, management, processing, budgeting, and/or marketing exercises. Total degree credit for ASCI 290/ASCI 490 limited to 6 units. Credit/No Credit grading only. 1-5 lectures. Prerequisite: Consent of instructor.

ASCI 304 Animal Genomics (3)

Application of genetic principles for domestic animal improvement. Improving animal performance and health through use of genetic markers and diagnostics, gene mapping, and related current technologies. 3 lectures. Prerequisite: BIO 302 or BIO 303 or BIO 351.

ASCI 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: ASCI 225.

ASCI 310 Technical Veterinary Skills (4)

Restraint and handling of animals, physical examination, necropsy procedure, basic wound management, applied pharmacology. Reproduction and herd health programs. 3 lectures, 1 laboratory. Prerequisite: ASCI 229.

ASCI 311 Advanced Beef Cattle System Management (4)

Management principles for the sustainability of commercial beef cattle operations. Systems approach for goal setting, financial analysis, range management, breeding systems, nutrition, health programs, marketing, and

production practices to enhance profitability of commercial cow-calf operations. 3 lectures, 1 laboratory. Prerequisite: ASCI 221 or consent of instructor.

ASCI 312 Production Medicine (3)

Basic disease concepts. Fundamentals of immunology and therapeutics. Disease prevention principles, infectious and non-infectious. Pre-harvest food safety and milk and meat quality assurance. Herd health management programs for production efficiency and product quality. 3 lectures. Prerequisite: ASCI 221 or ASCI 223; ASCI 225 or ASCI 222; ASCI 224 or ASCI 227; and ASCI 229.

ASCI 315 Equine Biomechanics (4)

Anatomy and physiology of the equine hoof and limb. An understanding of the art and science of the farrier's work. Evaluation of proper hoof care, trimming, and shoeing. Foot and leg conformation as it relates to sound locomotion. 3 lectures, 1 activity. Prerequisite: ASCI 224 or equivalent. Recommended: ASCI 229.

ASCI 320 Physiological Chemistry of Animals (4)

Interactions between the biological and chemical reactions in livestock. Physiology explained at the organ, tissue and cellular level as it relates to the whole animal system. 4 lectures. Prerequisite: CHEM 312 or CHEM 316, ASCI 229.

ASCI 321 Zoonoses and Veterinary Public Health Concerns (4)

Public health concerns including: animal and bird diseases which may be transmitted to people; pre-harvest food safety and handling concerns; and environmental public health hazards. 3 lectures, 1 activity. Prerequisite: BIO 111 or BIO 161.

ASCI 324 Advanced Equine Evaluation (2)

Appraising the relative merit of individual horses in halter and performance through the application, development and refinement of deductive and inductive logical processes. Oral and written expression of the selection rationale. 2 laboratories. Prerequisite: ASCI 228 or consent of instructor.

ASCI 325 Egg Production, Processing and Distribution (4)

Management of replacement pullets and laying hens including flock scheduling, vaccination and handling procedures, nutrition management, costs of operation and production projections. Quality determination, processing, sales and distribution of shell eggs and egg products. 3 lectures, 1 laboratory. Prerequisite: ASCI 225.

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 (4)

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, 1 laboratory. Prerequisite: Junior standing or consent of instructor.

ASCI 330 Poultry Meat Production and Processing (4)

Modern production techniques for the poultry meat industry. Management of hatcheries, broiler and/or turkey meat production, processing and further processing. 3 lectures, 1 laboratory. Prerequisite: ASCI 225.

ASCI 333 Equine Reproduction (5)

Management of the breeding farm, breeding problems, diseases, study of estrus cycles, servicing the mare, handling stallions. Breeding systems, teasing, embryo transfer, ultrasound pregnancy diagnosis, new developments in breeding technology. 4 lectures, 1 laboratory. Prerequisite: ASCI 224 and ASCI 229.

ASCI 339 Internship in Animal Science (1–12) (CR/NC)

Selected Animal Science students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

ASCI 342 Poultry Business Management (4)

Organization and management of vertically integrated poultry operations. Personnel management, cash flow analysis, cash vs. accrual accounting, structuring of financial statements, projecting product outputs and cash flow needs, employee benefit programs and insurance needs for poultry companies. 4 lectures. Prerequisite: ASCI 225 or consent of instructor.

ASCI 344 Equine and Human Communication (3)

Behavior of the horse and its relationship with people. Learning, motivation, social behavior and communication with techniques to improve the safety and understanding between people and horses. 3 activities. Prerequisites: ASCI 214, or consent of instructor.

ASCI 345 Equine Behavior Modification (5)

Advanced principles of equine behavior modification for training young horses under saddle. Identifying differences in individual horse's attitudes, techniques to teach horses to respond to different stimuli, management of young equine athlete. 5 activities. Prerequisite: ASCI 344 and consent of instructor.

ASCI 346 Equine Nutrition (4)

Equine digestion, diet development considerations and evaluations, nutritional management, and the relationship of respective topics to recommended feeding practices, research data, and nutritional portfolios. Information is based on recent advances in horse nutrition and the National Research Council's Nutrient Requirements for Horses. 3 lectures, 1 laboratory. Prerequisite: ASCI 220 and ASCI 224.

ASCI 347 Equine Exercise Physiology (3)

Applied physiology of the exercising horse. Examine different physiological systems: muscular, cardiovascular, respiratory, and nutritional. Gait analysis, lameness, and treatment. The athletic horse: sports medicine, conditioning, drugs, and necropsy evaluation. A distance learning course. 3 lectures. Prerequisite: ASCI 224 and ASCI 229 or consent of instructor.

ASCI 350 Applied Nonruminant Nutrition (4)

Comparison of nonruminant and ruminant digestive systems, nutrient requirements, risk management for ingredients, formulation and nutritional management. Influence of growth and production curves, consumption patterns, and feeding management in commercial poultry and swine industries. Feed manufacturing and governmental regulations. 3 lectures, 1 laboratory. Prerequisite: ASCI 220.

ASCI 351 Reproductive Physiology (4)

Reproductive anatomy of male and female farm animals. General endocrinology and systemic physiology. Endocrine system effects on the various aspects of reproduction, such as: gametogenesis, estrus, gestation, parturition, mothering and seasonality. Introduction to reproductive biotechnology and embryo manipulation. 3 lectures, 1 laboratory. Prerequisite: ASCI 229.

ASCI 355 Ruminant Nutrition (4)

Digestive physiology and nutrition of ruminants. Anatomy and physiology of the digestive tract. Rumen microbial fermentation. Nitrogen utilization and metabolism. Energy partitioning. Net energy system. Range livestock and feedlot nutrition. Supplementation. Common metabolic and nutritional dysfunctions. Diet formulation. 3 lectures, 1 laboratory. Prerequisite: ASCI 220; ASCI 320 or CHEM 313 or CHEM 371.

ASCI 363 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, résumé, and cover letter. 2 seminars. Prerequisite: Junior standing.

ASCI 366 Veterinary Pharmacology (4)

Investigation of pharmacological principles applied to animal systems. Overview of drugs acting on the nervous, endocrine, circulatory, urinary systems, and reproductive systems, specialty areas of pharmacology, and pharmacogenomics of livestock and companion animals. 3 lectures, 1 activity. Prerequisite: CHEM 111 or CHEM 127, and ASCI 229.

ASCI 384 Processed Meat Products (4)

Physical, chemical and functional characteristics of meat food raw materials. Science and technology of value-added processing including curing, sausage manufacture, low moisture products, and restructuring. Quality assurance and related current industry topics. 3 lectures, 1 laboratory. Prerequisite: ASCI 211 and junior standing.

ASCI 400 Special Problems for Advanced Undergraduates (2–4) (CR/NC)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of instructor.

ASCI 403 Applied Biotechnology in Animal Science (5)

Coverage of current resources, techniques and methodologies used in animal research and biotechnology as well as experimental design, model assessment, and data interpretation with application to an experimental setting in the laboratory. 3 lectures, 2 laboratories. Prerequisite: BIO 161, BIO 162, upper

division genetics course (BIO 302 or BIO 303 or BIO 351 or ASCI 304) or consent of instructor.

ASCI 405 Domestic Livestock Endocrinology (4)

Endocrine system and its role in the homeostasis of the animal. Use of hormones in increasing productivity of domestic animals. Endocrinology of reproduction, growth, metabolism and immunology. Discussions of cost-benefit relationships in the use of hormones. 4 lectures. Prerequisite: ASCI 229.

ASCI 406 Applied Animal Embryology (5)

Technology of promoting oocyte development, fertilization, culturing, cryopreservation and micromanipulation of embryos. Mouse, cattle and horse embryos used for learning the techniques involved in embryology. 3 lectures, 2 laboratories. Prerequisite: ASCI 229 and ASCI 351.

ASCI 410 Applied Animal Behavior Science (4)

Principles of behavior applied to animals in managed environments. Observation and measurement of behavior, including sampling and recording methods. Learning, including training and operant conditioning. Discussion of issues related to behavioral welfare. Etiology and management of maladaptive behavior. 3 lectures, 1 laboratory. Prerequisite: ASCI 320, or CHEM 313 or CHEM 371, and ASCI 221, or ASCI 222, or ASCI 223, or ASCI 224, or ASCI 225, or ASCI 227.

ASCI 412 Advanced Livestock Event Planning (3)

Organization and planning for the Western Bonanza Junior Livestock Show. Establishment of committee assignments and show manager responsibilities. Corporate partnerships established and fund raising begun. Planning for activities and guest speakers and new student recruitment. Total credit limited to 6 units. 1 lecture, 2 activities. Prerequisite: ASCI 212, AGB 314 and consent of instructor.

ASCI 413 Advanced Livestock Event Management (1)

Student management of the Western Bonanza Junior Livestock Show. Leadership skills, team building, media relations, use of computer applications, livestock and fair industry contacts and mentoring to new students. Application of knowledge learned in ASCI 412. Total credit limited to 2 units. 1 activity. Prerequisite: ASCI 412 and consent of instructor.

ASCI 415 HACCP for Meat and Poultry Operations (3)

Using Hazard Analysis and Critical Control Point (HACCP) principles to develop regulatory inspection plans for meat and poultry operations; development and use of prerequisite programs; microbiological and process overviews. 3 lectures. Prerequisite: ASCI 211 or consent of instructor.

ASCI 420 Animal Metabolism and Nutrition (3)

Metabolism of proteins, carbohydrates, lipids, minerals, vitamins and water, and the relationship of nutrient utilization to animal production. 3 lectures. Prerequisite: ASCI 220; ASCI 320 or CHEM 313 or CHEM 371.

ASCI 425 Meat Industry Study Tour (2)

Study tour of commercial meat businesses. Livestock harvest and carcass fabrication, further meat processing, retail and food service operations. Personnel, processing procedures, regulatory standards, industry specifications and current issues. Travel for 4 days. 2 activities. Prerequisite: ASCI 211 or consent of instructor.

ASCI 430 Animal Feed Processing (4)

Management of feed manufacturing for poultry/swine, dairy/beef, and companion animals. General operation of a processing facility including process flow, raw materials receiving, particle reduction, mixing, pelleting, packaging and delivery. State and federal regulations. 3 lectures, 1 laboratory. Prerequisite: ASCI 112 or consent of instructor.

ASCI 438 Systemic Animal Physiology (4)

Homeostatic relationships of organ systems. Cardiovascular, respiratory, urogenital and neuro-endocrinological functions. 3 lectures, 1 laboratory. Prerequisite: ASCI 229, CHEM 313 or CHEM 371, or ASCI 320.

ASCI 440 Immunology and Diseases of Animals (4)

Introduction to immune system, including innate and acquired immunity of domesticated animals. Application of immunological analyses and examination of current disease issues in domesticated animals. 3 lectures, 1 laboratory. Prerequisite: ASCI 229. Recommended: ASCI 320, CHEM 371 or equivalent.

ASCI 450 Computer Applications in Animal Science: Spreadsheet Analysis (4)

Development of spreadsheets relating to livestock production. Integration of database and analytical techniques. Cost-benefit analyses of livestock production systems. 2 lectures, 2 activities. Prerequisite: CSC 110.

ASCI 455 Advanced Equine Reproductive Technologies (4)

Assisted reproductive technologies in horses; use of gametes from normal and sub-fertile horses; manipulation of sub-fertile horses, donor and recipient mares; manipulation of endocrine system; embryo utilization; cryobiology of gametes and embryos; assessment of high-risk mare, fetus, and neonate. 3 lectures, 1 laboratory. Prerequisite: ASCI 333; ASCI 351; recommended: ASCI 405 and ASCI 406.

ASCI 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ASCI 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

ASCI 476 Issues in Animal Agriculture (3)

Exploration of social, political and environmental forces which will affect livestock production in the future. Roles played by advocacy groups and the media in influencing consumer demands and management practices. 3 seminars. Prerequisite: Upper division standing.

ASCI 477 Senior Project – Research Experience in Animal Science (3)

Independent research experience in a specific area of animal science conducted under faculty supervision. Minimum 90 hours required. Prerequisite: Senior standing, ASCI 363 and consent of instructor; one course in statistics recommended.

ASCI 478 Senior Project – Advanced Internship Experience in Animal Science (3)

Independent internship experience conducted under faculty supervision focusing on a discipline area of animal science. Completion of a project as a component of the internship. Minimum 90 hours required. Prerequisite: ASCI 363 and senior standing.

ASCI 479 Senior Project – Current Topics in Animal Science (3)

Critical evaluation and formal presentation of current issues facing animal agriculture. Evaluation of current topics, analysis of supporting evidence and logic, and synthesis and formal presentation of the resulting perspectives on different approaches to current challenges. 3 lectures. Prerequisite: Senior standing and ASCI 363 or consent of instructor.

ASCI 480 Advanced Integration of Livestock and Meat Production (4)

Integration of domestic livestock systems and meat production. Advanced concepts in science and technology of animal management, growth enhancement, harvest and processing related to product safety and quality. 3 lectures, 1 laboratory. Prerequisite: ASCI 211 and ASCI 221; or equivalent course.

ASCI 490 Advanced Animal Production and Management Enterprise (1-5) (CR/NC)

Advanced field experience in animal production systems. May include health, nutrition, reproduction, management, processing, budgeting, and/or marketing exercises as well as management decision-making opportunities. Total degree credit for ASCI 290/ASCI 490 limited to 6 units. Credit/No Credit grading only. 1-5 lectures. Prerequisite: Consent of instructor.

ASCI 500 Individual Study in Animal Science (1–6)

Advanced independent study planned and completed under the direction of a member of the Animal Science faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

ASCI 503 Advanced Molecular Techniques in Animal Science (4)

Advanced molecular laboratory techniques in animal science. Topics include analyses of cellular and metabolic regulation, gene expression, gene activation and regulation, gene construct design, transgenesis, knockout animal models. 2 lectures, 2 laboratories. Prerequisite: ASCI 403 or equivalent course.

ASCI 520 Comparative Animal Nutrition (4)

Advanced problem-based presentation of animal nutrition case studies. Emphasis on nutrients, clinical nutrition disorders and species not commonly considered in production animal nutrition. Analytical and problem-solving skills will be utilized to develop solutions to complex animal nutrition management issues. 3 lectures, 1 activity. Prerequisite: ASCI 320, or CHEM 313 or CHEM 371, and

one of the following: ASCI 346 or ASCI 350 or ASCI 355 or DSCI 301, or consent of instructor.

ASCI 530 Advanced Molecular Nutrition (3)

In-depth analysis of molecular signaling mechanisms and events related to nutrient metabolism using examples from the current literature in animal science and nutrition. 3 lectures. Prerequisite: ASCI 320 or ASCI 420 or CHEM 372 or graduate standing and consent of instructor.

ASCI 540 Advanced Immunology and Diseases of Animals (4)

In-depth analysis of the immune system, including molecular basis for immunity of domesticated animals. Application of immunological assays, and application of scientific method to examine immunity and disease in domesticated animals. Not open to students with credit in ASCI 440. 3 lectures, 1 laboratory. Prerequisite: ASCI 229; ASCI 320 or CHEM 371 or equivalent; STAT 218 or equivalent; or consent of instructor. Corequisite: ASCI 541.

ASCI 541 Advanced Animal Immunology Laboratory (1)

Laboratory complement to ASCI 540. Independent research projects, including hypothesis development, experimental design, data collection and analyses, and written and oral presentations. 1 laboratory. Corequisite: ASCI 540.

ASCI 555 Advanced Equine Reproductive Technologies (4)

Assisted reproductive technologies in horses; use of gametes from normal and sub-fertile horses; manipulation of sub-fertile horses, donor and recipient mares; manipulation of endocrine system; embryo utilization; cryobiology of gametes and embryos; assessment of high-risk mare, fetus, and neonate. 3 lectures, 1 laboratory. Prerequisite: Graduate standing.

ASCI 570 Selected Topics in Animal Science (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

ASCI 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

ASCI 581 Graduate Seminar in Animal Science (1-4) (CR/NC)

Current findings and research problems in the field and their application to the industry. Credit/No Credit grading only. Total credit limited to 12 units.-1-4 seminars. Prerequisite: Graduate standing and consent of instructor.

ASCI 593 Stem Cell Research Internship (5)

Supervised graduate research in stem cell science and engineering. Provides students with an off-campus industrial or university research internship. Total credit limited to 10 units. Prerequisite: Graduate standing in the Specialization in Stem Cell Research for the MS in Biological Sciences or for the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture, and BMED 510, BMED 545, BMED 515, and BIO 534. *Crosslisted as ASCI/BIO/BMED 593.*

ASCI 594 Applications in Stem Cell Research (2)

Transfer of skills and knowledge gained through ASCI/BIO/BMED 593, in an applied setting at Cal Poly. Demonstration of technical, problem solving, and presentation skills, and familiarity with current research. Part of the culminating experience for the Specialization in Stem Cell Research for the MS in Biological Sciences or for the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture. 1 seminar and supervised work. Prerequisite: ASCI/BIO/BMED 593 *Crosslisted as ASCI/BIO/BMED 594.*

ASTR-ASTRONOMY AND ASTROPHYSICS

ASTR 101 Introduction to the Solar System (4) GE B3

Descriptive astronomical properties of the Earth, Moon, other planets and their satellites. Comets, asteroids and other members of the Solar System. Theories of the formation of the Solar System. Opportunities for telescope observations of the Moon and planets. Not open to students who have completed or are taking ASTR 301, ASTR 302, or PHYS 132. 4 lectures. Fulfills GE B3.

ASTR 102 Introduction to the Stars and Galaxies (4) GE B3

Descriptive astronomical properties of the Sun, stars, galaxies and interstellar material. Expanding universe and cosmological models. Opportunities for telescope observations of the stars and constellation identification. Not open to students who have completed or are taking ASTR 112, ASTR 301, ASTR 302, or PHYS 132. ASTR 101 is not a prerequisite. 4 lectures. Fulfills GE B3.

ASTR 112 Introduction to the Stars and Galaxies (4) GE B3 & B4

Descriptive astronomical properties of the Sun, stars, galaxies and interstellar material. Exploration of cosmological models of an expanding universe. Laboratory activities include real and virtual astronomical viewing and experiments. Not open to students who have completed or are taking ASTR 102, ASTR 301, ASTR 302, or PHYS 132. ASTR 101 is not a prerequisite. 3 lectures, 1 activity. Fulfills GE B3 & B4.

ASTR 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.

ASTR 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ASTR 301 The Solar System (3)

Quantitative and descriptive properties of the Solar System including the physics of the planets, their satellites, comets and interplanetary media. Possible origins of the Solar System. 3 lectures. Prerequisite: PHYS 132 or PHYS 122 and MATH 141 or MATH 161.

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. 3 lectures. Prerequisite: PHYS 132 or PHYS 122 and MATH 141 or MATH 161. ASTR 301 is not a prerequisite.

ASTR 324 Time, Longitude and Navigation (4) GE Area F

The state of navigation prior to 1800 and the world wide problem of determining longitude at sea. Emphasis on historical and modern-day scientific solutions to the longitude problem and navigation technology, time and timekeeping, celestial navigation, and awareness of technological solutions to societal problems. 4 lectures. Prerequisite: Junior standing and completion of GE Area B, MATH 119 or equivalent. Fulfills GE Area F.

ASTR 326 Relativity and Cosmology (3)

Introduction to the basic ideas of Einstein's theories of relativity and cosmology. The structure and evolution of the universe. The principle of relativity, the speed of light, gravity and the equivalence principle. Curved spacetime, black holes, the expanding universe, the Big Bang, and nucleosynthesis. 3 lectures. Prerequisite: PHYS 132 or PHYS 122 and MATH 141 or MATH 161. ASTR 302 is not a prerequisite.

ASTR 404 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.

ASTR 444 Observational Astronomy (4)

Introduction to observational astronomy. Coordinate systems, telescopes and observational instruments (CCDs, filters, spectrographs), observational methods and techniques, data reduction and analysis. Laboratory activities include use of a telescope, CCD camera for data acquisition, data reduction and analysis, and presentation of results. 3 lectures, 1 laboratory. Prerequisite: ASTR 302.

ASTR 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ASTR 471 Selected Advanced Laboratory (1-2)

Directed group laboratory study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 2 laboratories. Prerequisite: Consent of instructor.

BIO-BIOLOGY

BIO 100 Orientation to Biological Sciences (1) (CR/NC)

Introduction to Biological Sciences faculty, department and campus resources, research opportunities, possible careers, studying science, and current topics in biology. Credit/No Credit grading only. 1 lecture.

BIO 111 General Biology (4) GE B2 & B4

Principles of cellular biology, heredity, ecology, biological diversity, and evolution, with emphasis on their relationships to human affairs. Not open to students who have completed BIO 115 or BIO 161. 3 lectures, 1 laboratory. Fulfills GE B2 & B4.

BIO 112 Environmental Biology and Conservation (4) GE B5

A biologically centered exploration of our planet focusing on natural resource conservation and contemporary environmental issues. Interactions between components of the biosphere and impacts of human society on interrelationships within ecosystems. Trends in natural resource conservation and biodiversity preservation. 4 lectures. Fulfills GE B5.

BIO 113 Animal Diversity and Ecology (4) GE B2 & B4

Animal diversity and ecology in aquatic and terrestrial communities including structural and functional adaptations of animals to their environment. Identification of common invertebrate and vertebrate animals. Field experience in local ecosystems. Saturday field trips. 2 lectures, 2 laboratories. Fulfills GE B2 & B4.

BIO 114 Plant Diversity and Ecology (4) GE B2 & B4

Plant diversity and ecology in aquatic and terrestrial plant communities including adaptations of plants to their environment. Identification of common, local native plants and plant communities, uses of native plants by Native Americans, and human impacts on native plant communities. Saturday field trips. 2 lectures, 2 laboratories. Fulfills GE B2 & B4.

BIO 115 Animal/Human Structure and Function (4) GE B2 & B4

Survey of the structure and function of animal cells, tissues, organs, and organ systems, with examples drawn from vertebrates and invertebrates; emphasis will be on vertebrates, especially the human. Not open to students who have completed BIO 153 or BIO 162. 3 lectures, 1 laboratory. Recommended prerequisite: PSC 102 or CHEM 110 or CHEM 111. Fulfills GE B2 & B4.

BIO 160 Diversity and the History of Life (4)

Overview of the history, diversity and genetic relatedness of life on Earth; broad-scale evolutionary framework of the organization and expansion of life on Earth. 2 lectures, 2 laboratories.

BIO 161 Introduction to Cell and Molecular Biology (4) GE B2 & B4

Fundamentals of cellular biology with an emphasis on the molecular perspective of life: metabolism, photosynthesis, cell structure and reproduction, meiosis, immunology, classical and molecular genetics, gene regulation. 3 lectures, 1 laboratory. Recommended prerequisite: CHEM 110 or CHEM 111 or CHEM 124 or CHEM 127. Fulfills GE B2 & B4.

BIO 162 Introduction to Organismal Form and Function (5)

Fundamentals of the structure and physiology of cells, tissues, and organs of plants and animals: energy acquisition and food distribution, gas exchange and fluid transport, and sensing and responding to the environment. 3 lectures, 2 laboratories. Prerequisite: BIO 161. Recommended: CHEM 110 or CHEM 111 or CHEM 124 or CHEM 127.

BIO 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies or surveys of selected problems. Intended for lower division students in the Biological Sciences Department. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit does not apply to any concentration in the Biological Sciences Department. 1-2 laboratories. Prerequisite: Consent of department chair.

BIO 211 Biology of Plants and Animals (4)

Plant and animal anatomy, physiology, diversity and life cycles. How plants and animals acquire nutrients, reproduce, and adapt to environments. Emphasis on hands-on activities and model organisms suited for the elementary classroom. For Liberal Studies majors only. 3 lectures, 1 laboratory. Prerequisite: BIO 111. Recommended: STAT 130 or STAT 217.

BIO 213 Life Science for Engineers (2) GE B2

Fundamentals of life sciences: energetics, cell biology, molecular and classical genetics, microbiology, organismal biology, and ecology. For engineering students only. 2 lectures. Prerequisite: MATH 142. Corequisite: ENGR/BRAE 213. Recommended: CHEM 124. Fulfills GE B2.

BIO 227 Wildlife Conservation Biology (4) GE B2

Historical development of wildlife biology and philosophies. Basic principles of ecology and evolution. Practices applied to wildlife. Current problems involving people-wildlife interactions with special reference to world biodiversity. 4 lectures. Fulfills GE B2.

BIO 232 Nanotechnology, Human Biology, Ethics and Society (4)

Focus on four nanotechnology examples as focal points for themes of nanoscale science and technology, human biology, society, ethics, and systems thinking: gold nanoshells for cancer treatment; molecular manufacturing; tissue engineering of a vital organ; and a microfluidic glucose sensor. The focal points provide natural contexts for learning biology at the cellular level, the molecular

level, the organ level and the biological systems level, respectively. 4 lectures. Prerequisite: GE Areas B1, B2, B3.

BIO 253 Orientation to the Health Professions (1) (CR/NC)

Participation in hospital activities and mental health services. Intended for medically oriented students. Total credit limited to 6 units with a maximum of 1 unit per quarter. Credit/No Credit grading only. 1 activity. Prerequisite: Consent of instructor. Priority to BIO and MCRO majors.

BIO 263 Introductory Ecology and Evolution (4)

Basic concepts in ecology and evolution. Relationships among organisms in populations, communities and ecosystems, structures and dynamics of populations, communities and ecosystems, ecosystem inputs and energy flows, nutrient cycling, biogeography, population genetics, evolution, patterns of biodiversity and issues in conservation biology. 3 lectures, 1 laboratory. Prerequisite: BIO 160 or BIO 161. Recommended: Both BIO 160 and BIO 161.

BIO 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

BIO 302 Human Genetics (4) GE B5

Basic principles of human inheritance, including the transmission of genetic traits, chromosomal abnormalities and their effects, gene structure and function, mutations and mutagenic agents, cancer genetics, population genetics, and principles of genetic counseling. 4 lectures. Prerequisite: One course from GE Area B1 (Recommended: STAT 217 or STAT 218), and one course from GE Area B2. Fulfills GE B5.

BIO 303 Survey of Genetics (4)

Principles of heredity and variation, including transmission, population and quantitative genetics; introduction to molecular mechanisms of inheritance. 4 lectures. Prerequisite: BIO 111 or BIO 161 or BOT 121. Recommended: STAT 218.

BIO 305 Biology of Cancer (4) GE B5

Introduction to the causes, characteristics and treatment of human cancer. Topics include effects of carcinogens and radiation; the genetics of cancer; molecular, cellular and physiological changes in common cancers; conventional chemotherapy and new treatments. Not open for major credit in Biological Sciences, Microbiology or Biochemistry. 4 lectures. Prerequisite: Completion of GE Area B2. Fulfills GE B5.

BIO 306 Applications of Biological Concepts (4)

Applications of basic biological concepts with special reference to how these concepts can be presented and developed in elementary schools. Emphasis is on hands-on activities, problem solving and computer assisted instruction modules in biology. 3 lectures, 1 laboratory. Prerequisite: Two of the following: BIO 113, BIO 114, BIO 115.

BIO 307 World Aquaculture: Applications, Methodologies and Trends (4) GE Area F

Life histories and habitats of important species of fishes, invertebrates and algae. Methodologies for the commercial propagation of specific forms. Global and regional coverage, including socioeconomic trends, controversies and applications in developed and less developed regions of the world. 3 lectures, 1 activity. Prerequisite: One GE Area B2 course in biology (BIO, ZOO, BOT or MCRO prefix). Not open for major credit in Biological Sciences. Recommended: Junior standing. Fulfills GE Area F.

BIO 325 General Ecology (4)

Relationships between organisms and their physical, chemical, and biological environment in terrestrial and aquatic habitats. Laboratory emphasis on field studies. Occasional field experiences may require participation during non-scheduled times. 3 lectures, 1 laboratory. Prerequisite: BIO 160, BIO 162, and BIO 263, or consent of instructor.

BIO 327 Wildlife Ecology (4)

Principles of ecology as applied to the study of wild vertebrates and their habitats. Emphasis on techniques for collecting and analyzing field data and how these data apply to the study and management of wildlife. Use of the literature, inventory of plants and animal populations, use of maps and databases, quantifying diet and habitat use, determining sex and age and nutritional condition, capture and marking techniques, non-invasive sampling methods. 3 lectures, 1 laboratory. Prerequisite: BIO 263 or NR 306. Recommended: STAT 217 or STAT 218.

BIO 328 Marine Ecology (4)

Introduction to the functional biology of marine plants and animals and the ecological processes that underlie their distribution and abundance in open

oceans, coastal regions, and estuaries. 2 lectures, 2 laboratories. Several field trips. Prerequisite: BIO 160, BIO 162, and BIO 263. Recommended: STAT 217 or STAT 218.

BIO 330 Extended Field Biology Activity (1)

Minimum of two days of field instruction in places with significant biological diversity, and an individual or group project. Focus on field notebooks, field identification, survey methods, experimental design, and significant habitat types for various groups of organisms. The Schedule of Classes will list the title of the associated field biology course. Total credit limited to 6 units, each associated with a different field biology course, with no more than 4 units applied as advisor approved electives. 1 activity. Prerequisite or concurrent: Enrollment in corresponding field biology course.

BIO 351 Principles of Genetics (5)

Principles of genetics and genetic analysis, including underlying molecular mechanisms. Subjects include gene structure and function, inheritance patterns, regulation of gene expression, mutation, recombination, recombinant DNA technology, and an introduction to population genetics. 5 lectures. Prerequisite: BIO 161 and concurrent or prior enrollment in CHEM 312 or CHEM 316. Recommended: BIO 263.

BIO 361 Principles of Physiology (4)

Fundamental principles of general and organs systems physiology, including composition and concentration of cellular and other body fluids, categories of movement (e.g., diffusion, membrane transporters), energy (thermodynamics, metabolic), enzymes, and membrane potentials with application to whole organisms. Introduction to physiological measurement techniques. 2 lectures, 2 laboratories. Prerequisite: BIO 162, and CHEM 312 or CHEM 316.

BIO 375 Molecular Biology Laboratory (3)

Introduction to techniques used in molecular biology and biotechnology; DNA extraction, characterization, cloning, Southern blotting, reverse transcription, polymerase chain reaction, and sequencing analysis. 1 lecture, 2 laboratories. Prerequisite: BIO 161, and grade of C- or better in BIO 351 or CHEM 373 or consent of instructor. *Crosslisted as BIO/CHEM 375.*

BIO 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. 1-2 laboratories. Prerequisite: Consent of instructor.

BIO 401 Conservation Biology (4)

Principles of conservation biology; practical solutions to current threats to biodiversity in terrestrial, freshwater, and marine environments. 3 lectures, 1 laboratory. Prerequisite: BIO 263 or NR 306.

BIO 405 Developmental Biology (4)

Events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation, and organogenesis, with emphasis on differential gene expression in model organisms. 3 lectures, 1 laboratory. Prerequisite: BIO 161, BIO 162, and BIO 303 or BIO 351.

BIO 414 Evolution (4)

Scientific evaluation of the theories, mechanisms, and patterns of biological evolution. 4 lectures. Prerequisite: BIO 263 or equivalent, and BIO 303 or BIO 351. Recommended: BIO 325 or equivalent.

BIO 415 Biogeography (4)

Plant and animal distribution patterns in relation to past and present physical and biotic factors; survey of major biomes with major emphasis on North and South America. 4 lectures. Prerequisite: BIO 263.

BIO 419 Ecological Methodology (4)

Introduction to quantitative methods used in ecology with an emphasis on the design and analysis of field studies. Population estimates, sampling design and analysis, and the determination of community structure. 3 seminars, 1 activity. Prerequisite: STAT 218 or equivalent. Recommended: BIO 263 or BIO 325 or NR 306 or BOT 326.

BIO 421 Wetlands (4)

The formation, characteristics, and functions of wetlands. Genesis of hydric soils. Plant adaptations to saturated soils. Wetlands as wildlife habitat. Policies and social issues associated with wetlands. The procedures of wetland delineations. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or BIO 162, CHEM 111 or CHEM 127, and SS 121 or SS 131. Recommended: BOT 313, NR 306 or BIO 325. *Crosslisted as BIO/NR/SS 421.*

BIO 424 Organizing and Teaching Science (4)

Techniques, aims and objectives in the teaching of physical and life sciences at the secondary level. Selection and organization of teaching material, including strategies for English language learners (ELL) and special needs students.

Evaluation of results. 4 lectures. Prerequisite: Admission to the Single Subject Credential Program. *Crosslisted as BIO/PSC 424.*

BIO 426 Immunology (4)

Principles of molecular and cellular immunology. Emphasis on molecular regulation of immune cell development, including generation of unique receptors, lymphocyte signal transduction and selection, programmed cell death and regulation of immune responses. Discussion and demonstration of roles of immunology in disease and as diagnostic tools. 3 lectures, 1 laboratory. Prerequisite: BIO 351 or CHEM 373. Recommended: CHEM 313 or CHEM 371.

BIO 427 Wildlife Management (4)

Important habitats, such as riparian, wetlands, and habitat features important to wildlife, such as vegetation types and snags. Basic concepts of wildlife management. Emphasis on planning and designing habitats to meet the needs of wildlife. 3 lectures, 1 laboratory. Prerequisite: One of the following upper-division ecology courses: BIO 325, BIO 327, BIO 328, BIO 401, BIO 444, BOT 326, or NR 306.

BIO 432 Vertebrate/Human Anatomy and Physiology I (5)

Anatomy and physiology of the skeletal, muscular, nervous (central and peripheral) systems, and sense organs of vertebrates, with an emphasis on human systems. Not open to students with credit in ZOO 331. 3 lectures, 2 laboratories. Prerequisite: BIO 361 or consent of instructor.

BIO 433 Vertebrate/Human Anatomy and Physiology II (5)

Anatomy and physiology of the digestive, circulatory, urinary, endocrine, and reproductive systems, with an emphasis on human systems. Not open to students with credit in ZOO 332. 3 lectures, 2 laboratories. Prerequisite: BIO 361 or consent of instructor.

BIO 434 Environmental Physiology (4)

Comparative physiological mechanisms involved in the regulation of oxygen uptake, water and ion balance, and temperature regulation in animals. Emphasis is placed on physiological adaptations which maintain or restore homeostasis in animals which are subjected to environmental changes. 3 lectures, 1 laboratory. Prerequisite: BIO 162. Recommended: BIO 263.

BIO 435 Plant Physiology (4)

Consideration of the principal physiological and biochemical processes of plants with emphasis on water relations, mineral nutrition, photosynthesis, and the physiology of plant development. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or BIO 162. Recommended: BIO 161 or BIO 303; CHEM 312 or CHEM 316.

BIO 438 Aquaculture (4)

Propagation and rearing of fishes, invertebrates and algae from marine, freshwater, and estuarine habitats. Current methodologies and general life histories. Global perspective including aquacultural development in developed and developing countries. 3 lectures, 1 laboratory. Prerequisite: BIO 160, BIO 162, and BIO 263.

BIO 439 Fisheries Science and Resource Management (4)

Scientific investigation of marine and freshwater fisheries. Methodologies and quantitative strategies for study of finfish and invertebrates. Role of oceanographic or limnological processes on stock maintenance. Impact of human exploitation on maintenance of sustainable yields, including user-group conflict issues, and regional/global controversies. Lab/field protocols, basic fisheries statistical procedures, molecular methods, computer simulations. 3 lectures, 1 laboratory. Prerequisite: BIO 162. Recommended: ZOO 322.

BIO 441 Bioinformatics Applications (4)

Introduction to new problems in molecular biology and current computer applications for genetic database analyses. Use of software for: nucleic acid, genome and protein sequence analysis; genetic databases, database tools; industrial applications in bioinformatics; ethical and societal concerns. 3 lectures, 1 laboratory. Prerequisite: Junior standing; BIO 161 or BIO 303. Recommended: BIO 302 or BIO 303 or BIO 351 or CHEM 373. *Crosslisted as BIO/CHEM 441.*

BIO 443 Molecular Ecology and Systematics (4)

Introduction to the science used to define and recognize the units of biological diversity, including a survey of the types of molecular data and computer programs used at the population and species level. 3 lectures, 1 laboratory. Prerequisite: BIO 160, BIO 162, BIO 263, BIO 351 and STAT 218 or equivalent.

BIO 444 Population Ecology (3)

Growth, fluctuations, balance, and natural mechanisms controlling terrestrial wildlife populations. 3 lectures. Prerequisite: BIO 263 or NR 306.

BIO 450 Undergraduate Laboratory Assistantship (1–4) (CR/NC)

Assisting the instructor in teaching and supervising undergraduate laboratories in the Biological Sciences Department. Total credit limited to 8 units, with a maximum of 4 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of instructor and department chair.

BIO 452 Cell Biology (4)

Introduction to cell structure and function, energy conversions, protein sorting, signaling, cytoskeleton, cell adhesion, and the cell cycle. 3 lectures, 1 laboratory. Prerequisite: BIO 351 or CHEM 373, and CHEM 312 or CHEM 317. Recommended: CHEM 313 or CHEM 371.

BIO 461 Senior Project – Research Proposal (2)

Completion of a research proposal and literature review, including analysis of experimental results from published peer-reviewed articles in biology. Written and oral presentations. 2 activities. Prerequisite: Junior standing.

BIO 462 Senior Project – Research (2)

Completion of a research project or equivalent in the biological sciences, selected and conducted in consultation with an instructor. Results are presented in written reports. 2 laboratories. Prerequisite: Junior standing and consent of instructor. BIO 400, BIO 461 or MCRO 461 are recommended.

BIO 463 Honors Research (2)

Completion of advanced research in the biological sciences, selected and conducted in consultation with an instructor. Results presented as a written report and/or oral presentation in a public forum. 2 laboratories. Prerequisite: BIO 462 and consent of instructor.

BIO 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

BIO 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

BIO 472 Current Topics in Biological Research (1–4)

Applications of biological research topics. Discussions of how selected discoveries in biological research formed the basis for, and were developed into, practical applications, currently accepted theories, generally utilized techniques or decisions affecting society and political policies. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-4 seminars. Prerequisite: Junior standing or consent of instructor.

BIO 476 Gene Expression Laboratory (2)

Heterologous gene expression of a recombinant protein in a microbial system: gene cloning, construction of expression plasmid, DNA sequence analysis, transformation of microbial host, selection and analysis of transformed host cells, expression and purification of recombinant protein. 2 laboratories. Prerequisite: BIO/CHEM 375; CHEM 313 or CHEM 371. *Crosslisted as BIO/CHEM 476.*

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. Major credit limited to 4 units; total credit limited to 12 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. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

BIO 500 Individual Study (1–4)

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 Master of Science (MS) program. Total credit limited to 4 units. 1-4 laboratories. Prerequisite: Graduate standing in Biological Sciences and consent of instructor.

BIO 501 Molecular and Cellular Biology (4)

Principles of molecular and cellular biology including gene function and regulation, energetics, protein trafficking, cytoskeleton, signaling, adhesion, and the cell cycle. 3 lectures, 1 laboratory. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

BIO 502 Biology of Organisms (4)

Principles of and current topics in organismal biology, with an emphasis on physiology (including organ systems), behavior, and responses to the environment. 3 lectures, 1 laboratory. Prerequisite: BIO 501 and graduate standing in Biological Sciences, or consent of instructor.

BIO 503 Population Biology (4)

Considerations of theory and practice in population ecology, evolutionary biology, and biosystematics. 3 lectures, 1 laboratory. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

BIO 511 Trends in Biology (1) (CR/NC)

Recent trends in the field of biology for graduate students new to the Biological Sciences master's degree program. Overview of current faculty research to help students choose a thesis project and mentor. Credit/No Credit grading only. 1 activity. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

BIO 515 History of Biology (3)

Analysis of historical attempts to solve biological problems. 3 seminars. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

BIO 524 Developmental Biology Seminar (2)

Principles and selected topics in developmental biology. Issues of differentiation, morphogenesis, and pattern formation; specific topics chosen by participants. 2 seminars. Prerequisite: Graduate standing in Biological Sciences or consent of instructor. Recommended: BIO 501.

BIO 531 Theory and Prediction in Ecology (3)

Directed group study and lectures on selected topics in ecology. Emphasis on an in-depth study of a restricted topic. 3 seminars. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

BIO 534 Principles of Stem Cell Biology (2)

Principles of stem cell biology including characteristics, types, roles in development, therapeutic uses, historical perspectives and ethical issues. 2 seminars. Prerequisite: Graduate standing in Biological Sciences, Biomedical Engineering, or Agriculture, or consent of instructor. Recommended: BIO 452 or BIO 501.

BIO 542 Multivariate Biometry (4)

Studies in continuous multivariate statistics, including the multivariate linear model, principal components and factor analysis, discriminant analysis, clustering, and canonical correlation. Use of MINTAB and SAS throughout. 4 lectures. Prerequisite: Two courses in statistics or consent of instructor.

BIO 561 Proposal Writing for Biology Research (3)

Written and oral presentations of a proposal for research in biology including a literature review. 3 seminars. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

BIO 570 Selected Topics in Biology (1–4)

Directed group study of selected topics for graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

BIO 571 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

BIO 575 College Teaching Practicum (1-2) (CR/NC)

Part-time teaching assignment in an undergraduate college classroom. Includes teaching and related activities under the supervision of a professor in Biological Science. Total credit limited to 4 units. Credit/No Credit grading only. 1-2 activities. Prerequisite: Graduate standing and evidence of satisfactory preparation in biology. Department chair and graduate coordinator's approval required.

BIO 585 Cooperative Education Experience (6) (CR/NC)

Advanced study, analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to

6 units. Credit/No Credit grading only. Prerequisite: Graduate standing in Biological Sciences and consent of instructor.

BIO 590 Seminar in Biology (1)

Problems and topics in advanced biology selected according to the interest and needs of the students enrolled. Total credit limited to 6 units. 1 activity. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

BIO 593 Stem Cell Research Internship (5)

Supervised graduate research in stem cell science and engineering. Provides students with an off-campus industrial or university research internship. Total credit limited to 10 units. Prerequisite: Graduate standing in the Specialization in Stem Cell Research for the MS in Biological Sciences or for the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture, and BMED 510, BMED 545, BMED 515, and BIO 534. *Crosslisted as ASCI/BIO/BMED 593.*

BIO 594 Applications in Stem Cell Research (2)

Transfer of skills and knowledge gained through ASCI/BIO/BMED 593, in an applied setting at Cal Poly. Demonstration of technical, problem solving, and presentation skills, and familiarity with current research. Part of the culminating experience for the Specialization in Stem Cell Research for the MS in Biological Sciences or for the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture. 1 seminar and supervised work. Prerequisite: ASCI/BIO/BMED 593 *Crosslisted as ASCI/BIO/BMED 594.*

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 12 units. Credit/No Credit grading only. Prerequisite: Graduate standing in Biological Sciences and consent of instructor.

BIO 598 Masters Project in Biology (2)

Individual investigation or research project for Masters of Arts in Biology. Written report required. Course satisfies culminating experience for the MA degree in Biology. Total credit limited to 4 units. 2 laboratories. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

BIO 599 Thesis (1–3)

Individual research under the general supervision of the faculty, leading to a graduate thesis of suitable quality. Total credit limited to 9 units. 1-3 laboratories. Prerequisite: Graduate standing in Biological Sciences; consent of instructor, and consent of thesis committee.

BMED–BIOMEDICAL ENGINEERING

BMED 111 Biomedical Engineering Calculations (3)

General introduction to bioengineering application of basic engineering science applied to topics in biomechanics, bioinstrumentation, biomaterials, biotechnology, and related areas. Application of the concepts and methods of science, mathematics and engineering to problems in biomedical engineering. 3 lectures. Corequisite: MATH 142 or consent of instructor.

BMED 212 Introduction to Biomedical Engineering Design (3)

General introduction to bioengineering design, including examples of engineering analysis and design applied to representative topics in biomechanics, bioinstrumentation, biomaterials, biotechnology, and related areas. Review of technological needs, design methodology, testing procedures, statistical analysis, governmental regulation, evaluation of costs and benefits, quality of life, and ethical issues. 2 lectures, 1 laboratory. Prerequisite: MATH 143 or consent of instructor.

BMED 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

BMED 310 Biomedical Engineering Management and Analysis (4)

Fundamentals of biomedical engineering analysis. Use and application of tools and analytical methods used by bioengineers. 3 lectures, 1 laboratory. Prerequisite: EE 201 and CSC 101 or CSC 234 or consent of instructor.

BMED 355 Electrical Engineering Concepts for Biomedical Engineering (4)

An introduction to electrical engineering concepts for biomedical engineers. Continuation of basic circuit analysis. Steady state AC circuit analysis and phasor concepts. Application of the Laplace Transform to transient circuit analysis. An introduction to digital logic gates, combinational and sequential logic circuits. 4 lectures. Prerequisite: EE 201, MATH 344.

BMED 400 Special Problems for Advanced Undergraduates (2-4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 8 units. Prerequisite: ME 212, junior standing and consent of department chair.

BMED 404 Applied Finite Element Analysis (4)

Finite element based solutions to engineering problems with an emphasis on elastostatic problems in structural mechanics. The power and pitfalls associated with the finite element method highlighted through practical modeling assignments. Introduces the use of commercial finite element codes. 3 lectures, 1 laboratory. Prerequisite: ME 329 or CE 351 or BMED 410. *Crosslisted as BMED/CE/ME 404.*

BMED 410 Biomechanics (4)

Introduction to physiological systems, with emphasis on structure and function of major tissues and organs. Application of mechanics to understand the behavior of these tissues and organs at gross and microscopic levels. Bielastic solids. Rigid body biomechanics. Biofluids, basic mechanical properties of collagen and elastin, bone, cartilage, muscles, blood vessels, and other living tissues. Application of continuum mechanics to hard and soft tissues. Biomechanical engineering design for clinical applications. 3 lectures, 1 laboratory. Prerequisite: ME 212, CE 204, BMED 310 or consent of instructor.

BMED 420 Principles of Biomaterials Design (4)

Fundamentals of materials science as applied to bioengineering design. Natural and synthetic polymeric materials. Materials characterization and design. Wound repair, blood clotting, foreign body response, transplantation biology, biocompatibility of materials, tissue engineering. Artificial organs and medical devices. Government regulations. Patenting. Ethical issues. 3 lectures, 1 laboratory. Prerequisite: CE 204, MATE 210 or consent of instructor.

BMED 425 Biomedical Engineering Transport (4)

Mass transfer in solids, liquids, and gases with application to biological systems. Free and facilitated diffusion. Convective mass transfer. Diffusion-reaction phenomena. Active transport. Biological mass transfer coefficients. Nonequilibrium thermodynamic analysis of transport phenomena. The osmotic effect. Diffusion and exchange in biological systems. 3 lectures, 1 laboratory. Prerequisite: ME 302, ME 341 or consent of instructor.

BMED 430 Biomedical Modeling and Simulation (2)

Finite element methods for anatomical modeling and boundary value problems in the biomechanics of tissues and biomedical devices. Nonlinear biodynamics, heat flow, cardiac impulse propagation, anatomic modeling, and biomechanics. 1 lecture, 1 laboratory. Prerequisite: BMED 425 or consent of instructor.

BMED 440 Bioelectronics and Instrumentation (4)

Analog and digital circuits in bioinstrumentation. Biomedical signals in continuous and discrete systems. Sampling and digital signal processing. Ultrasound, MRI, CT, Bioelectromagnetics. Electrokinetics. Biophysical phenomena, transducers, and electronics as related to the design of biomedical instrumentation. Potentiometric and amperometric signals and amplifiers. Biopotentials, membrane potentials, chemical sensors. Mechanical transducers for displacement, force and pressure. Temperature sensors. Flow sensors. Light-based instrumentation. Electrical safety. 3 lectures, 1 laboratory. Prerequisite: EE 201, BMED 310 or consent of instructor.

BMED 445 Biopotential Instrumentation (4)

Focus on the principles associated with instrumentation used to detect surface biopotentials. Emphasis on circuit level design and laboratory implementation of systems used to detect ECG, EMG and EEG signals. Development of practical experience with analog electronic instrumentation used in the design and testing process. A system level design project related to surface biopotential detection and recording. 2 lectures, 2 laboratories. Prerequisite: BMED 440.

BMED 450 Contemporary Issues in Biomedical Engineering (4)

Current and evolving topics in biomedical engineering, including medical and industrial applications. Exploration of contemporary issues in biomedical engineering, including technical and societal implications. The Schedule of Classes will list topic selected. Total credit limited to 16 units. 4 lectures. Prerequisite: Senior standing in Biomedical Engineering.

BMED 455, 456 Biomedical Engineering Design I, II (4) (4)

Engineering design methodology, design process, project planning, decision making, modeling, construction, and testing of an open-ended design project. Preparation of formal engineering reports. Statistical analysis. Governmental regulations. Bioethical issues. 2 lectures, 2 laboratories. **BMED 455** prerequisite: BMED 410 or consent of instructor. **BMED 456** prerequisite: BMED 455 or consent of instructor.

BMED 460 Engineering Physiology (4)

Physiology for biomedical engineering students, with an emphasis on control mechanisms and engineering principles. Engineering aspects of basic cell functions; biological control systems; muscle; neural; endocrine, and circulatory systems, digestive, respiratory, renal, and reproductive systems; regulation of metabolism, and defense mechanisms. 3 lectures, 1 laboratory. Prerequisite: ZOO 331 or equivalent, BMED 310 or consent of instructor.

BMED 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

BMED 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

BMED 481 Senior Project Design Laboratory I (1)

Selection and development of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 1 laboratory. Prerequisite: MATH 244, IME 314, ME 302 or consent of instructor.

BMED 482 Senior Project Design Laboratory II (1)

Continuation of BMED 481. Continuation of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 1 laboratory. Prerequisite: BMED 481 or consent of instructor.

BMED 483 Senior Project Design Laboratory III (2)

Continuation of BMED 482. Continuation of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 2 laboratories. Prerequisite: BMED 482 or consent of instructor.

BMED 500 Individual Study (2-4)

Individual investigation, research, studies or surveys of selected problems. Advanced study planned and completed under the direction of faculty. Open to graduate students who have demonstrated the ability to do independent work. Total credit limited to 8 units. Prerequisite: Graduate standing and consent of department chair.

BMED 510 Principles of Tissue Engineering (4)

Exploration of areas including cell source and isolation, scaffold selection and modification, tissue cultivation and bioreactor design, and patient implantation. Applications of tissue engineering for creating skin, cartilage, blood vessels, and other tissues. 3 lectures, 1 laboratory. Prerequisite: An upper division course in physiology.

BMED 512 Biomedical Engineering Horizons (4)

Examination of the advances in nanotechnology, micro-electro-mechanical systems, materials and clinical technology. Relationship between modern medical achievements and advances in engineering and science, the biomedical engineering industry, and the use of technology in a human context. 4 lectures. Prerequisite: Graduate standing, MATH 143, CHEM 125, PHYS 131 or PHYS 141, BIO 161 or consent of instructor.

BMED 515 Introduction to Biomedical Imaging (4)

Introduction to the fundamental principles and applications of biomedical imaging modalities in medicine. Topics include X-ray radiography, computed tomography, magnetic resonance imaging, ultrasound, nuclear medicine, and optical imaging. 2 lectures, 2 laboratories. Prerequisite: PHYS 132, MATH 244, graduate standing, or consent of instructor.

BMED 520 Introduction to Biomedical Engineering (4)

Advanced treatment of the basic engineering sciences in the biomedical engineering context. For the student who has had little prior exposure to biomedical engineering, but has either a strong engineering or a strong science background. 4 lectures. Prerequisite: Graduate standing.

BMED 525 Skeletal Tissue Mechanics (4)

Overview of the mechanical properties of various tissues in the musculoskeletal system, the relationship of these properties to anatomic and histologic structures, and the changes in these properties caused by aging, disease, overuse, and disuse. Tissues covered include bone, cartilage and synovial fluid, ligament, and tendon. 4 lectures, Prerequisite: CE 204, BMED 460.

BMED 530 Biomaterials (4)

Structure-function relationships for materials in contact with biological systems. Interactions of materials implanted in the body. Histological and hematological considerations including foreign body responses, inflammation, carcinogenicity, thrombosis, hemolysis, immunogenic and toxic properties. Microbial interaction with material surfaces, degradation. 4 lectures. Prerequisite: BIO 213, ENGR 213, MATE 210 and graduate standing or consent of instructor. *Crosslisted as BMED/MATE 530.*

BMED 535 Bioseparations (4)

Advanced topics in physicochemical hydrodynamics, bioseparations and microfluidic bioseparations, which include the key aspects of electrokinetics, colloid science and suspension mechanics in bioseparations. Understanding key separation design parameters through theoretical and numerical models. 4 lectures. Prerequisite: BMED 425, ME 341 or consent of instructor.

BMED 540 Microcirculation (4)

Anatomy and physiology of microcirculation, including wall structure, flow regulation, nutrient exchange, inflammation, and angiogenesis. Additional focus on experimental approaches, the primary literature, microcirculatory pathophysiology, and the role of engineering approaches to assess and treat microvascular dysfunction. 3 lectures, 1 laboratory. Prerequisite: BMED 460 or BIO 433 or equivalent.

BMED 545 Cell Transplantation and Biotherapeutics (4)

Lecture topics include patho-physiology, disease models, rodent anatomy, and therapeutic strategies. Laboratory topics include rodent handling, survival surgery, therapy delivery, and measurements of organ function or repair. Focus on experimental design, data collection and analysis, and literature integration. 2 lectures, 2 laboratories. Prerequisite: Statistics - STAT 312 or STAT 218; Physiology - BMED 460, BIO 361, or ASCI 438.

BMED 550 Current and Evolving Topics in Biomedical Engineering (4)

Current topics in biomedical engineering, including medical and industrial applications. Exploration of detailed technical treatment of contemporary issues in biomedical engineering, and examination of technical and societal implications of these subjects. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Graduate standing in biomedical engineering or consent of department chair.

BMED 555 Neural Systems Simulation and Modeling (4)

The biophysical basis of the Hodgkin-Huxley active membrane model. A detailed description of the dynamics of voltage gated ion channels. The complete Hodgkin-Huxley active membrane model, with an emphasis on its use in simulating the electrical activity of nerve cells. Equivalent circuit/ circuit simulator based approaches to modeling Hodgkin-Huxley neurons. 4 lectures. Prerequisite: MATH 244, BMED 440.

BMED 563 Biomedical Engineering Graduate Seminar (2)

Selected topics of interest to biomedical engineering and other graduate students. Open to graduate students and selected seniors. A forum to share information about research and research tools; an opportunity to discuss topics of interest with professionals in the field, academics, and other graduate students. The Schedule of Classes will list topic selected. Total credit limited to 4 units. 1 seminar, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

BMED 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing or consent of instructor.

BMED 571 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

BMED 591 Thesis Project Design Laboratory I (2)

Selection and development of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation

of outline, literature review, and project schedule. 2 laboratories. Prerequisite: Graduate standing.

BMED 592 Thesis Project Design Laboratory II (2)

Continuation of BMED 591. Completion of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 2 laboratories. Prerequisite: BMED 591 or consent of instructor.

BMED 593 Stem Cell Research Internship (5)

Supervised graduate research in stem cell science and engineering. Provides students with an off-campus industrial or university research internship. Total credit limited to 10 units. Prerequisite: Graduate standing in the Specialization in Stem Cell Research for the MS in Biological Sciences or for the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture, and BMED 510, BMED 545, BMED 515, and BIO 534. *Crosslisted as ASCI/BIO/BMED 593.*

BMED 594 Applications in Stem Cell Research (2)

Transfer of skills and knowledge gained through ASCI/BIO/BMED 593, in an applied setting at Cal Poly. Demonstration of technical, problem solving, and presentation skills, and familiarity with current research. Part of the culminating experience for the Specialization in Stem Cell Research for the MS in Biological Sciences or for the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture. 1 seminar and supervised work. Prerequisite: ASCI/BIO/BMED 593 *Crosslisted as ASCI/BIO/BMED 594.*

BMED 599 Design Project (Thesis) (1-9)

Selection by individual or group, with faculty guidance and approval, of 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. Total credit limited to 9 units. Prerequisite: Graduate standing.

BOT–BOTANY

BOT 121 General Botany (4)

GE B2 & B4

The anatomy, physiology, reproduction, and importance of plants. 3 lectures, 1 laboratory. Fulfills GE B2 & B4.

BOT 238 Central Coast Flora and Vegetation (3)

Field identification of native plants and plant communities of the California Central Coast. Factors that affect plant growth in natural environments. 2 lectures, 1 laboratory. Prerequisite: BOT 121.

BOT 311 Plants, People and Civilization (4)

GE B5

Human uses of plants for food, beverage, medicine, fiber, recreation, and rituals. Uses of plants by different cultures throughout the world and the social, economical, and environmental importance of plants in our lives. 3 lectures, 1 laboratory. Prerequisite: One course from GE Area B2. Fulfills GE B5.

BOT 313 Taxonomy of Vascular Plants (4)

Introduction to classification and identification of vascular plants, emphasizing major plant families; field and herbarium techniques. 2 lectures, 2 laboratories. Prerequisite: BIO 114 or BIO 162 or BOT 121.

BOT 323 Plant Pathology (4)

Comprehensive study of the causes and effects of disease in plants. Designed to lead to an understanding of the science and modern control methods. 2 lectures, 2 laboratories. Prerequisite: BIO 114 or BIO 162 or BOT 121.

BOT 324 Ornamental and Forest Pathology (4)

Causes and effects of diseases of important ornamental and forest plants, disease agents (life cycle, host range, environmental relationships), and modern approach to control. 2 lectures, 2 laboratories. Prerequisite: BIO 162 or BOT 121.

BOT 326 Plant Ecology (4)

Plant communities, population dynamics, and effects of the following environmental factors on plant growth and development: soil, water, temperature, light, atmosphere, topography, organisms, and fire. 3 lectures, 1 laboratory. Prerequisite: BIO 114 or BIO 162 or BOT 121. Recommended: BIO 263 and STAT 217 or STAT 218.

BOT 329 Plants, Food, and Biotechnology (4)

GE Area F

Agriculture as applied biology and its impact on civilization. Application of technology to increase the efficiency of food production. Genetics and biotechnology; culminating in an assessment of genetically engineered foods, the myths, the controversy, the science. Not open to CRSC or FRSC majors. 3 lectures, 1 laboratory. Prerequisite: Completion of one of the following: BIO 111, BIO 114,

BIO 161, BOT 121, or HCS 120. Recommended: Junior standing. *Crosslisted as BOT/HCS 329.* Fulfills GE Area F.

BOT 335 Plant Anatomy (4)

Microscopic study of vascular plants dealing with the origin, development and structure of cells, tissues and organs. 2 lectures, 2 laboratories. Prerequisite: BIO 162 or BOT 121.

BOT 431 Advanced Plant Pathology (4)

Methods, instruments, and materials used in diagnosis of plant diseases and in plant disease research. 2 lectures, 2 laboratories. Prerequisite: BOT 323 or BOT 324.

BOT 433 Field Botany (4)

Field studies of California's diverse vegetation and flora. Factors affecting the distribution of plants and plant communities and their ecological relationships. Identification of plants and plant communities in the field. Several field trips required including two weekend trips to California's deserts and mountains. 2 lectures, 2 laboratories. Prerequisite: BOT 313 or consent of instructor.

BOT 437 Phycology (4)

Comprehensive examination of the ecology, life histories, functional morphology, physiology, and taxonomy of marine and freshwater algae. Laboratories emphasize species endemic to the central coast of California. 2 lectures, 2 laboratories. Prerequisite: Junior standing and BIO 162.

BOT 450 Plant Biotechnology Laboratory (2)

Application of genetic engineering technology to plants; methods of plant tissue culture and transformation. 2 laboratories. Prerequisite: BIO 303 or BIO 351 or CHEM 373 or HCS 304. *Crosslisted as BOT/HCS 450.*

BRAE–BIORESOURCE and AGRICULTURAL ENGINEERING

BRAE 121 Agricultural Mechanics (2)

Identification and use of tools and materials; shop safety; tool sharpening and care; concrete mixes and materials; simple electric wiring; metal work; pipe fitting; basic woodworking; estimating quantities and costs. Students are required to meet safety regulations in laboratory work. 1 lecture, 1 laboratory.

BRAE 124 Small Engines (2)

Operating principles of the small internal combustion engine. Maintenance and trouble-shooting applications of small power units to all types of engine applications. Repair procedures related to economic justifications. 1 lecture, 1 activity.

BRAE 128 Careers in Bioresource and Agricultural Engineering (2)

Introduction to careers associated with BioResource and Agricultural Engineering, and Agricultural Systems Management. Professional engineering registration process. Engineering problem solution and report format. Design procedures. Engineering fundamentals. Laboratory includes visits to facilities relating to career opportunities. 1 lecture, 1 laboratory.

BRAE 129 Laboratory Skills and Safety (1)

Introduction to fabrication and construction materials used in the field of Agricultural Engineering. Fabrication skills in the development of wood, metal, concrete projects, and creative design. Strength tests of wood, fasteners, concrete, and student design projects. 1 laboratory. Prerequisite: BRAE and ASM majors only.

BRAE 133 Introduction to Engineering Design Graphics (1)

Visual communication in engineering design and problem solving. Principles of freehand sketching, engineering graphics, and computer-aided-drafting. Perspective and orthographic sketching, orthographic drawing with instruments and computer, applied descriptive geometry. 1 laboratory.

BRAE 141 Agricultural Machinery Safety (3)

Evaluation of safe tractor and equipment operation. Supervised field operation emphasizing the safe and efficient performance of modern farm and utility-industrial equipment. 2 lectures, 1 laboratory.

BRAE 142 Agricultural Power and Machinery Management (4)

Evaluation of agricultural machinery and tractor power performance. Equipment studied includes primary and secondary tillage tools, grain drills, row crop planters, sprayers, grain and forage harvesters, and specialty crop harvesters. Emphasis on management, selection, cost analysis using computers and efficient operation of agricultural machinery. 3 lectures, 1 laboratory. Prerequisite: MATH 116 or equivalent.

BRAE 151 CAD for Agricultural Engineering (1)

Computer aided drafting on a desktop personal computer using Autocad software. Drawing setup. 2-D projections including automatic dimensioning and hatching. Isometric construction, drawing layers, library symbols. Use of 3-D drawing software. 1 laboratory. Prerequisite: BRAE 133 or equivalent.

BRAE 152 3-D Solids Modeling (1)

Introduction to 3-dimensional solids modeling using state-of-the-art software. Model generation and modification of associative properties, assembly modeling, extrusions and revolutions. 1 laboratory. Prerequisite: BRAE 133, BRAE 151 or equivalent courses.

BRAE 200 Special Problems for Undergraduates (1–4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

BRAE 201 Enterprise Project (1-4) (CR/NC)

Introductory experience in a bioresource/agricultural engineering or agricultural systems management project. Project participation is subject to approval by the department head and the Cal Poly Corporation. Credit/No Credit grading only. Prerequisite: Consent of instructor.

BRAE 203 Agricultural Systems Analysis (3)

Agricultural Systems Analysis investigates the interrelationships between sub-components in an overall system. Problem solving algorithms, network analysis, project planning techniques, and optimization. 2 lectures, 1 laboratory. Prerequisite: MATH 118 or equivalent.

BRAE 213 Bioengineering Fundamentals (2)**GE B2**

Treatment of the engineering applications of biology. Genetic engineering and the industrial application of microbiology. Systems physiology with engineering applications. Structure and function relationships in biological systems. The impact of life on its environment. 2 lectures. For engineering students only. Prerequisite: MATH 142. Corequisite: BIO 213. Recommended: CHEM 124. *Crosslisted as BRAE/ENGR 213.* Fulfills GE B2.

BRAE 216 Fundamentals of Electricity (4)

Application of electricity in BioResource and Agricultural Engineering, including basic electric circuits. Will include wiring materials, code regulations, electrical measurements, R-L-C circuit fundamentals, system planning, motors, basic electronics, and an introduction to computer usage. 3 lectures, 1 laboratory. Prerequisite: BRAE 129, MATH 142, PHYS 131.

BRAE 231 Agricultural Building Construction (3)

Development of practical skills in carpentry and light construction. Selection of materials. Agricultural buildings repaired, constructed, or modified during laboratory periods. 1 lecture, 2 laboratories. Prerequisite: BRAE 129 or consent of instructor.

BRAE 232 Agricultural Structures Planning (4)

Planning of facilities required in production systems. Materials and processes used in construction of agricultural structures. Environmental factors affecting crop storage structures and animal housing. Design of structural environments to meet the needs of commodities, animals, and plants. 3 lectures, 1 laboratory. Prerequisite: BRAE 151, PHYS 132.

BRAE 234 Introduction to Mechanical Systems in Agriculture (4)

Introduction to elements used in the mechanical transmission of power and force in agricultural systems. Power transmission using v-belts, roller chain, gear and shaft drives, hydraulic actuators. Linear and nonlinear actuation devices including linkages, cams, and hydraulic/pneumatic cylinders. 3 lectures, 1 laboratory. Prerequisite: PHYS 131.

BRAE 236 Principles of Irrigation (4)

Land grading design, operation, management, and evaluation of irrigation methods. 3 lectures, 1 laboratory. Prerequisite: MATH 141, SS 121.

BRAE 237 Introduction to Engineering Surveying (2)

An introduction to basic field note keeping as well as the use of steel tapes, automatic levels, total stations and survey tools. Training in the procedures for differential and profile leveling; angle measurement and traversing. Hands-on experience with the use of GPS for surveying. An understanding in computations to determine direction, elevations, and earthwork volumes. Practice in map reading and building layout. 1 lecture, 1 laboratory. Prerequisite: MATH 119 or equivalent.

BRAE 239 Engineering Surveying (4)

Development of proper field note taking and procedures for measuring using automatic levels, total stations and GPS systems. Understanding in the procedures and computations for differential leveling, profiles, traversing,

triangulation and topographic surveys. Computations in traverse adjustment, contour mapping, earthwork volumes, curve alignments and building layout. Understanding in map reading, the use of datums, photogrammetry, CAD design and boundary law. 2 lectures, 2 laboratories. Prerequisite: MATH 119 or equivalent.

BRAE 240 Agricultural Engineering Laboratory (1)

Individual projects. Total credit limited to 4 units. 1 laboratory. Prerequisite: Consent of instructor.

BRAE 247 Forest Surveying (2)

Use and care of tapes, staff compass, abney levels, total stations, and GPS receivers. Keeping field notes, measurements by tape. Closed and open traverse by compass and total stations. Turning angles and determining directions of lines. Map reading and public land description. GPS measurements. Weekend field trips required. 1 lecture, 1 laboratory. Prerequisite: NR 215. *Crosslisted as BRAE/NR 247.*

BRAE 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

BRAE 301 Hydraulic and Mechanical Power Systems (4)

Selection, application and use of hydraulic components and mechanical power transmission equipment. Use of standardized circuit design procedures. 3 lectures, 1 laboratory. Prerequisite: PHYS 121 or PHYS 141.

BRAE 302 Servo Hydraulics (4)

Application of microcomputers and programmable logic controllers to hydraulic, pneumatic and mechanical systems. Theory, instrumentation and sensors used in process and control systems used in agricultural equipment. 3 lectures, 1 laboratory. Prerequisite: BRAE 216 or BRAE 324 and BRAE 234 or BRAE 301.

BRAE 312 Hydraulics (4)

Static and dynamic characteristics of liquids, flow in open and closed channels, uniform and nonuniform flow, flow measurement, pumps. 3 lectures, 1 laboratory. Prerequisite: PHYS 132, ME 211.

BRAE 320 Principles of Bioresource Engineering (4)

Theory and applications of bioprocess technology in biological and agricultural systems. Engineering properties of biological materials and organisms. Basic unit operations, fluid mechanics and heat/mass transfer as applied to bioprocess technology. Special requirements of agricultural and biological processes. 3 lectures, 1 laboratory. Prerequisite: BRAE 232, BRAE 236, PHYS 132.

BRAE 321 Agricultural Safety (3)

Principles of agricultural safety. Accident causation and prevention, hazard identification and abatement, laws and regulations. Machinery, electrical, chemical, livestock, shop and fire safety. Safety program development. 2 lectures, 1 activity. Prerequisite: Junior standing.

BRAE 324 Principles of Agricultural Electrification (4)

Applications of DC/AC electricity in agriculture. National Electric Code regulations. The wiring of agricultural structures and electrical distribution. Series, parallel and series-parallel circuits, R-L-C circuits, electric motors, electronics. 3 lectures, 1 laboratory. Prerequisite: MATH 119, PHYS 121.

BRAE 328 Measurements and Computer Interfacing (4)

Transducers and engineering measurements in agricultural engineering. Covering transducer characteristics, signal processors and controllers, instrumentation techniques, and the use of the computer in the measurement and control of typical engineering problems. 3 lectures, 1 laboratory. Prerequisite: EE 321, EE 361, a computer programming course.

BRAE 331 Irrigation Theory (3)

Plant-water-soil relations using evapo-transpiration, plant stress, soil moisture deficiency, frequency and depth of irrigation, salinity, infiltration, drainage and climate control. 3 lectures. Prerequisite: BRAE 236, or BRAE 340.

BRAE 335 Internal Combustion Engines (4)

Principles of operation of internal combustion engines. Theory of operation and diagnosis evaluation and repair of small engines, gasoline and diesel engines and economics of operation, use and repair. Power analysis and application. 3 lectures, 1 laboratory. Prerequisite: Junior standing.

BRAE 337 Landscape Irrigation (4)

Design of sprinkler and drip irrigation systems including: site characteristics, soil variables affecting water storage and infiltration rate, plant selection and hydrozones, hydraulics, nozzle spacing, selection of system components, back flow prevention, plumbing codes and cost estimating. Irrigation system evaluation and audit irrigation scheduling, and water budget. 3 lectures, 1 laboratory. Prerequisite: MATH 118 or consent of instructor.

BRAE 339 Internship in BioResource and Agricultural Engineering (1–12) (CR/NC)

Students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

BRAE 340 Irrigation Water Management (4) GE Area F

Soil-plant-water relationships; evapotranspiration; irrigation schedules; salinity and drainage; irrigation efficiency. Water measurement; soil moisture measurement; irrigation systems and practical constraints affecting scheduling. California water supply and budget; water rights; local, state and federal water institutions; California water issues. 3 lectures, 1 laboratory. Prerequisite: Junior standing, completion of GE Area B, and Math 118 or higher. Fulfills GE Area F.

BRAE 342 Agricultural Materials (4)

Physical properties of agricultural materials and their measurement. Strength of materials, material flow and transport, material deformation, shape and size classification, moisture relationships and biological interactions. Interactions between agricultural materials, the environment and equipment used to handle them. 3 lectures, 1 laboratory. Prerequisite: PHYS 121, SS 121, MATH 119.

BRAE 343 Mechanical Systems Analysis (4)

Use of statics and dynamics to make original calculations, plans, sketches, graphics, drawings, schemes and layouts for the fabrication and construction of machines. 3 lectures, 1 laboratory. Prerequisite: BRAE 342.

BRAE 344 Fabrication Systems (4)

Fabrication systems including cutting, sawing, shearing, bending, welding, grinding, cleaning, painting and proper safety procedures. Experimental projects to include team design and construction, presentation, organization, and evaluation. 2 lectures, 2 laboratories. Prerequisite: BRAE 343.

BRAE 345 Aerial Photogrammetry and Remote Sensing (3)

Object recognition, three-dimensional equipment, and interpretation of aerial photographs. Print alignment, stereoscopic viewing, scales, elevation determination, and application. Orthophotos and their relationship to Geographic Information Systems (GIS). Application of aerial photos to regional studies. 2 lectures, 1 laboratory. Prerequisite: MATH 118.

BRAE 348 Energy for a Sustainable Society (4) GE Area F

Study of how the transition can be made from fossil fuels to renewable energy sources including hydro, biomass, solar, wind, and energy conservation. Environmental, economic, and political consequences of a renewable energy-based sustainable society. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Area B. Fulfills GE Area F.

BRAE 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems in agriculture. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

BRAE 401 Enterprise Project Management (1-4) (CR/NC)

Advanced experience in a bioresource/agricultural engineering or agricultural systems management project. Project leadership and management are stressed. Project participation is subject to approval by the department head and the Cal Poly Corporation Credit/No Credit grading only. Prerequisite: BRAE 201 or consent of instructor.

BRAE 403 Agricultural Systems Engineering (4)

Engineering and economic principles combined with mathematical optimization techniques to evaluate parameters in agricultural production and processing systems. Project planning techniques, linear and nonlinear modeling, response surface methodology. Professional responsibilities in Agricultural Engineering including ethics, patents, copyrights, liability. 3 lectures, 1 laboratory. Prerequisite: MATH 242 or MATH 244.

BRAE 405 Chemigation (1)

Fertilizer and chemical injection through irrigation systems. Hardware, fertilizer compounds, and distribution uniformity. Matching chemicals and equipment to specific irrigation methods. Safety. 1 laboratory. Prerequisite: BRAE 236 or BRAE 340.

BRAE 414 Irrigation Engineering (4)

Design of on-farm irrigation systems; micro, surface, and sprinkler irrigation systems; canals and pumps; economic and strategies of pipe design; pipeline protection. 3 lectures, 1 laboratory. Prerequisite: BRAE 331 or BRAE 340; BRAE 312 or course in hydraulics with a grade of C or better, or consent of instructor.

BRAE 418, 419 Agricultural Systems Management I, II (4) (4)

Project management of agricultural systems. Emphasis placed on a team approach to problem solution. Case studies and student projects used to explore the following topics: project leadership, project organization, communication, needs assessment, feasibility studies, cost analysis, decision making, solution implementation, and evaluation. BRAE 418: 3 lectures, 1 laboratory. BRAE 419: 2 lectures, 2 laboratories. Prerequisite: BRAE 203, AGB 301, AGB 310 and GE A3. For BRAE 419: BRAE 418.

BRAE 421 Equipment Engineering (3)

Design and construction of specialized agricultural components and equipment. 2 lectures, 1 laboratory. Prerequisite: CE 204, ME 212.

BRAE 422 Equipment Engineering (4)

Design and construction of specialized agricultural components and equipment. 2 lectures, 2 laboratories. Prerequisite: BRAE 421.

BRAE 425 Computer Controls for Agriculture (3)

Computer activated controls as applied to agricultural machinery, agricultural structures, processing and irrigation industries. Encompassing control logic to evaluate stability behavior of systems of computer interfacing, data input and control output. 2 lectures, 1 laboratory. Prerequisite: BRAE 324, CSC 110 or CSC 113 or CSC 232.

BRAE 427 Agricultural Process Engineering (3)

Agricultural engineering principles applied to air, water, air-water mixtures, drying, heating, refrigeration, fluid flow, size reduction, fan laws and materials handling. 2 lectures, 1 laboratory. Prerequisite: BRAE 312, BRAE 430, ME 302.

BRAE 432 Agricultural Buildings (4)

Selection of buildings, storage units, and related equipment for production agriculture. Economics and functionality of various designs and construction materials. Environmental factors affecting crop storage and animal housing. 3 lectures, 1 laboratory. Prerequisite: PHYS 121, BRAE 342, BRAE 343.

BRAE 433 Agricultural Structures Design (4)

Structural analysis and design of agricultural service and processing buildings. Emphasis on use of wood, metals, and reinforced concrete in light construction. 3 lectures, 1 laboratory. Prerequisite: BRAE 232, CE 204.

BRAE 435 Drainage (4)

Relevant principles of hydrology and porous media flow. Flow nets, wells and ground water, design of simple surface and sub-surface drains. 3 lectures, 1 laboratory. Prerequisite: Junior standing, BRAE 312, BRAE 331, or BRAE 340 or SS 432 and consent of instructor.

BRAE 438 Drip/Micro Irrigation (4)

Drip/micro irrigation hardware and management. Emphasizes agricultural drip/micro irrigation with some landscape application. Filtration, emitters, chemical injection, agronomic constraints, and scheduling. Field trip(s) included. 3 lectures, 1 laboratory. Prerequisite: BRAE 236 or BRAE 340.

BRAE 439 Vineyard Water Management (4)

Management of rain and irrigation water in vineyards. Irrigation scheduling, managing water stress, climate control with irrigation methods commonly used. Management for wine, table grapes, and raisins. 3 lectures, 1 laboratory. Prerequisite: BRAE 340 or BRAE 236.

BRAE 440 Agricultural Irrigation Systems (4)

On-farm irrigation system evaluation and management. Drip, micro-spray, furrow, border strip, sprinkler systems. Irrigation efficiency and uniformity. Pumping costs. For non-BRAE majors only. 3 lectures, 1 laboratory. Prerequisite: BRAE 340 or consent of instructor.

BRAE 447 Advanced Surveying with GIS Applications (4)

Collecting field data; processing the data; generating graphical representation of the data; design based on the data and laying out the design in the field; and available record resources for use in GIS systems and their accuracy. 2 lectures, 2 laboratories. Prerequisite: BRAE 239.

BRAE 448 Bioconversion (4)

Biological, thermal and physical techniques for converting biomass into useful energy forms for agriculture and industry. Laboratory exercises include experiments with anaerobic digestion of animal wastes into methane, ethanol fermentation of grains and composting of agricultural residues. Technical and economic feasibility of biofuels. 3 lectures, 1 laboratory. Prerequisite: MATH 118 or equivalent, or consent of instructor.

BRAE 460 Senior Project Organization (1)

Selection and organization of senior project. Involves time management, research techniques, budgeting and project presentation. Documentation of multidisciplinary team experience. 1 lecture. Prerequisite: GE A3.

BRAE 461, 462 Senior Project I, II (2) (2)

Solution of an engineering or systems management problem in agriculture. May involve research methodology, problem statement, analysis, synthesis, project design, construction, and evaluation. Project requires 150 hours with a minimum of faculty supervision. **BRAE 461** prerequisite: BRAE 460. **BRAE 462** prerequisite: BRAE 461.

BRAE 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Consent of instructor.

BRAE 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

BRAE 481 Advanced Agricultural Mechanics (2)

Advanced shop skills. Carpentry, electricity, plumbing, surveying, power mechanics, tractor equipment operation and maintenance. 1 lecture, 1 laboratory. Prerequisite: Agricultural teacher candidates starting/returning from student teaching, senior or graduate standing or consent of instructor.

BRAE 485 Cooperative Education Experience in BioResource and Agricultural Engineering (6) (CR/NC)

Part-time work experience with an approved BioResource and Agricultural Engineering firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

BRAE 495 Cooperative Education Experience in BioResource and Agricultural Engineering (12) (CR/NC)

Full time work experience with an approved BioResource and Agricultural Engineering firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

BRAE 500 Individual Study (1–3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limited to 6 units, repeatable in same term. Prerequisite: Consent of instructor.

BRAE 521 Systems Analysis of Agricultural Systems (4)

Principles and methods of creative problem solving and systems analysis as applied to the design of agricultural systems. Problem solving using the engineering design process to analyze the need, establish boundaries, and generate creative alternative solutions. Examples worked through in feasibility analysis, transportation and network problems, linear programming, project planning, human factors and ergonomics, and system analysis with an emphasis on optimum system operation. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor.

BRAE 532 Water Wells and Pumps (4)

Water well drilling, design, and development. Pump characteristics and system head. Series and parallel operation. Design of pump intakes. Variable speed electric drives and engines. Pump testing. 3 lectures, 1 laboratory. Prerequisite: BRAE 340 or equivalent, or BRAE 312 or equivalent.

BRAE 533 Irrigation Project Design (4)

Engineering solutions and social aspects of improved water delivery to farms and canal automation. Flow measurement. Water user associations. Unsteady canal and pipeline controls. PID controls and modeling. 3 lectures, 1 laboratory. Prerequisite: BRAE 340 or BRAE 312 or equivalent (hydraulics/fluid mechanics course).

BRAE 570 Selected Topics in BioResource and Agricultural Engineering (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

BRAE 571 Selected Advanced Laboratory in BioResource and Agricultural Engineering (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

BRAE 581 Graduate Seminar in BioResource and Agricultural Engineering (3)

Group study of current problems of the bioresource and agricultural engineering industry; current experimental and research findings as applied to field of bioresource and agricultural engineering. The Schedule of Classes will list topic selected. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

BRAE 599 Thesis in BioResource and Agricultural Engineering (1–9)

Systematic research of a significant problem in bioresource and agricultural engineering. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.

BUS–BUSINESS**BUS 100 Student Orientation and College Success (1) (CR/NC)**

Orientation to academic areas (majors, minors, concentrations) within the Orfalea College of Business, including the development of a comprehensive personalized four-year plan to graduation. Career exploration to assist with future career planning and concentration selection. Exploration of skills needed for academic success: effective goal setting, time management, study skills, registration systems/strategies, and adjustment to college life. Credit/No Credit grading only. 1 lecture.

BUS 200 Special Problems for Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of area coordinator.

BUS 207 Legal Responsibilities of Business (4)

Examination of the American legal system and important legal principles for business operations, such as those involved with contracts, torts, agency, business organizations, and employment. Emphasis on how legal principles help define socially responsible conduct. Case studies. 4 lectures.

BUS 212 Financial Accounting for Nonbusiness Majors (4)

Introduction to financial accounting theory and practice with an emphasis on financial statement preparation and analysis. Not open to Business majors. 4 lectures.

BUS 214 Financial Accounting (4)

Principles of financial accounting for Business majors. The course prepares students to understand and interpret financial statement information. Financial reporting standards are explored to give students an understanding of how financial events are reflected in financial statements. 4 lectures.

BUS 215 Managerial Accounting (4)

Applications of accounting for making business decisions. Content includes planning and control issues including cost behavior, budget preparation, performance reporting; addresses social responsibility and employee motivational and behavioral considerations. Preparation of spreadsheet applications useful for decision-making. 4 lectures. Prerequisite: Demonstrated competency in electronic spreadsheet, word processing, and presentation applications. BUS 212 or BUS 214 or equivalent.

BUS 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

BUS 290 Business Programming (4)

Fundamentals of computer programming related to business applications. Application development using graphical user interface controls, variables, data types, and input/output with text files. 4 lectures.

BUS 302 International and Cross Cultural Management (4)

Dimensions of culture and its variations within and across nations. Impact of culture on managing in a global context. Development of managerial competencies requisite to working in and supervising multicultural groups in international corporations. Frameworks for analyzing cultural and contextual influences on organizational behavior, culture shock and readjustment, expatriation and repatriation, cultural change and innovation, intercultural

conflict, and ethical dilemmas. Case studies, behavioral simulations, self-assessments and fieldwork. 4 lectures. Prerequisite: GE Area A, C1, C2, D1-D4.

BUS 303 Introduction to International Business (4)

Special terms, concepts, and institutions associated with the environment in which international companies operate. Students will be enabled to understand, analyze and offer solutions to global business problems. 4 lectures. Prerequisite: A grade of C- or better in ECON 222, or consent of instructor.

BUS 308 Business Law II (4)

Legal aspects of management decisions, including problems arising in sales, commercial paper, personal property and bailments, secured transactions, bankruptcy, and securities regulation, with emphasis on the uniform commercial code. Case studies. 4 lectures. Prerequisite: BUS 207 or equivalent.

BUS 310 Introduction to Entrepreneurship (4)

Role and impact of entrepreneurship; characteristics and traits of entrepreneurs; social, economic, cultural and policy conditions conducive to entrepreneurship; entrepreneurial thinking; opportunity identification and assessment; the management team; organizational and legal issues; business models; acquiring social and financial capital; managing startup to growth; entrepreneurial behavior in existing organizations; realizing and harvesting value. 4 lectures. Prerequisite: GE Area A.

BUS 311 Managing Technology in the International Legal Environment (4) GE D5

Analysis of U.S. and international laws regarding technological innovations from economic, social and political perspectives. Copyrights, patents, trademarks, trade secrets, contracts, products liability and privacy. The Internet, computer programs and biotechnology. 4 lectures. Prerequisite: Junior standing; completion of GE Areas A, D1 and D2. Fulfills GE Area D5 except for Business Administration majors.

BUS 319 Accounting Information Systems (4)

Comprehensive coverage of manual and computerized accounting processes and internal controls. 3 lectures, 1 activity. Prerequisite: BUS 214.

BUS 320 Federal Income Taxation for Individuals (4)

Federal income taxation and planning for individuals. Federal role of taxation in the business decision-making process. Issues related to individual income tax preparation and introduction to basic property transactions. 4 lectures. Prerequisite: BUS 319 or consent of instructor.

BUS 321, 322 Intermediate Accounting I, II (4) (4)

Comprehensive coverage of financial reporting issues. BUS 321 covers financial statements, assets other than investments and intangibles, and liabilities. BUS 322 covers investments, intangibles, equities, revenue recognition and the Cash Flows Statement. 4 lectures. Prerequisite: BUS 321: BUS 214; BUS 319; BUS 322: BUS 321 with minimum grade of C-; Business majors must have formally declared their concentration to enroll in BUS 322.

BUS 342 Fundamentals of Corporate Finance (4)

Theory and applications of financing business operations. Financial management of current and fixed assets from internal and external sources. Analysis, planning, control, and problem solving. Some discussion of corporate social responsibility in the context of corporate objective functions. The use of technology in the form of financial calculators and/or spreadsheets. 4 lectures. Prerequisite: A grade of C- or better, or consent of instructor, in all of the following: BUS 214, STAT 252.

BUS 343 Quantitative Methods in Finance (4)

Basic mathematical foundations for advanced courses in finance: mathematical finance -- dealing with elementary materials (time value of money, single multiple period portfolio choice, and application of arbitrage), and risk management -- dealing with value-at-risk, stressing current industry practices. 4 lectures. Prerequisite: STAT 252.

BUS 346 Principles of Marketing (4)

Introduction of the marketing process: identifying target markets; developing and launching products or services; and managing pricing, promotion, and distribution strategies. Focus on leveraging technologies that result in innovation and impact marketing practice. Recognition that markets are global. Ethics and social responsibility in marketing decision-making. 4 lectures. Prerequisite: A grade of C- or better, or consent of instructor, in the following: for Business Administration and Economics majors, ECON 222 and BUS 207; for Industrial Technology majors, ECON 201; for Recreation Administration majors, either RPTA 210 or RPTA 260; and for all other majors, either ECON 201 or ECON 222.

BUS 350 The Global Environment (4) GE Area F

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Areas A and B. *Crosslisted as AG/BUS/EDES/ENGR/HUM/SCM/UNIV 350.* Fulfills GE Area F.

BUS 382 Organizations, People, and Technology (4)

Organizations as sociotechnical systems. Examination of macro dimensions of organizations including environment, mission, goals, structure, people, technology, and internal management systems and processes. Case analysis, experiential class activities. Application to technology-oriented business settings. 4 lectures. Prerequisite: GE Area A, C1, C2, D1-D4; Business majors must have formally declared their concentration to enroll.

BUS 384 Human Resources Management (4)

Introduction to functional areas of the discipline including staffing, compensation, employee development and labor relations. Additional workplace issues addressed include performance and human capital management, employer legal and social responsibility for employee wellbeing, managing a diverse/global workforce, and using human resource information systems. 4 lectures. Prerequisite: GE Area A, C1, C2, D1-D4.

BUS 386 Employee Training and Development (4)

Needs assessment, including organization, person, and task or competency analysis. Design, delivery and evaluation of employee training and human resource development in knowledge-based organizational settings. Performance management and feedback systems; development of learning organizations; human resource information systems (HRIS) applications in career management and training administration. 4 lectures. Prerequisite: BUS 384.

BUS 387 Organizational Behavior (4)

Application of behavioral, social and organizational science concepts to management. Exploration of the interactions between individuals and the organizations in which they work and live. Individual, interpersonal, team, intergroup and organizational levels of analysis included in topics such as expectations, perception, communications, creativity, leadership style, cultural and ethical behavior, group dynamics, team effectiveness and work design. 4 lectures. Prerequisite: GE Area A, C1, C2, D1-D4, ECON 221 and BUS 207. Recommended: STAT 252.

BUS 391 Information Systems (4)

Computer applications in business and industry. Information systems and integrated systems concepts, computer hardware and software, strategic uses of information systems, databases, data warehousing, decision support systems and artificial intelligence, network basics, electronic commerce, systems development, ethical use of information, employing technology in a socially responsible manner, and emerging trends and technologies in information systems. 4 lectures. Prerequisite: BUS 214. Prerequisite for Industrial Technology majors: BUS 212.

BUS 392 Business Application Development (4)

The fundamental concepts and models of application development needed to understand the key processes related to building functioning business applications and appreciate the complexity of application development. The concepts of computer programming, data structures, problem solving, programming logic, and fundamental design techniques. Up-to-date application development tools and technologies currently used by business enterprises. 4 lectures. Prerequisite: BUS 391 with a grade of C- or better, or consent of instructor. *Formerly BUS 390.*

BUS 393 Database Systems in Business (4)

Design, development, testing, and implementation of databases for business applications. Data modeling with entity relationship diagrams (ERD) and class diagrams (UML). Data normalization, data integrity, the effect of business rules on data normalization. Advanced queries using structured query language (SQL). Database application development culminating in a database project. 4 lectures. Prerequisite: BUS 391; Business majors must have formally declared their concentration to enroll.

BUS 394 System Analysis and Design (4)

Systems analysis and design. Project team creation and performance monitoring. Systems development life cycle and project management, process modeling using data flow diagrams, data modeling with E/R diagrams, CASE tools, object modeling with UML, and prototype development. 4 lectures. Prerequisite: BUS 391.

BUS 395 Systems Design and Implementation (4)

Systems design and implementation, with focus on project management and incorporating software quality into the software development process, including software testing. 4 lectures. Prerequisite: BUS 394 with a minimum grade of C- or better, or consent of instructor.

BUS 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Senior standing or consent of instructor.

BUS 401 Seminar in General Management and Strategy (4)

Application of interdisciplinary skills to business and corporate strategy formulation and implementation. Analysis of interdependence between external environments and internal systems. Focus on responsibilities, tasks, and skills of general managers, including socially responsible behavior and governance. Case studies, group problem solving. Capstone course of Business core curriculum. 4 seminars. Prerequisite: BUS 342, BUS 346, BUS 387, BUS 391, senior standing, and completion of one of the following: IT 326, IT 330, IT 341, or IT 371.

BUS 402 International Business Management (4)

Managerial concepts and techniques for analysis and decision making within international businesses. Environmental and organizational factors influencing multinational operations. Assessing international market opportunities and entry modes. Complexities of multinational management strategy, structure and systems, especially during initial stages of internationalization. Case studies and simulations. 4 lectures. Prerequisite: BUS 342, BUS 346, BUS 387 or consent of instructor.

BUS 403 Advanced Seminar in International Management (4)

Integration of management concepts within complex multinational organizations. Interdisciplinary approach to identifying and assessing multinational and global competitive environments and strategies; structuring and managing interdependent multinational operations; addressing conflicts between domestic and international policies and practices in multinational enterprises. Case studies, simulations, group analysis and problem solving. 4 seminars. Prerequisite: BUS 302 and BUS 402. Business majors must have formally declared their concentration to enroll.

BUS 404 Governmental and Social Influences on Business (4)

Analysis from legal, economic, political, and ethical perspectives, of the changing domestic and international environments of the business enterprise. Topics include administrative law, agencies and regulatory policy, antitrust law, public policy analysis, business-government relations, and corporate responsibility. Case studies. 4 lectures. Prerequisite: BUS 207 and ECON 222.

BUS 405 Joint Ventures and Alliances (4)

Examination of joint ventures and alliances between organizations, using cross-cultural, interdisciplinary perspective. Alliance motives, types and traits. Processes for partner selection, negotiation, structure, operation, and performance assessment of international and cross-cultural alliances. Lectures, case studies, and simulation. 4 lectures. Prerequisite: BUS 342, BUS 346, and BUS 387.

BUS 406 Managing Mergers, Acquisitions and Divestitures (4)

Issues associated with analyzing, negotiating, and managing mergers, acquisitions and divestitures (MADS) using cross-cultural, interdisciplinary perspective. Rationale for decision to pursue MADS and processes for identifying targets; valuing and negotiating MADS; staffing and human resource management issues; strategic control and integration; and cross-cultural conflict and divided loyalties in domestic and international MADS. Lectures, case studies and simulation. 4 lectures. Prerequisite: BUS 342, BUS 346, and BUS 387.

BUS 407 Managing People in Global Markets (4)

Impact of cultural and strategic differences on management of people in multinational organizations. Critical human resource issues in domestic and international operations. 4 lectures. Prerequisite: BUS 387.

BUS 409 Law of Real Property (4)

Legal problems of acquisition, ownership and transfer of real property. Contracts, agency, estates, and co-ownership, mortgages and deeds, covenants, conditions, and restrictions, easements, landlord-tenant, and zoning. 4 lectures. Prerequisite: Senior standing.

BUS 410 The Legal Environment of International Business (4)

U.S., foreign, and international law affecting international business transactions. U.S. and foreign cultural, ethical, and political norms and legal institutions, and their effect on law and business. 4 lectures. Prerequisite: BUS 207 and ECON 222.

BUS 412 Advanced Managerial Accounting (4)

Product costing systems including hybrid costing systems, management control systems, cost allocation, activity based costing, cost information for decision making, new manufacturing environments, and strategic control systems. International dimension integrated in the course content. 4 lectures. Prerequisite: BUS 215.

BUS 416 Volunteer Income Tax Assistance – Senior Project (4)

Training and practice in the preparation of state and federal individual income tax returns. Coverage of the deductions and credits applicable to individuals. Students provide free tax assistance and income tax preparation to community residents under the supervision of qualified professionals. 2 lectures, 2 activities. Prerequisite: BUS 320 or equivalent, senior standing.

BUS 417 Taxation of Corporations and Partnerships (4)

Comparative study of the taxation of C corporations and flow-through tax entities, including S corporations, partnerships and limited liability companies. 4 lectures. Prerequisite: BUS 320 or equivalent.

BUS 418 Listening to the Customer (4)

A project-oriented introduction to exploratory, secondary, and qualitative methods. Access and use of secondary sources of information that support marketing decision making and lead to a carefully crafted research plan. Emphasis on qualitative marketing research techniques, with the goal of setting the stage for additional data collection. 4 lectures. Prerequisite: BUS 346.

BUS 419 Strategic Marketing Measurement (4)

Gathering, analyzing, and reporting information critical for marketing decision making. Focus on primary data collection and analytical techniques including experimental design, descriptive statistics, chi-square analysis, ANOVA, and regression. Other methods may include data mining, GIS, and customer relations management (CRM). 4 lectures. Prerequisite: BUS 418, STAT 252; Business majors must have formally declared their concentration to enroll.

BUS 420 Advanced Financial Reporting (4)

Comprehensive coverage of selected advanced financial accounting and reporting topics. Topics include revenue recognition, software development costs, employee stock option plans, pensions and posts retirement benefit plans, accounting for income taxes, leases, specialized inventory issues and advanced consolidation issues. 4 lectures. Prerequisite: BUS 322.

BUS 422 Government and Not-For-Profit Entities (4)

Accounting and reporting by state and local governments and not-for-profit entities. State and local governmental topics include: fund structures, budgetary accounting, the modified accrual basis of accounting, reporting entity issues. Not-for-profit topics include: financial and reporting concepts and practices, contributions, restricted resources, endowments. 4 lectures. Prerequisite: BUS 321.

BUS 424 Professional Accounting (4)

Development of the accounting profession. Past, present and future. Emphasis on contemporary issues confronting the professional accountant and his/her social and ethical responsibilities and opportunities. 4 lectures. Prerequisite: Consent of instructor.

BUS 425 Auditing (4)

Survey of the auditing environment including institutional, ethical, and legal liability dimensions. Introduction to audit planning, assessing materiality and audit risk, collecting and evaluating audit evidence, considering the internal control structure, substantive testing, and reporting. 4 lectures. Prerequisite: BUS 322.

BUS 427 International Accounting (4)

Consideration of conceptual, managerial, professional and institutional issues of international accounting. 4 lectures. Prerequisite: BUS 321 or equivalent.

BUS 428 Accounting Policy (4)

Role of management in establishing and directing accounting policy. Coverage includes impact of management decisions on external reporting and taxes and the impact of financial reporting requirements on management decisions. 4 seminars. Prerequisite: BUS 322.

BUS 429 Accounting Process Analysis (4)

Coverage of revenue, purchasing, human resources and payroll, integrated production, and general ledger and business reporting processes in enterprise systems. A risk management approach to evaluate key business and accounting processes. E-business concepts. 3 lectures, 1 activity. Prerequisite: BUS 215 and BUS 321 with a minimum grade of C-.

BUS 430 Internship/Cooperative Education (2–12) (CR/NC)

Work experience in business, industry, government and other areas of student career interest. Periodic written progress reports, final report, and evaluation by work supervisor required. Credit/No Credit grading. Major credit limited to 4 units; total credit limited to 12 units. Prerequisite: Approval of area chair, junior standing, and a CPSLO cumulative GPA of at least 2.5 without being on academic probation.

BUS 431 Security Analysis and Portfolio Management (4)

In-depth analysis of equity market and its instruments. Detailed study of leading stock valuation models. Impact of changes in the firm's fundamentals and in macroeconomic factors on stock prices. Brief introduction to equity and index derivatives. 4 lectures. Prerequisite: BUS 342, ECON 339 or STAT 324; Business majors must have formally declared their concentration to enroll.

BUS 432 Insurance Planning and Risk Management (4)

Introduction to insurance planning and risk management and its role in financial planning. Key concepts include determining risk exposure and selecting insurance products. Legal aspects of property and liability policy, life, health, and social insurance. 4 lectures. Prerequisite: BUS 342.

BUS 433 International Finance (4)

Financial management of international business. International capital and money markets, international financial institutions, special problems in evaluating direct foreign investment, and financial techniques used in international business operations. 4 lectures. Prerequisite: BUS 431 or BUS 439.

BUS 434 Real Estate Finance (4)

Analyses of real estate financing techniques and funding sources for development projects. Effects of federal, state, and local taxes on real estate investments. In-depth investigation and computer analyses of real estate investment projects. 4 lectures. Prerequisite: BUS 342.

BUS 435 Real Estate Investment (4)

Intensive investigation and computer analysis of real estate investment opportunities. Problems in real estate and property management. 4 lectures. Prerequisite: BUS 342.

BUS 436 Entrepreneurial Finance (4)

Process of financing new and fast-growing firms. Readings on the venture capital process, from seed capital through the initial public offering. Valuation of firms seeking venture capital, and those planning their initial public offering. Valuing convertible securities. Real options valuation. 4 seminars. Prerequisite: BUS 342.

BUS 437 Retirement and Estate Planning (4)

Retirement planning and employee benefits; Social Security and Medicare; types of retirement plans; qualified plan characteristics; distribution options; and group insurance benefits. Trusts, power of attorney, and probate. 4 lectures. Prerequisite: BUS 342.

BUS 438 Advanced Corporate Finance (4)

Corporate finance with an emphasis on managing the corporation to create shareholder value. Detailed treatment of topics such as capital budgeting, capital

structure, economic value-added, corporate distribution policy, financial distress, and mergers and acquisitions. 4 lectures. Prerequisite: BUS 431 and BUS 439.

BUS 439 Fixed Income Securities and Markets (4)

Development of analytical skills for properly valuing fixed income securities. Bond pricing, yields, and volatility; interest rate term structure and yield curve; securities, market structure, and analytical techniques; bond portfolio strategies and an introduction to interest rate derivatives. 4 lectures. Prerequisite: BUS 342; Business majors must have formally declared their concentration to enroll.

BUS 440 Commercial Bank Management (4)

Analysis of the management of a commercial bank as a profit-making entity. Emphasis put on cases in bank management, especially those which deal with the management of a bank's asset and liability structure. 4 lectures. Prerequisite: BUS 342 and ECON 337.

BUS 441 Computer Applications in Finance (4)

A combination lecture/computer lab course focusing on computer acquisition of financial data and the subsequent application of financial theory and analysis to this data so as to facilitate financial decision making. 3 lectures, 1 activity. Prerequisite: BUS 342.

BUS 442 Introduction to Futures and Options (4)

An in-depth analysis of derivatives markets and instruments. Emphasis on the valuation of futures, options, swaps, and other derivative securities. 4 seminars. Prerequisite: BUS 431.

BUS 443 Case Studies in Finance (4)

Development of analytical and decision-making techniques in applying financial theory to business management problems. Emphasizes working capital management, financial analysis and forecasting, mergers and acquisitions, and other current topics in finance, including financial ethics. Cases are used to emphasize practical problems. 4 lectures. Prerequisite: BUS 431 or BUS 439.

BUS 444 Financial Engineering and Risk Management (4)

Advanced course synthesizing concepts from corporate finance, derivative securities, statistics, and computer science. Emphasis on both computer programming in a matrix programming language (Matlab) to solve practical risk management and valuation problems, and analytical training in the area of stochastic calculus, and its application to derivative security pricing. Practical applications of derivatives for controlling risk in an international corporate environment. 4 lectures. Prerequisite: BUS 431.

BUS 445 Ethics and Behavioral Finance (4)

Contemporary theoretical and empirical issues including agency theory, reputation building, game theory, and financial ethics. Discussion of the application of ethics theory to financial decisions. May include lectures, case analyses, student presentations, and guest speakers. 4 lectures. Prerequisite: BUS 342.

BUS 446 International Marketing (4)

Basic skills and tools needed to evaluate the cultural factors that impact the acceptance of products and services in markets around the world. Building of an understanding of global marketing strategy. 4 lectures. Prerequisite: BUS 346.

BUS 451 Product Development and Launch (4)

Building of project-based skills in developing new products and planning for their launch. Major phases of product development: opportunity identification, product design and positioning, pre-market testing and forecasting, and launch marketing. Introduction to data-gathering methods used to design well differentiated and successful products. 4 lectures. Prerequisite: BUS 418, STAT 252; Business majors must have formally declared their concentration to enroll.

BUS 452 Product Management (4)

Development of project-based skills in managing products in the growth, maturity, and decline stages of their life cycles. Emphasis on the distribution, pricing, and communication strategies required to maintain distinctive product advantages. Product modification, product line strategies, and pruning. 4 lectures. Prerequisite: BUS 419.

BUS 454 Developing and Presenting Marketing Projects (4)

Client-based course providing an opportunity to apply marketing abilities. Teams draw upon research, analytical, and strategic marketing skills to develop an actionable plan that addresses a critical marketing challenge faced by an organization. Deliverables include research findings and written and verbal presentation to the organization and instructor. 4 lectures. Prerequisite: BUS 418, STAT 252; Business majors must have formally declared their concentration to enroll.

BUS 455 Marketing Management (4)

Integration of key marketing concepts using tools such as computer simulations, readings, and/or case studies. Development and implementation of strategic and tactical decisions for companies and brands. 4 lectures. Prerequisite: BUS 451 and BUS 452.

BUS 456 Industrial Customer Interfacing (4)

Focus on managing aspects of the customer interface for strategic advantage. Emphasis on building and maintaining customer data bases. Establishing and maintaining customer service centers. Providing technical support services. Conference and trade show planning and development. 4 lectures. Prerequisite: BUS 346 or consent of instructor.

BUS 461, 462 Senior Project I, II (2) (2)

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time. Prerequisite: Senior standing.

BUS 463 Senior Project: Applied Accounting and Auditing Research (4)

Practice with multiple authoritative accounting and auditing databases, actual published financial reports, and business writing. Real world accounting and auditing issues, including revenue recognition and ethics issues. Federal and state regulation of securities transactions. Prerequisite: Senior standing, BUS 322 and Graduation Writing Requirement.

BUS 464 Applied Senior Project Seminar (4)

Selection and analysis of business problems and opportunities in directed individual or group-based projects. Problems typical to those which graduates could encounter in their fields of employment. Formal report required. 4 seminars. Prerequisite: Senior standing.

BUS 465 Senior Project: Forensic Accounting Seminar (4)

The concepts and principles of fraud. Application of fraud examination theory and detection procedures to an unstructured, real-life fraud case involving asset misappropriation and fraudulent financial statements. Summarization of findings and presentation in oral and written form. 2 lectures, 2 activities. Prerequisite: Senior standing.

BUS 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Consent of instructor.

BUS 471 Compensation (4)

Design and management of compensation systems. Job analysis, job evaluation, wage and salary surveys, incentive systems, gainsharing, benefit administration, pay equity and legal regulation. Simulation and case study development of a wage structure, pay level and individual raise policies, administrative controls, salary and program budgets. 4 lectures. Prerequisite: BUS 384 and STAT 252, or equivalent.

BUS 472 Labor Relations (4)

Union organizing. Negotiation and administration of collective agreements. Simulation of bargaining, grievance, and arbitration processes. 4 lectures. Prerequisite: BUS 384 or equivalent.

BUS 473 Employment Law (4)

Federal and state labor policy as expressed in common law, relevant statutes, and executive orders. Effects upon employees, management, protected groups, and the public. Current rules analyzed in a contemporary and historical context. Understanding important workplace and employment problems. 4 lectures. Prerequisite: BUS 207, BUS 384 or equivalent.

BUS 474 Independent Study in Accounting (4)

Individual investigation, research, study or survey of selected topics in accounting, auditing or taxation. Total credit limited to 8 units, repeatable in the same term. The Schedule of Classes will list topic selected. Prerequisite: BUS 322.

BUS 475 Staffing (4)

Processes by which individuals and organizations become matched to form the employment relationship. Specific issues related to human resources planning, internal and external recruitment and selection. 4 lectures. Prerequisite: BUS 384 and STAT 252, or equivalent.

BUS 477 Managing Change and Development (4)

Analysis of development and trends in the field of organization change and development. Application of behavioral and organizational science knowledge

and social technology to growth and change of organizations for the purpose of improving effectiveness and sustainability. 4 seminars. Prerequisite: BUS 387 or BUS 382 or consent of instructor.

BUS 478 Organization Design Programs (4)

Impact of changing business environment and strategy on design of organizations. Organization design programs, including design models, redesign processes, and guiding principles. Case studies, current redesign projects and field studies. 4 lectures. Prerequisite: BUS 382 or consent of instructor.

BUS 479 Purchasing and Materials Management (4)

Role and scope of the procurement function and concept of an integrated materials management process. Relations with functional departments. Purchasing structure and processes in business and service organizations. Global concept of international purchasing. Measuring purchasing performance. 4 lectures. Prerequisite: ECON 222 and IT 371.

BUS 483 Seminar in Managerial Consultation (4)

Management consulting in the private and public sectors. Analysis of substantive and process skills required to provide independent and objective advice to clients. Application of consulting knowledge and skills to real client problems and facilitation of change. 4 seminars. Prerequisite: BUS 382 and BUS 387.

BUS 484 Corporate Training (4)

Developing and managing curriculum for an industrial setting. Developing a philosophy, assessing resources, developing and sequencing objectives, developing and properly using materials in training, evaluating and reporting effectiveness. Managing people and resources within this process in an industrial setting. 4 lectures. Prerequisite: Senior standing.

BUS 486 Human Resource Information Systems (4)

Application of computers to the management of human resources. Human resource decision support systems and routine transaction processing. Ethical use of information systems in managing the human resource function. Basic system design decisions. Use of information systems to support traditional human resource functional areas. Exposure to enterprise-wide, integrated software. 4 lectures. Prerequisite: BUS 384 and BUS 391.

BUS 488 Planning and Managing New Ventures (4)

The purpose and process of business planning and the challenges of managing a start-up enterprise. Preparation of a complete business plan: management and organization; product or service; marketing; finance; operating and control systems; growth. 4 seminars. Prerequisite: BUS 215, BUS 310, BUS 342, BUS 346 and BUS 436; Business majors must have formally declared their concentration to enroll.

BUS 489 Negotiation for Managers (4)

Theory and practice of negotiation in the management of enterprise, including ethical issues in negotiation and the impact of culture on negotiation. 4 lectures. Prerequisite: BUS 387.

BUS 491 Modeling and Analysis Using Computer Simulation (4)

Modeling organizational systems and processes such as computer networks, transportation systems, manufacturing systems, retail systems, etc. Developing computer simulation models and animation of systems to provide decision support in selecting system design alternatives. Applying quantitative methods to model uncertainty and conduct statistical performance analysis. 4 lectures. Prerequisite: BUS 391, STAT 251 or equivalent.

BUS 494 Enterprise Information Systems (4)

Information systems in an integrated business environment. Collaborative learning with teams analyzing, designing, implementing and evaluating enterprise software. Determine and implement organizational policies and procedures to assure system performance. Coverage of business processes in the areas of accounting, procurement, human resource, production customer relationship and supply chain management. Ethical use of information systems in managing businesses. Role of information systems in conducting business in a socially responsible manner. 4 lectures. Prerequisite: BUS 391.

BUS 495 Software Testing (4)

Theory and practice of software testing, including state-of-the-art practices, design issues, staffing issues, test management issues, and other related areas. Software testing tools utilized for applications testing, and test management. 4 lectures. Prerequisite: BUS 391 and CPE/CSC 101 or CSC 237 (with a grade of C- or better), or consent of instructor.

BUS 496 Electronic Commerce (4)

Focus on the technology of electronic commerce, including programming, development environments and security, through a series of lectures, guest

speakers, demonstrations, exercises and case studies. Networking, client/server computing, and web/database design concepts. Working e-commerce application required at end of course. 4 lectures. Prerequisite: BUS 391, CPE/CSC 101 or CSC 237 (with a grade of C- or better, or consent of instructor), BUS 390.

BUS 498 Directed Topics in Information Systems (4)

Specialized Information Systems (IS) topic selected from the IS areas of current interest. Intended for advanced IS concentration students who want to learn and acquire in-depth IS knowledge and skills. The Schedule of Classes will list topic selected. 4 lectures. Prerequisite: BUS 390 and BUS 393.

BUS 499 Data Communications and Networking (4)

Combines the fundamental concepts of data communications and network-ing with practical applications in business. Provides a basic understanding of the technical and managerial aspects of business telecommunication. Introduction to data communications and applications and technical fundamentals, and to network products, technologies, applications, and services. 4 lectures. Prerequisite: BUS 391, or consent of instructor.

CD—CHILD DEVELOPMENT

CD 102 Orientation to the Child Development Major (2)

Introduction to the child development major, self-assessments, career opportunities, university and community resources, and the program at Cal Poly. 2 lectures. Prerequisite: CD majors only or consent of instructor.

CD 109 Parenting (2)

Philosophies and techniques explored out of which an individual can devise an effective parenting style. Basic skills for parent effectiveness. 2 lectures.

CD 131 Observing and Interacting with Children (4)

Observation methods and guidance techniques for adults working with children in family, community, and educational settings. 3 lectures, 1 activity.

CD 200 Special Problems for Undergraduates (1–4)

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 4 units per quarter.

CD 207 The Learner's Development, Culture and Identity in Educational Settings (4)

Theoretical background of child and early adolescent development within diverse cultural settings and implications for the teaching-learning process. Observations of children in everyday settings. 3 lectures, 1 activity. Participation in public schools requires mandated fingerprint clearance. Prerequisite: PSY 201 or PSY 202. *Crosslisted as CD/EDUC 207.*

CD 230 Preschool Laboratory (4)

Teaching experience with children in a preschool laboratory setting. Participant planning, execution and evaluation of age-appropriate activities. Observation is used as the basis for planning for the development of the whole child. 4 laboratories. Prerequisite: CD 131, PSY 256, or consent of instructor.

CD 254 Family Psychology (4)

Introduction to research and theory on family relationships and behavior across the lifespan. Contextual influences, diversity of family forms, and topics such as love, mate selection, marital quality, parenting, gender, household work, divorce, and remarriage. 4 lectures. Prerequisite: PSY 201 or PSY 202. *Crosslisted as CD/PSY 254.*

CD 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

CD 304 Infant and Toddler Development (4)

Human development from conception through the second year of life. Examination of theory and research in multiple domains of development. Consideration of environments and activities which enhance the emerging capabilities of infants and toddlers. 4 lectures. Prerequisite: PSY 256.

CD 305 Early and Middle Childhood Development (4)

In-depth study of theory and research on development in early and middle childhood, especially within physical, cognitive, social, and emotional domains. Consideration of case studies and current practices in light of theoretical perspectives and current research. 4 lectures. Prerequisite: PSY 256 or CD/EDUC 207.

CD 306 Adolescence (4)

Psychological analysis of the years from prepubescence to young adulthood. Current research on behavior and development during adolescence with emphasis on physical, affective, cognitive, sociocultural, historical, family, peer and school aspects of life during the post-child, pre-adult years. 4 lectures. Prerequisite: CD 207 or PSY 256. *Crosslisted as CD/PSY 306.*

CD 329 Research Methods in Child Development (4)

Introduction to research methods in child development. Critically evaluating research literature, generating research questions, and conducting observations and interviews with children and adolescents. 3 lectures, 1 activity. Prerequisite: PSY 256, STAT 217.

CD 330 Supervised Internship (4) (CR/NC)

Faculty-supervised internship. Role of professional apprentice is experienced and analyzed by each student. Credit/No Credit grading only. Prerequisite: Psychology and Child Development majors only. CD 230, PSY 323, junior standing and consent of instructor.

CD 350 Developmental Issues in Education (4)

Current issues concerning how human beings develop and learn. Topics may include motivation, intelligence, peer relations, creativity, learning competence, moral development, and the implications these topics have for education. 4 lectures. Prerequisite: PSY 256 or CD/EDUC 207.

CD 390 Career Planning (2) (CR/NC)

Individual career and graduate school planning. Current employment issues for college graduates such as career profiles, trends and work environments. Credit/No Credit grading only. 2 seminars. Prerequisite: Junior standing or consent of instructor. *Crosslisted as CD/PSY 390.*

CD 400 Special Problems for Advanced Undergraduates (1–4)

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 4 units per quarter. Prerequisite: Junior standing.

CD 401 Perspectives on Child and Adolescent Development (4)

Advanced study of theoretical perspectives and research on the development of children and adolescents and the implications for current practice and policy. 4 seminars. Prerequisite: CD 304, CD 305, CD 306, CD 329, CD 330, senior standing, or consent of instructor.

CD 404 Administration of Children's Programs (4)

Organization and administration of programs for young children, preschool and child care centers. Staffing, finance, equipment, records, program evaluations, regulations, public policy and community relations. 4 lectures. Prerequisite: CD 305.

CD 413 Children, Adolescents and Technology (6)

Examination of research and theory on how children and adolescents use digital technologies and influences on cognitive, social, and identity development. Observations of children's use of various digital technologies, and design of activities that use technology tools to support learning goals. 4 lectures, 2 laboratories. Prerequisite: CD 305, CD 306, CD 329.

CD 424 Children's Learning in Families and Communities (4)

Examination of research on children's learning and development in diverse families and community settings. Effective organizational practices, and formal and informal instructional activities. Further study of sociocultural perspectives and cross-cultural research. 4 lectures. Prerequisite: Two of the following: CD 304, CD 305, CD 306 or consent of instructor.

CD 430 Advanced Internship (4) (CR/NC)

Faculty-supervised preprofessional experience in a career-related setting which complements the CD 330 internship. Such roles as master teacher, caseworker, therapeutic intern, administrative aide or program specialist are experienced and analyzed by each student. Credit/No credit grading only. Prerequisite: Psychology and Child Development majors only. CD 330 and consent of instructor.

CD 431 Assessing Children's Development and Environments (4)

Current developmental and environmental assessments used in childcare and educational settings and in research. Practice using, creating, and evaluating child assessments. 3 lectures, 1 activity. Prerequisite: CD 304 and CD 305 or two of the following: PSY 419, PSY 420, PSY 421, CD 329 or PSY 329. *Crosslisted as CD/PSY 431.*

CD 432 Research Internship (4) (CR/NC)

Faculty-supervised research experience on various topics related to child and adolescent development. Student apprenticeship with a department faculty member to conduct aspects of a research project. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: CD 329, CD 330, or consent of instructor.

CD 461 Senior Project Seminar (2)

Senior project expectations and skills. Students work alone or in groups to identify appropriate topics, methods and content for the senior project; to be presented in a series of progress reports. Begin literature reviews for completion in CD 462. 2 seminars. Prerequisite: Psychology and Child Development majors only. Completion of GWR, CD 329, and consent of instructor.

CD 462 Senior Project (2)

Completion of a project under faculty supervision. Prerequisite: CD 461.

CD 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Consent of instructor.

CE–CIVIL ENGINEERING**CE 111 Introduction to Civil Engineering (1) (CR/NC)**

Broad overview of the field of civil engineering, including professional societies and their student chapters, professional licensing and registration, professional codes of ethics, the elements of engineering design, and the scope of analysis and design activities undertaken by private- and public-sector civil design professionals. Credit/No Credit grading only. 1 lecture.

CE 112 Design Principles in Civil Engineering (2)

The civil and environmental engineering design process. Illustration and quantification of design alternatives. Practice in creating and evaluating typical designs drawn from different specialty areas of the field. 2 lectures. Prerequisite: MATH 141.

CE 113 Computer Aided Drafting in Civil Engineering (2)

Computer-aided drawing (CAD) and related software to display and quantify engineering designs. Elements of engineering design drawings. Related topics in information technology. 2 laboratories. Corequisite: CE 112, or prerequisite: ENVE 111.

CE 200 Special Problems for Undergraduates (1–2) (CR/NC)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of department chair.

CE 201 Mechanics of Materials (6)

Stresses, strains, and deformations associated with torsion, axial, shear, moment, and pressure vessel loadings. Combined loadings and principle representations of the states of stress and strain at a point. Basic failure criteria. Introduction to stability including buckling of columns. Equivalent in content to CE 204 and CE 207. 6 lectures. Prerequisite: ME 211.

CE 204 Mechanics of Materials I (3)

Stresses, strains, and deformations associated with axial, torsional, and flexural loading of bars, shafts, and beams. Analysis of elementary determinate and indeterminate mechanical and structural systems. 3 lectures. Prerequisite: ME 211.

CE 207 Mechanics of Materials II (3)

Combined stress states including torsion, axial, shear, moment, and pressure vessel loadings. Principle stress/strain states. Basic failure criteria. Analysis of beam forces, moments, deflections, and rotations. Introduction to stability concepts including column buckling. 3 lectures. Prerequisite: CE 204.

CE 240 Additional Engineering Laboratory (1-2) (CR/NC)

Special assignments undertaken by students who need or wish to acquire abilities supplementary to their standard pattern of courses. Assignments must be primarily of shop or laboratory nature. Work done with minimum faculty supervision. Total credit limited to 6 units. Credit/No Credit grading only. 1-2 laboratories.

CE 251 Numerical Methods in Engineering (4)

Concepts from numerical analysis and basic programming theory introduced in the context of engineering applications. Topics include the application of programming constructs, finite precision calculations, vectors, matrices,

eigenvalues/vectors, linear systems, linear programming, basic nonlinear systems, differential equations, plotting, statistics, least squares, and approximations. 3 lectures, 1 laboratory. Prerequisite: CE 113 and MATH 244. Corequisite: CE 207.

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 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

CE 321 Fundamentals of Transportation Engineering (3)

The characteristics and functions of highway, air, rail, transit and other modes of urban and intercity transportation. Fundamentals of transportation design, operations, and planning. Evaluation of costs, benefits, and environmental considerations. 3 lectures. Prerequisite: PHYS 131, CE 259. *Formerly CE 221.*

CE 322 Fundamentals of Transportation Engineering Laboratory (2)

Application of principles of transportation planning, operations, and design. Emphasis on urban transportation planning and operations, and the design of urban and intercity highway and rail facilities. Experimental determination of the physical and mechanical properties of pavement materials through laboratory and field testing. Analysis of data and preparation of testing reports. 2 laboratories. Prerequisite or concurrent: CE 321. *Formerly CE 222.*

CE 336 Water Resources Engineering (4)

Hydraulics of pile flow. Open channel flow, groundwater, and hydrology. 4 lectures. Prerequisite: ME 341 or ENVE 264.

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 or ENVE 264. Corequisite: CE 336.

CE 351 Structural Analysis (4)

Analysis for member forces and deflections of determinate and indeterminate structures, including trusses, beams, and frames. General theorems, influence diagrams, and energy methods. 3 lectures, 1 laboratory. Prerequisite: CE 251 and either CE 201 or CE 207.

CE 355 Reinforced Concrete Design (4)

Analytical and design principles of reinforced concrete in designing civil engineering systems. Origin of code requirements. Fundamentals of proportioning. Details of elements and structural systems. 3 lectures, 1 laboratory. Prerequisite: CE 259, CE 351.

CE 356 Structural Steel Design (4)

Design and behavior of the elements of steel structures. Design and analysis of bolted, welded and eccentric connections. Proportioning of members and connections. Introduction to plastic design, end plate connection, composite construction, shear connections and design of composite beams. 3 lectures, 1 laboratory. Prerequisite: CE 351.

CE 381 Geotechnical Engineering (4)

Engineering geology, elementary mass-volume relations, clay-water interaction, soil classification, soil compaction, geostatic stress distributions, 1-D and 2-D steady-state flow, shear strength under drained and undrained conditions. 4 lectures. Prerequisite: CE 207 and ME 341. Concurrent: CE 382 (CE majors only).

CE 382 Geotechnical Engineering Laboratory (1)

Use of standard laboratory test methods to determine physical, mechanical, and hydraulic properties of soil. 1 laboratory. Corequisite: CE 381.

CE 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

CE 401 Advanced Mechanics of Materials (4)

Introduction to linear elasticity as a means for development of reduced order theories such as torsion, beams, columns, and plates from the general three-dimensional continuum. Energy methods as well as the application and limitation of these theories. 4 lectures. Prerequisite: CE 351 or ME 328.

CE 404 Applied Finite Element Analysis (4)

Finite element based solutions to engineering problems with an emphasis on elastostatic problems in structural mechanics. The power and pitfalls associated with the finite element method highlighted through practical modeling assignments. Introduces the use of commercial finite element codes. 3 lectures, 1 laboratory. Prerequisite: ME 329 or CE 351 or BMED 410. *Crosslisted as BMED/CE/ME 404.*

CE 405 Concrete Materials (4)

Supplementary cementitious materials and chemical admixtures and their incorporation into concrete mix design. Design and testing of concrete for durability and other specialized properties. 3 lectures, 1 laboratory. Prerequisite: CE 259.

CE 407 Structural Dynamics (4)

Effect of vibration and transient loads on structural elements. Dynamics load factors, support motion, damping and natural frequencies of multidimensional structural systems. Modal analysis. 3 lectures, 1 laboratory. Prerequisite: CE 351, ME 212.

CE 421 Traffic Engineering (4)

Principles of traffic circulation on highway systems and other modes. Traffic control. Traffic data collection and analysis. Capacity analysis. Traffic modeling. New technologies. 3 lectures, 1 laboratory. Prerequisite: CE 321 or consent of instructor.

CE 422 Highway Geometrics and Design (4)

Alignment location and safe geometric design of highways. Earthwork and drainage related to highway. Theory and practice in design of alignments, highway cross-sections, intersections, interchanges, and freeways in urban and rural areas. Application of advanced computer software to highway geometrics. 2 lectures, 2 laboratories. Prerequisite: CE 321 or consent of instructor.

CE 423 Intelligent Transportation Systems (4)

Specification and operation of Intelligent Transportation Systems (ITS). Traffic surveillance and control systems including applications to freeways, urban streets, rural highways, and public transportation. Standards include the National Architecture for ITS. 3 lectures, 1 laboratory. Prerequisite: CE 321, graduate standing, or consent of instructor.

CE 424 Public Transportation (4)

Interdisciplinary aspects of public transportation problems, systems-team design approach to solutions. History and present state of public transportation; role of public transportation in urban environment; legislative, political, social, and economic aspects of public transportation systems. Methodology and procedures for transit planning. Review of transit studies. 3 lectures, 1 laboratory. Prerequisite: CE 321 or consent of instructor.

CE 431 Coastal Hydraulics I (4)

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. 4 lectures. Prerequisite: ME 341 or ENVE 264.

CE 432 Coastal Hydraulics II (4)

Reformed breaker height determination, wave runup analysis using a reformed breaker height. Wave setback analysis. Pile height determination. Criteria for types of breaking waves. Revetment analysis, rip-rap revetment design, wave forces on pilings. 4 lectures. Prerequisite: CE 431.

CE 433 Open Channel Hydraulics (4)

Analysis and characteristics of flow in open channels; critical flows; uniform flow; gradually varied flow; channel design problems, channel transitions and controls. Rapidly varied flow; hydraulic jump and energy dissipaters. Unsteady flows, waves and wave propagation, flood routing. Applications of numerical methods in hydraulic engineering. 4 lectures. Prerequisite: CE 336.

CE 434 Groundwater Hydraulics and Hydrology (4)

Differential equations of groundwater flow, Darcy's Law, solutions of the steady and unsteady flow, differential equations for confined and unconfined flows. Pumping test design. Groundwater models, leaky aquifers. Saltwater intrusion. 4 lectures. Prerequisite: CE 336.

CE 435 Engineering Hydrology (4)

Analysis of hydrologic cycle components such as precipitation, infiltration and evaporation. Rainfall-runoff analysis to determine peak flows and runoff hydrographs. Hydrologic river and reservoir routings and their applications for

flood plain management. Application of frequency analysis methods to determine design rainfalls and design flows. 4 lectures. Prerequisite: CE 336.

CE 440 Hydraulic Systems Engineering (4)

Water and wastewater flows. Design of water distribution systems, transmission and storage reservoirs, wastewater collection systems, and storm water systems. Pumps and pump systems, flow measurements. Water sources for municipal supply. 3 lectures, 1 laboratory. Prerequisite: CE 336.

CE 454 Structural Design (4)

Design of reinforced concrete, steel and timber structures. Loading standards, code design methods, connection design. Comprehensive design projects. 2 lectures, 2 laboratories. Prerequisite: CE 351, CE 355, CE 356.

CE 455 Design of Timber Structures (4)

Analysis and design of timber structures with emphasis on construction methodology, and material behavior. Topics include: physical and mechanical properties of structural lumber and glulams; lateral load paths; diaphragms; connections; shear wall design; and combined load design. 3 lectures, 1 laboratory. Prerequisite: CE 355 or CE 356.

CE 456 Seismic Principles for Civil and Environmental Engineers (4)

Basic principles in seismic analysis and design of civil and environmental systems. Seismological aspects of earthquakes. Simple concepts in structural dynamics. Simplified code-based analysis and design. 4 lectures. Prerequisite: CE 207. Not open to students with credit in CE 557.

CE 457 Bridge Engineering (4)

Fundamentals of the structural analysis and design of highway bridges. Construction materials in bridges. Loads on highway bridges. Load path and distribution in bridge superstructure. Design of reinforced concrete, pre-stressed concrete, steel plate girder, and composite bridges. 3 lectures, 1 laboratory. Prerequisite: CE 351 and CE 355. Corequisite: CE 356.

CE 458 Fiber Reinforced Polymer (FRP) Design (4)

Properties and mechanical characteristics of Fiber Reinforced Polymer (FRP) composite materials; applications in civil engineering structures as primary or secondary reinforcement; and design techniques based on newly developed ACI 440 design guidelines and worldwide experience in FRP design. 3 lectures, 1 laboratory. Prerequisite: CE 351 and CE 355. Concurrent: CE 356.

CE 459 FRP Strengthening of Reinforced Concrete Structures (4)

Flexural and shear strengthening reinforced and prestressed concrete members using fiber reinforced polymer composite plates and laminates; seismic repair and rehabilitation of columns, slabs, beams and structures. Focus on design philosophy and design methodology, based on the current understanding of FRP-strengthening techniques. 3 lectures, 1 laboratory. Prerequisite: CE 355.

CE 461, 462 Senior Project I, II (2) (2)

Completion of a 120-hour integrated civil research, analysis, and/or design project that is representative of those encountered in professional practice. Prerequisite: Senior standing and consent of the supervising faculty member.

CE 464 Professional Practice (3)

Examination of the non-technical issues that are dealt with on a regular basis by the design professional, including professional ethics, marketing and business development, professional engagement, personnel and project management, risk management, professional liability insurance, and dispute resolution. 3 seminars. Prerequisite: Senior standing.

CE 466 Senior Design I (3)

Work on multi-disciplinary teams to complete an integrated civil design project. Focus of formal instruction on selected topics in geotechnical, structural, transportation, and water resources engineering design. Topics, related to interpersonal communication, teamwork, leadership, ethics, and professional practice, addressed to promote understanding of the non-technical issues and skills that must be mastered to become a successful design professional. 2 lectures, 1 laboratory. Prerequisite: CE 321, CE 322, CE 336, CE 337, CE 355, CE 356, CE 381, CE 382, senior standing, and consent of instructor.

CE 467 Senior Design II (3)

Continuation of CE 466. Continuation of work on multi-disciplinary teams to complete an integrated civil design project. Focus of formal instruction on technical and non-technical issues. Summarization of team project results in formal written reports and oral presentations. 2 lectures, 1 laboratory. Prerequisite: CE 466.

CE 468, 469 Community Engineering Senior Design I, II (3) (3)

Two-part series. Student teams work in cooperation with a local community organization to complete an integrated civil design project. Projects representative of those encountered in professional practice. Focus on professional as well as design issues. Volunteer service required. 2 lectures, 1 laboratory. Prerequisite: CE 321, CE 322, CE 336, CE 337, CE 355, CE 356, CE 381, CE 382, senior standing, and consent of instructor.

CE 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

CE 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

CE 481 Analysis and Design of Shallow Foundations (4)

Evaluation of shear strength for foundation design. Analysis of bearing capacity for generalized conditions. Design of reinforced concrete spread footings. Stress distributions beneath loaded areas. Immediate settlement, consolidation settlement, rate of consolidation, and creep. 4 lectures. Prerequisite: CE 381 and CE 382.

CE 482 Conventional Subsurface Exploration (4)

Subsurface exploration and sampling techniques. Laboratory analysis of material variability. Preparation of subsurface exploration reports. 2 lectures, 2 laboratories. Prerequisite: CE 481.

CE 486 Introduction to Geological Engineering (4)

Identification and characterization of consolidated geologic materials for the purpose of civil analysis and design. Interpretation of geologic maps, cross sections, and reports. Interpretation of aerial photographs. Engineering considerations important in dealing with transported soils. 4 lectures. Prerequisite: CE 381, CE 382, and GEOL 201.

CE 487 Design of Foundations and Slopes in Rock (4)

Evaluation of the engineering properties of rocks. Rock core description. Slope stability analyses in rock. Discontinuity analysis. Rockfall hazard assessment and mitigation. Design of shallow foundations on rock. 4 lectures. Prerequisite: CE 381, CE 382, and GEOL 201.

CE 488 Engineering Risk Analysis (4)

Introduction to the basic concepts of probability theory, statistics, and decision theory as they pertain to problems in civil and environmental engineering. Emphasis placed on the use of probabilistic modeling, Bayesian statistics, risk analysis, and decision theory. 4 lectures. Prerequisite: CE 381 and STAT 312.

CE 493 Cooperative Education Experience (2) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units. Prerequisite: Sophomore standing and consent of instructor.

CE 494 Cooperative Education Experience (6) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units. Prerequisite: Sophomore standing and consent of instructor.

CE 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

CE 500 Individual Study (1–3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated

ability to do independent work. Enrollment by petition. Prerequisite: Consent of department chair, graduate advisor and supervising faculty member.

CE 501 Advanced Matrix Analysis of Structures I (4)

Matrix terminology and operations. Matrix procedures for analysis of two-dimensional frameworks. Development of stiffness, flexibility and mixed methods. Development of algorithms and programs for use in the analysis of structural frameworks. Discussion of modeling issues and limitations. 3 lectures, 1 laboratory. Prerequisite: CE 351 or consent of instructor.

CE 502 Advanced Matrix Analysis of Structures II (4)

Matrix procedures for analysis of three-dimensional frameworks. Development of algorithms and programs for use in the analysis of structural frameworks. Additional topics to include: member releases, nonprismatic members, elastic supports, offset connections and oblique supports. 3 lectures, 1 laboratory. Prerequisite: CE 501 or consent of instructor.

CE 504 Finite Element Analysis I (4)

Linear finite element theory and analysis. Strong, weak and variational formulations. Physical and isoparametric spaces. Error estimates and numerical integration. Development of finite element algorithms. Use of commercial finite element codes to illustrate course concepts including modeling issues and limitations. 3 lectures, 1 laboratory. Prerequisite: CE/ME 404 and CE 511 or ME 501 or consent of instructor. *Crosslisted as CE/ME 504. Formerly ME 502.*

CE 505 Finite Element Analysis II (4)

Nonlinear and dynamic finite element theory and analysis. Variational formulations and their significance. Isoparametric formulation and numerical integration. Development of two and three-dimensional finite element algorithms. The limitations of FEA. 3 lectures, 1 laboratory. Prerequisite: CE/ME 504. *Crosslisted as CE/ME 505.*

CE 511 Continuum Mechanics and Linear Elasticity (4)

Introduction to continuum mechanics. Kinematics, stress, and balance laws. Constitutive theory for isotropic and anisotropic solids and viscous fluids. Applications including design of beams and pressure vessels, stress concentrations, fiber-reinforced composites, and non-homogeneous biological materials. 4 lectures. Prerequisite: ME 401 or CE 401 or consent of instructor. *Crosslisted as CE 511/ME 501.*

CE 513 Inelastic Stress Analysis (4)

Perfectly plastic and work hardening materials; von Mises and Tresca yield, isotropic and kinematic hardening flow rules, boundary-value problems. Finite elasticity: kinematics, Cauchy- and Green-elasticity, invariance, constraints, Neo-Hookean and Mooney-Rivlin materials, experimental approaches, non-uniqueness, anisotropy, residual stress, thermoelasticity, boundary-value problems. 4 lectures. Prerequisite: ME 501 or CE 511. *Crosslisted as CE 513/ME 503.*

CE 521 Airfield and Highway Pavement Designs (4)

Theories, principles, and procedures in the structural design of highway and airfield pavements. Design of flexible and rigid pavements. Performance of flexible and rigid pavements in the field and the characterization of pavement materials. Practical and direct exposure to laboratory testing of pavement materials. 3 lectures, 1 laboratory. Prerequisite: CE 321, CE 259, CE 381, graduate standing or consent of instructor.

CE 522 Advanced Transportation Design (4)

Application of computers to advanced highway and transportation systems and geometrics. Use of computers for the solution of transportation facility design problems. 2 lectures, 2 laboratories. Prerequisite: CE 321, graduate standing, or consent of instructor.

CE 523 Transportation Systems Planning (4)

Planning of urban and regional multimodal transportation systems. Modeling of transportation networks and travel demand. Travel survey design. Urban data systems. Evaluation of alternatives based on economic, social, technological, and other factors. 2 lectures, 2 laboratories. Prerequisite: CE 321, graduate standing, or consent of instructor.

CE 524 Pavement Performance and Management Systems (4)

Introduction to pavement management; pavement distress data collection; deflection measurements and analysis; pavement performance modeling; pavement structure design; maintenance planning and rehabilitation strategies; prioritization and optimization; computer applications in pavement management. 2 lectures, 2 laboratories. Prerequisite: CE 321, CE 322, CE 259.

CE 525 Airport Planning and Design (4)

Historical background of aviation and airport development; financing; estimating demand; aircraft characteristics; airport capacity; airspace and air traffic control; site selection; airport configuration; geometric design of landing area; planning and development of terminal areas; lighting; pavement design and drainage. 3 lectures, 1 laboratory. Prerequisite: CE 321, graduate standing, or consent of instructor.

CE 526 Transportation Safety (4)

Introduction to nature and extent of transportation safety problem worldwide and in the United States. Several sub-areas of transportation safety: road safety, human factors, vehicle safety; crash data collection and management; safety planning; hot spot identification; methodologies for conducting transportation accident studies; statistical applications to accident data; predictive model building; "before-after" studies; countermeasure design. 3 lectures, 1 laboratory. Prerequisite: CE 321, CE 322, STAT 312.

CE 527 Sustainable Mobility (4)

Presentation and analysis of concepts and designs for sustainable mobility from a global-to-local, interdisciplinary perspective, including pedestrians, bicyclists, and public transportation. Addresses economy, environment, and equity (social issues) through lectures, panels, excursions and a planning/design project in San Luis Obispo County. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

CE 528 Transportation Analysis (4)

Principles of engineering systems analysis and applications to transportation using examples from different modes. Identification of transportation benefits, costs, user and non-user impacts, transportation cost models, pricing, and optimization. 3 lectures, 1 laboratory. Prerequisite: CE 321, graduate standing, or consent of instructor.

CE 529 Modeling and Simulation in Transportation (4)

Theory and operation of transportation systems, the systems approach, simulation techniques. Use of available software packages. Simulation model development, calibration and use. 2 lectures, 2 laboratories. Prerequisite: CE 321, graduate standing, or consent of instructor.

CE 533 Advanced Water Resources Engineering (4)

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. 4 lectures. Prerequisite: CE 336 or graduate standing.

CE 535 Water Resources Systems Planning and Analysis (4)

Water resources planning, development, system analysis and optimization. Dynamic programming, multi-objective water resource systems. 4 lectures. Prerequisite: CE 336.

CE 536 Computer Applications in Water Resources with Geographic Information Systems (GIS) (4)

Modeling, design and analysis of water, wastewater, stormwater systems. Integration of water resource systems with Geographic Information Systems (GIS). 3 lectures, 1 laboratory. Prerequisite: CE 336 and CE 440.

CE 537 Groundwater Contamination (4)

Sources and types of groundwater contamination, contamination transport mechanisms. Sorption and other chemical reactions. Numerical modeling of contaminant transport. Nonaqueous phase liquids. Groundwater remediation and design. 4 lectures. Prerequisite: CE 113; corequisite: CE 336 and ENVE 331.

CE 538 Urban Water Systems (4)

Integration of water delivery, wastewater collection, drainage systems, and associated treatment components in urbanizing areas. Relationships between surface and groundwater elements of water sources and disposal. Use of current design models to quantify the benefits of non-traditional options. 4 lectures. Prerequisite: CE 440.

CE 539 Environmental Hydraulics (4)

Application of fluid mechanics principles to environmental flows. Emphasis on advection, dispersion, stratification and mixing effects. Stratified flows, turbulent jets and plumes, wastewater and thermal diffusers, cooling ponds and channels, control of environmental problems. 4 lectures. Prerequisite: CE 336.

CE 552 Analysis and Seismic Design of Reinforced Concrete (4)

Emphasis placed on reinforced concrete behavior and seismic design. Topics include moment curvature analysis and plastic hinge modeling, strut and tie,

design of structural walls, design of concrete moment frames and seismic detailing. 4 lectures. Prerequisite: CE 454; Recommended: concurrent: CE 557. Formerly CE 452.

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 556 Advanced Fiber Reinforced Polymer (FRP) Strengthening of Reinforced Concrete Structures (4)

Flexural and shear strengthening reinforced and pre-stressed concrete members using FRP composite laminates and plates; seismic repair and rehabilitation of columns, beams, slabs and whole structures. Design philosophies based on the current ACI 440 and the most up to date research in FRP composites. Durability, fire protection and blast mitigation of structures utilizing FRP laminates. 3 lectures, 1 laboratory. Prerequisite: CE 355. Not open to students with credit in CE 459.

CE 557 Seismic Analysis and Design for Civil Engineers (4)

Extension of the basic principles of structural dynamics to analysis of civil structures (buildings, bridges, tanks, etc.) to earthquake loading. Code based (Uniform Building Code and AASHTO) earthquake resistant design of civil structures. 3 lectures, 1 laboratory. Prerequisite: CE 407.

CE 558 Advanced Fiber Reinforced Polymer (FRP) Design (4)

Properties and mechanical characteristics of FRP composites and design methodologies based on the current understanding and usage of FRP composites. Applications of composite rebars in civil engineering structures as primary reinforcement. Design and analysis of reinforced concrete structures utilizing FRP rebars based on the ACI 440 design guidelines. 3 lectures, 1 laboratory. Prerequisite: CE 355. Not open to students with credit in CE 458.

CE 559 Prestressed Concrete Design (4)

Advanced analysis, design and behavior of prestressed and precast concrete elements and structures. Origin of code requirements. Detailed design of prestressed concrete components of civil engineering systems for buildings and highway construction. Creep and shrinkage of concrete and relaxation of steel applied to prestressing losses. 4 lectures. Prerequisite: CE 355 or graduate standing.

CE 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 seminars. Prerequisite: Graduate standing or consent of instructor.

CE 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

CE 573 Public Works Administration (3)

Management and engineering of infrastructure and related systems in public jurisdictions. Utility systems, streets and highways, illumination, distribution systems, etc. Personnel management, financing, public relations, and contract management. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

CE 574 Computer Applications in Civil Engineering (3)

Overview of computer application, hardware and software alternatives, use of selected application programs, CAD, microcomputers, management and application of resources. 1 lecture, 2 laboratories. Prerequisite: Graduate standing or consent of instructor.

CE 581 Advanced Geotechnical Engineering (4)

Advanced topics in saturated flow, unsaturated flow, and consolidation. Stress-strain-deformation response of soils under both drained and undrained loading. Conventional and advanced laboratory strength testing. 3 lectures, 1 laboratory. Prerequisite: CE 481 or graduate standing.

CE 582 Geotechnical In Situ Testing (4)

Standard penetration, cone penetration, and flat-plate dilatometer testing. Equipment operation and maintenance. Interpretation of SPT/CPT/DMT sounding data. Stratigraphic analysis. CPT/DMT-based analysis and design of shallow and deep foundations. 2 lectures, 2 laboratories. Prerequisite: CE 481 or graduate standing.

CE 583 Geotechnical Earthquake Engineering (4)

Introduction to engineering seismology and ground motion evaluation. Dynamic behavior of soils. Seismic site response analysis. Soil liquefaction evaluation methods and mitigation techniques. Seismic stability of slopes and retaining walls. Computer-aided analysis. 4 lectures. Prerequisite: CE 481 and CE 407 or graduate standing.

CE 584 Lateral Support Systems (4)

Classical and modern earth pressure theories. Lateral earth pressure calculations for general subsurface conditions. Analysis and design of reinforced concrete cantilever walls, sheetpile walls, soldier-pile walls, tie-back walls, and mechanically-stabilized earth. Computer-aided analysis and design. 4 lectures. Prerequisite: CE 481 or graduate standing.

CE 585 Slope Stability Analysis (4)

Analysis of stability by planar, circular arc, piecewise-linear, and composite-surface techniques. Analysis of earth-fill dams and reservoirs for static, steady flow, sudden drawdown, and seismic loading conditions. Field instrumentation. Methods for slope remediation and stabilization. Computer-aided analysis. 4 lectures. Prerequisite: CE 481 or graduate standing.

CE 586 Analysis and Design of Deep Foundations (4)

Bearing capacity and settlement analysis of drilled shafts and driven piles. Analysis and design of single piles and pile groups for vertical, lateral, and combined loading. Construction procedures, field inspection, and load-testing. Computer-aided analysis and design. 4 lectures. Prerequisite: CE 481 or graduate standing.

CE 587 Geoenvironmental Engineering (4)

Principles for containment applications. Engineering properties of soils and geosynthetics and their interaction with contaminants and wastes; analysis of geosynthetics used in containment facilities; liners; covers; leachate and gas collection systems; contaminant transport; and monitoring systems. 4 lectures. Prerequisite: CE 381.

CE 588 Ground Improvement (4)

Ground improvement applications investigated for modification of geomechanical and hydraulic properties of soils. Engineering properties of soft ground and high water content materials; mechanical, chemical, and thermal stabilization investigated for foundation and environmental remediation applications. 4 lectures. Prerequisite: CE 381, CE 382, and CE 481.

CE 589 Geosynthetics Engineering (4)

Geosynthetics applications within civil engineering. Design content for geotechnical, geoenvironmental, and transportation applications. Manufacturing processes, material properties, interaction with soils, and service conditions. 4 lectures. Prerequisite: CE 381.

CE 591 Graduate Seminar I(1)

Current research activities and analysis/design philosophies in civil and environmental engineering practice. 1 seminar. Prerequisite: Graduate standing.

CE 592 Graduate Seminar II (1)

Current research activities and analysis/design philosophies in civil and environmental engineering practice. Development of oral and written presentation skills. 1 seminar. Prerequisite: CE 591 and graduate standing.

CE 593 Cooperative Education Experience (2) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

CE 594 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

CE 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

CE 599 Design Project (Thesis) (1-9)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

CHEM-CHEMISTRY**CHEM 101 Introduction to the Chemical Sciences (1) (CR/NC)**

Introduction to the chemistry and biochemistry disciplines. Orientation, advising, career opportunities and introduction to the faculty. Designed for first-year CHEM and BCHEM majors. Credit/No Credit grading only. 1 lecture. Prerequisite: CHEM/BCHEM major or consent of instructor.

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. 3 lectures. Prerequisite: Passing score on ELM examination, or an ELM exemption, or MATH 104. Not open to students majoring in Chemistry or Biochemistry. Not open to students with credit for CHEM 110, CHEM 111, CHEM 124, or CHEM 127.

CHEM 110 World of Chemistry (4)**GE B3 & B4**

The fundamentals of chemical cause and effect-structure/function relationships. The basic principles of chemistry and their applications to solving human problems in organic materials science, biochemistry, toxicology, environmental science, agriculture, nutrition, and medicine. Not open to students majoring in Chemistry or Biochemistry. Not open to students with credit for CHEM 111, CHEM 124, or CHEM 127. 3 lectures, 1 laboratory. Prerequisite: Passing score on ELM examination, or an ELM exemption, or MATH 104. Fulfills GE B3 & B4.

CHEM 111 Survey of Chemistry (5)**GE B3 & B4**

Introduction to atomic theory, chemical reactions, bonding, stoichiometry, nomenclature, and solutions. Intended for students who are preparing for CHEM 212/312. Not open to students with credit for CHEM 110, CHEM 124, or CHEM 127. 4 lectures, 1 laboratory. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104. Recommended: High school chemistry or CHEM 106 or equivalent. Fulfills GE B3 & B4.

CHEM 124 General Chemistry for the Engineering Disciplines I (4)**GE B3 & B4**

General chemistry concepts presented using a materials science approach with engineering applications. Thermochemistry, bonding, solid-state structures, fundamentals of organic chemistry including polymers. Classwork is presented in an integrated lecture-laboratory format, with an emphasis on computer-based data acquisition, collaborative methods and multimedia-based presentation. Not open to students with credit for CHEM 110, CHEM 111 or CHEM 127. Equivalent to 3 lectures, 1 laboratory. Prerequisite: Passing score on ELM, or an ELM exemption, or credit in MATH 104. Recommended: High school chemistry or CHEM 106 or equivalent. Fulfills GE B3 & B4.

CHEM 125 General Chemistry for the Engineering Disciplines II (4)**GE B3 & B4**

A continuation of general chemistry designed for engineering students. Topics include solution chemistry, thermodynamics, kinetics, equilibrium, acids and bases, electrochemistry, and nuclear chemistry. Integration of laboratory with theoretical concepts. Use of computers for data acquisition and multimedia resources. Guided inquiry and collaborative methods emphasized. Not open to students with credit for CHEM 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 124, or AP Chemistry score of 5. Fulfills GE B3 & B4.

CHEM 127 General Chemistry I (4)**GE B3 & B4**

Introduction to atomic theory, chemical reactions, bonding, stoichiometry, nomenclature, gas laws, thermochemistry, molecular structure, and intermolecular forces. Intended primarily for students whose majors are in the College of Science and Mathematics. Not open to students with credit for CHEM 110, CHEM 111 or CHEM 124. 3 lectures, 1 laboratory. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104. Recommended: High school chemistry or CHEM 106 or equivalent. Fulfills GE B3 & B4.

CHEM 128 General Chemistry II (4)

Continuation of CHEM 127. Colligative properties, colloids and solutions, oxidation-reduction reactions, electrochemistry, kinetics, equilibria, and thermodynamics. Intended primarily for students whose majors are in the College of Science and Mathematics. Not open to students with credit for CHEM 125. 3 lectures, 1 laboratory. Prerequisite: CHEM 127 or AP Chemistry score of 5.

CHEM 129 General Chemistry III (4)

Continuation of CHEM 128. Acid and base equilibria, buffers, transition elements, solubility, complex ions, hybrid orbital theory, molecular orbital theory, and nuclear chemistry. Laboratory study of the chemical properties and semi-micro qualitative analysis of the representative group elements of the periodic table. 3 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 128.

CHEM 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: CHEM 111, CHEM 124, or CHEM 127 and consent of department chair.

CHEM 201 Undergraduate Research (1-3) (CR/NC)

Laboratory research under faculty supervision. Credit/No Credit grading only. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

CHEM 212 Introduction to Organic Chemistry (5)

Structure, isomerism, nomenclature, fundamental reactions of major functional groups and applications of organic chemicals in agriculture, medicine, industry, and the home. CHEM 212 accepted in lieu of CHEM 312, but not for upper division credit. Not open to students with credit in CHEM 312, CHEM 216/316. 4 lectures, 1 laboratory. Prerequisite: CHEM 111, CHEM 124 or CHEM 127.

CHEM 216 Introduction to Organic Chemistry I (5)

Basic principles of the bonding, isomerism and stereochemistry in compounds of carbon. Essentials of organic nomenclature. Representative reactions and mechanisms for selected aliphatic and aromatic compounds. Introduction to the physical analysis and synthesis of organic compounds. CHEM 216 accepted in lieu of CHEM 316, but not for upper division credit. Not open to students with credit in CHEM 316. 4 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 129.

CHEM 217 Introduction to Organic Chemistry II (5)

Properties and reactions of carbonyl compounds, alcohols, and organic halides with an overview of the mechanisms of the reactions. Introductory concepts and applications of infrared and NMR spectroscopy. CHEM 217 accepted in lieu of CHEM 317, but not for upper division credit. Not open to students with credit in CHEM 317. 3 lectures, 2 laboratories. Prerequisite: CHEM 216/316.

CHEM 218 Introduction to Organic Chemistry III (3)

Properties and reactions of amines, heterocyclic and aromatic compounds with an overview of the mechanisms of the reactions. Introductory concepts and applications of ultraviolet spectroscopy and mass spectrometry. CHEM 218 accepted in lieu of CHEM 318, but not for upper division credit. Not open to students with credit in CHEM 318. 3 lectures. Prerequisite: CHEM 217/317.

CHEM 222 Introduction to Computational Chemistry (2)

Introduction to chemical structure and behavior by computational chemistry techniques. Applications include scientific visualization, molecular modeling, geometry optimization, transition states and molecular dynamics. 1 lecture, 1 laboratory. Prerequisite: CHEM 129, CHEM 316 and MATH 142 or MATH 162.

CHEM 231 Introduction to Quantitative Analysis (5)

Fundamental theory for common titrimetric and spectrophotometric methods in analytical chemistry. Essentials of chemical equilibria as it applies to titration curves. The laboratory focuses on precision and accuracy for common, practical methods in analytical chemistry. CHEM 231 accepted in lieu of CHEM 331, but not for upper division credit. Not open to student with credit in CHEM 331. 3 lectures, 2 laboratories. Prerequisite: CHEM 129.

CHEM 252 Laboratory Glassblowing (1)

Techniques of glassblowing applied to the making of simple laboratory apparatus. 1 laboratory. Prerequisite: CHEM 111, CHEM 124 or CHEM 127.

CHEM 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

CHEM 305 Physical Chemistry for Engineers (4) GE B6

Fundamentals and applications of chemical thermodynamics of particular interest to engineers. Chemical and phase equilibria. 4 lectures. Prerequisite: PHYS 123 or PHYS 133, CHEM 125 or CHEM 129, MATH 143. Fulfills GE B6.

CHEM 312 Survey of Organic Chemistry (5)

Structure, isomerism, nomenclature, fundamental reactions of major functional groups and applications of organic chemicals in agriculture, medicine, industry,

and the home. Not open to students with credit in CHEM 212 or CHEM 216/316. 4 lectures, 1 laboratory. Prerequisite: CHEM 111, CHEM 124 or CHEM 127.

CHEM 313 Survey of Biochemistry and Biotechnology (5)

Chemistry of biomolecules including carbohydrates, proteins, fats, vitamins, enzymes and hormones. Basic molecular biology with applications to biotechnology and genetic engineering. Practical intermediary metabolism of prokaryotic and eukaryotic systems. 4 lectures, 1 laboratory. Prerequisite: CHEM 212/312 or CHEM 217/317.

CHEM 316 Organic Chemistry I (5)

Structure, bonding, nomenclature, isomerism, stereochemistry and physical properties of organic compounds. Introduction to spectroscopy. Reactions and mechanisms of alkanes, alkenes, alkynes, cycloalkanes and aromatic compounds. Laboratory techniques in organic preparations. 4 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 129.

CHEM 317 Organic Chemistry II (5)

Reactions and reaction mechanisms of organic halides, alcohols, phenols, epoxides, ethers, carboxylic acids and their derivatives, aldehydes, ketones; acidity and basicity; infrared and NMR spectroscopy. 3 lectures, 2 laboratories. Prerequisite: CHEM 216/316.

CHEM 318 Organic Chemistry III (3)

Chemistry of amines, aromatic compounds, heterocycles, macromolecules, some biomolecules, carbanions, rearrangement and ultraviolet and mass spectrometry. 3 lectures. Prerequisite: CHEM 217/317.

CHEM 319 Advanced Organic Chemistry Laboratory (2)

Practice in multiple step organic synthesis, column chromatography, vacuum distillation, enzymes as chemical reagents, inert atmosphere techniques, introduction to FT NMR spectroscopy and mass spectrometry, survey of organic chemical literature. 2 laboratories. Prerequisite: Concurrent or prior enrollment in CHEM 218/318.

CHEM 331 Quantitative Analysis (5)

Theory and application of chemical equilibrium to analytical problems. Survey of important analytical methods with stress placed on the theory and application associated with titrimetric and spectrophotometric analysis. 3 lectures, 2 laboratories. Prerequisite: CHEM 129.

CHEM 341 Environmental Chemistry: Water Pollution (3)

Chemical aspects of water and water pollution: alkalinity; acid deposition, particularly relating to lake and stream acidification and forest decline; drinking water treatment and THMs; wastewater treatment; detergents, builders, and eutrophication; pesticides; other toxic organic compounds such as PCBs and dioxin; hazardous wastes; toxic elements such as Pb, Hg, Sn, Cd, and Se. 3 lectures. Prerequisite: CHEM 129 and CHEM 212/312 or CHEM 216/316.

CHEM 349 Chemical and Biological Warfare (4) GE Area F

History, development, and use of chemical and biological warfare (CBW). Chemical and biological disarmament. Production and destruction of CBW agents. Uses of CBW. CBW terrorism. Ethics of CBW. 2 lectures, 2 seminars. Prerequisite: Junior standing, completion of GE Area B, including a chemistry course (CHEM), and a course in biology (BIO, MCRO or ZOO). Fulfills GE Area F.

CHEM 350 Chemical Safety (1)

Laboratory regulations, equipment hazard analysis, hazardous chemicals, classification of chemicals, toxic materials handling, reaction hazards, radiation, emergency procedures, safety management programs and legal concerns. Includes project. 1 lecture. Prerequisite: CHEM 212/312 or CHEM 216/316.

CHEM 351 Physical Chemistry I (3)

Basic physical chemistry for the study of chemical and biochemical systems. Kinetic-molecular theory, gas laws, principles of thermodynamics. Not open to students with credit in CHEM 305. 3 lectures. Prerequisite: CHEM 129, PHYS 122 or PHYS 132, MATH 143.

CHEM 352 Physical Chemistry II (3)

Application of physical chemistry to chemical and biochemical systems. Electrochemistry, kinetics, viscosity, surface and transport properties. 3 lectures. Prerequisite: CHEM 305 or CHEM 351.

CHEM 353 Physical Chemistry III (3)

Principles and applications of quantum chemistry. Chemical bonding and molecular structure. Spectroscopy and diffraction. 3 lectures. Prerequisite: CHEM 352.

CHEM 354 Physical Chemistry Laboratory (2)

Experimental studies of gases, solutions, thermochemistry, chemical and phase equilibria, electrochemistry, chemical and enzyme kinetics, computational methods and applications to chemistry and biochemistry. Applicable literature and databases. 2 laboratories. Prerequisite: CHEM 231/331. Corequisite: CHEM 352.

CHEM 357 Physical Chemistry III Laboratory (1)

Experimental and computational investigations of quantum chemistry, spectroscopy, symmetry and statistical chemistry. 1 laboratory. Corequisite: CHEM 353.

CHEM 371 Biochemical Principles (5)

Chemistry and function of major cellular constituents: proteins, lipids, carbohydrates, and membranes. 4 lectures, 1 laboratory. Prerequisite: CHEM 212/312 or CHEM 217/317, and BIO 161. Recommended: CHEM 231/331.

CHEM 372 Metabolism (4)

Intermediary metabolism of carbohydrates, lipids, amino acids and nucleotides, regulation and integration of metabolic pathways, bioenergetics, photosynthesis, electron transport, nitrogen fixation, biochemical function of vitamins and minerals. 4 lectures. Prerequisite: CHEM 371.

CHEM 373 Molecular Biology (3)

Structure of nucleic acids and chromosomes. Mechanisms and regulation of nucleic acid and protein synthesis. Molecular biology techniques. 3 lectures. Prerequisite: CHEM 371.

CHEM 375 Molecular Biology Laboratory (3)

Introduction to techniques used in molecular biology and biotechnology; DNA extraction, characterization, cloning, Southern blotting, reverse transcription, polymerase chain reaction, and sequencing analysis. 1 lecture, 2 laboratories. Prerequisite: BIO 161, and grade of C- or better in BIO 351 or CHEM 373 or consent of instructor. *Crosslisted as BIO/CHEM 375.*

CHEM 377 Chemistry of Drugs and Poisons (3)

Introduction to pharmacology and toxicology: history, sources, development and testing, physical and chemical properties, biochemical and physiological effects, mechanisms of action, and the therapeutic uses and toxicology of common drugs and poisons. 3 lectures. Prerequisite: CHEM 313 or CHEM 371.

CHEM 400 Special Problems for Advanced Undergraduates (1-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. 1-3 laboratories. Prerequisite: Junior standing and consent of department chair.

CHEM 401 Advanced Undergraduate Research (1-3) (CR/NC)

Laboratory research under faculty supervision. Credit/No Credit grading only. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor. 4 units may be applied to approved chemistry electives. *Crosslisted as CHEM/SCM 401.*

CHEM 405 Advanced Physical Chemistry (3)

Selected advanced topics in physical chemistry, which may include statistical mechanics, computational chemistry, nonequilibrium thermodynamics, lasers in chemistry, solid-state and/or advanced spectroscopy. Total credit limited to 6 units. 3 lectures. Prerequisite: CHEM 353 or consent of instructor.

CHEM 419 Bioorganic Chemistry (3)

Methods of investigating reaction mechanisms, mechanisms of chemical catalysis, organic models of enzymes, chemistry of vitamins that serve as enzyme cofactors, chemistry of the phosphate group, synthesis of biomolecules. 3 lectures. Prerequisite: CHEM 218/318.

CHEM 420 Advanced Organic Chemistry—Synthesis (3)

Modern methods of organic synthesis. Carbon-carbon bond forming reactions, functional group transformations, protecting groups, strategies of total synthesis of natural products. 3 seminars. Prerequisite: CHEM 218/318.

CHEM 439 Instrumental Analysis (5)

Theory, practice and method selection of modern instrumental analytical techniques, including spectroscopic, electrochemical, chromatographic and thermal methods. Current industrial applications. Laboratory work emphasizes optimization of experimental parameters. 3 lectures, 2 laboratories. Prerequisite: CHEM 231/331, CHEM 354. Recommended: CHEM 353.

CHEM 441 Bioinformatics Applications (4)

Introduction to new problems in molecular biology and current computer applications for genetic database analyses. Use of software for: nucleic acid,

genome and protein sequence analysis; genetic databases, database tools; industrial applications in bioinformatics; ethical and societal concerns. 3 lectures, 1 laboratory. Prerequisite: Junior standing; BIO 161 or BIO 303. Recommended: BIO 302 or BIO 303 or BIO 351 or CHEM 373. *Crosslisted as BIO/CHEM 441.*

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 212/312 or CHEM 216/316.

CHEM 445 Polymers and Coatings II (2)

Introduction to polymerization methods and mechanisms. Chemistry of initiators, catalysts and inhibitors, kinetics of polymerization. Uses of representative polymer types. Synthesis, film formation, structure and properties of polymers commonly used in coatings and adhesives. 3 lectures. Prerequisite: CHEM 217/317 and CHEM 444.

CHEM 446 Surface Chemistry of Materials (3)

Surface energy. Capillarity, solid and liquid interface, adsorption. Surface areas of solids. Contact angles and wetting. Friction, lubrication and adhesion. Relationship of surface to bulk properties of materials. Applications. 3 lectures. Prerequisite: CHEM 305 or CHEM 351 or ME 302. *Crosslisted as CHEM/MATE 446.*

CHEM 447 Polymers and Coatings Laboratory I (2)

Experimental techniques of producing and characterizing coatings. Polymer characterization and analysis. Molecular weight analysis using viscometry, light scattering, and gel permeation chromatography. Thermal analysis using differential scanning calorimetry, thermal mechanical analysis and dynamic mechanical analysis. Polymer rheology. Infrared, Raman and FT-NMR spectroscopy. Atomic force microscopy. 2 laboratories. Prerequisite or corequisite: CHEM 444.

CHEM 448 Polymers and Coatings Laboratory II (2)

Polymer synthesis using solution, suspension, bulk, emulsion techniques. Synthesis of chain growth polymers using free radical, anionic, cationic, and other catalysts. Synthesis of step-growth polymers. Kinetics of polymer reactions. Synthesis of resins used in modern coatings. 2 laboratories. Prerequisite: CHEM 447. Corequisite: CHEM 445.

CHEM 449 Internship in Polymers and Coatings (2)

Selected students will spend up to 12 weeks with an approved polymers and coatings firm engaged in production or related business. Time will be spent applying and developing production and technical skills and abilities in the polymers and coatings industry. Prerequisite: CHEM 444 or consent of instructor.

CHEM 458 Instrumental Organic Qualitative Analysis (3)

Separation, purification, and identification of organic molecules using chemical and instrumental methods, including nuclear magnetic resonance, infrared and ultraviolet spectroscopy and mass spectroscopy, and techniques in high resolution FT-NMR. 1 lecture, 2 laboratories. Prerequisite: CHEM 319.

CHEM 459 Undergraduate Seminar (2)

Oral presentation of current developments in chemistry based on current literature. Searching for, organizing and presenting developments from current literature in chemistry and biochemistry. Preparation for employment and for independent work, including senior project, in chemistry and biochemistry. 2 seminars. Prerequisite or corequisite: CHEM 318 and junior standing.

CHEM 461 Senior Project Report (1)

Completion of a senior project report under faculty supervision. Minimum 30 hours time commitment. Prerequisite: CHEM 459 and consent of instructor.

CHEM 463 Honors Research (1)

Advanced laboratory research. Results are presented in a poster session or other public forum. 1 laboratory. Prerequisite: CHEM 461 and consent of instructor.

CHEM 465 College Teaching Practicum (1-2) (CR/NC)

Teaching assignment in an undergraduate college classroom. Includes teaching and related activities under the direction of a permanent faculty member in the Department of Chemistry and Biochemistry. Total credit limited to 4 units. Prerequisite: Junior standing, CHEM 231/331 (or permission of instructor), evidence of satisfactory preparation in chemistry. Department chair approval required.

CHEM 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: CHEM 305, or CHEM 351, or CHEM 217/317 or consent of instructor.

CHEM 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

CHEM 474 Protein Techniques Laboratory (2)

Experiments in protein purification and analysis from recombinant sources. Ion-exchange and affinity chromatography, electrophoresis and blotting. UV, chemical, immune, and fluorescent detection. Enzyme kinetic analysis. 2 laboratories. Prerequisite: CHEM 371 or consent of instructor.

CHEM 476 Gene Expression Laboratory (2)

Heterologous gene expression of a recombinant protein in a microbial system: gene cloning, construction of expression plasmid, DNA sequence analysis, transformation of microbial host, selection and analysis of transformed host cells, expression and purification of recombinant protein. 2 laboratories. Prerequisite: BIO/CHEM 375; CHEM 313 or CHEM 371. *Crosslisted as BIO/CHEM 476.*

CHEM 477 Biochemical Pharmacology (3)

Consideration of current selected topics in pharmacology and drug targeting. 3 lectures. Prerequisite: CHEM 318.

CHEM 478 Pharmaceutical Development (3)

Process of drug development from research clinical candidate to market. Chemical process development, including synthesis optimization, scale up, pilot plant work, manufacturing, and good manufacturing procedure (GMP's). Role of pharmaceuticals in drug development, including various forms of formulation, analytical development requirements, and quality assurance. Project planning and timeline management, clinical trials, and regulatory affairs, including FDA filings. 3 lectures. Prerequisite: CHEM 318.

CHEM 481 Inorganic Chemistry (3)

A systematic study of chemical and physical properties of inorganic compounds based on periodic groupings with emphasis on chemical bonding and structure. Topics will include coordination chemistry and kinetics, organometallic chemistry, advanced acid-base relationships and bonding theories plus other selected topics. 3 lectures. Prerequisite: CHEM 352, and CHEM 231/331 or consent of instructor.

CHEM 484 Inorganic Chemistry Laboratory (2)

Laboratory techniques in inorganic chemistry. Synthetic and analytic techniques as applied to inorganic and organometallic chemistry. 2 laboratories. Prerequisite: CHEM 481.

CHEM 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. 2 units only applicable to approved chemistry electives. Major credit limited to 4 units; total credit limited to 12 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. Major credit limited to 4 units; total credit limited to 24 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

CHEM 500 Special Problems for Graduate Students (1-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Graduate standing and consent of department chair.

CHEM 528 Nutritional Biochemistry (3)

Nutritional aspects of biochemistry. Lecture, library research and student presentations. Topics include vitamins and minerals, essential and energy providing nutrients, deficiency, degenerative and genetic diseases of metabolism.

Emphasis on current research and controversy. 3 seminars. Prerequisite: CHEM 313 or CHEM 372 or consent of instructor.

CHEM 544 Polymer Physical Chemistry and Analysis (3)

Physical properties of polymers and coatings and their measurement; molecular weight averages, glass transition, thermodynamics of polymers, viscoelastic properties, rheology; molecular weight determination, thermal analysis, spectroscopic analysis, mechanical testing, atomic force microscopy. Special individual project. Not open to students with credit in CHEM 444. 3 lectures. Prerequisite: CHEM 212/312 or CHEM 216/316 or equivalent; CHEM 351 or equivalent.

CHEM 545 Polymer Synthesis and Mechanisms (3)

Polymerization methods and mechanisms; chemistry of initiators, catalysts and inhibitors; use of representative types; synthesis, structure and properties of polymers commonly used in coatings and adhesives. Special individual project. Not open to students with credit in CHEM 445. 3 lectures. Prerequisite: CHEM 544.

CHEM 547 Polymer Characterization and Analysis Laboratory (2)

Polymer characterization and analysis. Molecular weight analysis using viscometry, light scattering, and gel permeation chromatography. Thermal analysis using differential scanning calorimetry, thermal mechanical analysis and dynamic mechanical analysis. Polymer rheology. Infrared, Raman and FT-NMR spectroscopy. Atomic force microscopy. Special individual project. Not open to students with credit in CHEM 447. 2 laboratories. Corequisite: CHEM 544.

CHEM 548 Polymer Synthesis Laboratory (2)

Polymer synthesis using solution, suspension, bulk, emulsion techniques. Synthesis of chain growth polymers using free radical, anionic, cationic, and other catalysts. Synthesis of step-growth polymers. Kinetics of polymer reactions. Synthesis of resins used in modern coatings. Special individual project. Not open to students with credit in CHEM 448. 2 laboratories. Prerequisite: CHEM 547; prerequisite or corequisite: CHEM 545.

CHEM 550 Coatings Formulation Principles (3)

Formulation of modern coatings. Raw materials including resins, solvents, pigments, and additives. Formulation principles for solvent-borne and high solids coatings, water-borne coatings, powder coatings, radiation cure coatings and architectural coatings. Regulatory issues; VOC's. Coating properties, film formation, film defects, application methods, color and color acceptance. Special individual project. 3 lectures. Prerequisite: CHEM 444 or CHEM 544.

CHEM 551 Coatings Formulation Laboratory (2)

Laboratory formulation of modern coatings. Formation of pigment dispersions. Formulation of solvent-borne and high solids coatings, water-borne coatings, powder coatings, radiation cure coatings and architectural coatings. VOC measurements. Measurement of coating properties, film formation, film defects, application methods, color and color acceptance, hiding, gloss. Accelerated weathering. Special individual project. 2 laboratories. Corequisite: CHEM 550.

CHEM 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing or consent of instructor.

CHEM 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

CHEM 590 Graduate Seminar in Polymers and Coatings (1)

Problems and topics in polymers and coatings selected according to the interest and needs of the students enrolled. Total credit limited to 3 units. 1 seminar. Prerequisite: Graduate standing in the Polymers and Coatings program or consent of instructor.

CHEM 598 Graduate Project (3)

Supervised industrial graduate research in polymers and coatings science. Provides students with industrial research experience. Requires approval of graduate advisor. Total credit limited to 9 units. Prerequisite: CHEM 545, CHEM 547, CHEM 548, CHEM 550, CHEM 551.

CHEM 599 Graduate Thesis (3)

Directed graduate research in specialized advanced topics related to polymers and coatings science, leading to a graduate thesis of suitable quality. Requires approval of graduate advisor. Students are expected to work independently and report weekly to faculty advisor. Total credit limited to 9 units. Prerequisite: CHEM 545, CHEM 547, CHEM 548, CHEM 550, CHEM 551. *Formerly CHEM 570.*

CHIN-CHINESE**CHIN 101, 102, 103 Beginning Mandarin Chinese I, II, III (4) (4) (4)**

Beginning Chinese. Class practice in pronunciation, sentence structure, reading, writing and introduction to Chinese culture. To be taken in numerical sequence. 3 lectures, 1 activity. **CHIN 102** prerequisite: CHIN 101. **CHIN 103** prerequisite: CHIN 102, equivalent, or consent of instructor.

CHIN 121, 122 Intermediate Mandarin Chinese I, II (4) (4)

Review of grammar in Chinese. Practice in writing, speaking, listening and oral expression within a cultural context. To be taken in numerical sequence. 3 lectures, 1 activity. **CHIN 121** prerequisite: CHIN 103, equivalent, or consent of instructor. **CHIN 122** Prerequisite: CHIN 121 or consent of instructor.

CM-CONSTRUCTION MANAGEMENT**CM 102 Introduction to Construction Management (2)**

Introduction to the fundamental concepts and overview of the essential elements associated with the construction profession, to include: construction trends, ethics, safety and health issues, and professional practice methods. 2 lectures.

CM 115 Fundamentals of Construction Management (6)

Production of drawings and specifications for residential and light commercial construction. Integration of scheduling, estimating, codes, and contracts with a project based approach. Manual drawing techniques and computer aided drafting with building information modeling develop visualization skills for architectural systems. 6 laboratories. Prerequisite: ARCH 106, MATH 141, and PHYS 141.

CM 212 Fundamentals of Construction Management (3)

Introduction to the fundamental concepts of construction management. Primary areas of focus are quantity surveying and basic scheduling techniques. Additional topics of study to include work activity durations and sequencing, and computer applications in scheduling. Course does not satisfy approved technical elective requirement for CM majors. 3 laboratories. Prerequisite: Consent of instructor.

CM 213 Heavy Civil Construction Management (6)

Materials, methods, and techniques associated with civil engineering projects and heavy construction operations. Topics include tunnel, bridge, dam, and road construction; equipment selection; and temporary structures. Integration of scheduling, estimating, and construction contracts with a project based approach. 6 laboratories. Prerequisite: CM 102, CM 115 and CM 221. Prerequisite or concurrent: ARCE 211; BRAE 239; and BUS 207.

CM 221 Concrete and Formwork Technology (3)

Modern concepts of concrete and formwork construction. Significant developments in concrete chemistry and strength theory. Formwork systems, concrete mix design, admixtures, batching, finishing, curing and testing. Includes physically building basic forms, finishing and curing concrete, and testing of designed mixes. 2 lectures, 1 laboratory. Prerequisite: ARCH 106.

CM 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

CM 311 Residential Construction Management (6)

Materials, methods, and techniques associated with residential and light commercial construction operations. Topics include shallow foundations, timber and masonry framing, roofing, and exterior and interior finishes. Integration of scheduling, estimating, and construction contracts with a project based approach. 6 laboratories. Prerequisite: CM 213, PHYS 132 or CHEM 124, and CM 332.

CM 313 Commercial Construction Management (6)

Materials, methods, and techniques associated with large commercial and institutional construction operations. Topics include building systems analysis of foundations, waterproofing, structural framing, exterior cladding, and finishes. Integration of scheduling, estimating, and construction contracts with a project based approach. 6 laboratories. Prerequisite: CM 311.

CM 331 Construction Accounting (3)

Fundamentals of construction accounting principles to include income recognition, job cost control, cash flow analysis and associated cost reports. 3 lectures. Prerequisite: BUS 212 or BUS 214.

CM 332 Evaluation of Cost Alternatives (3)

Basic principles of economic evaluations using fundamental concepts of time value of money to compare cost alternatives related to construction, design, and real property development. 3 lectures. Prerequisite: Completion of GE Area D2 and MATH 142 or MATH 182.

CM 333 Construction Law (3)

The intersection of law and the construction industry. Topics of study include a survey of most major legal issues potentially encountered during construction activity. 3 lectures. Prerequisite: BUS 207 and CM 313, or consent of instructor.

CM 364 Construction Jobsite Management (3)

Procedures, methods and documentation associated with project level management of the construction process. Administrative roles and managerial relationships among the various members of the project team, primarily constructors, designers and owners. 3 laboratories. Prerequisite: CM 212.

CM 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 6 units, with a maximum of 4 units per quarter. Prerequisite: Consent of instructor.

CM 411 Specialty Contracting Construction Management (6)

Materials, methods, and techniques associated with mechanical, electrical, and plumbing systems. Topics include heating, ventilating, air conditioning, power distribution, grounding, lighting, communication, fire detection/protection, and plumbing. Integration of scheduling, estimating, and construction subcontracts with a project based approach. 6 laboratories. Prerequisite: CM 115, CM 213, CM 311, CM 313, CM 331, CM 332, ARCE 212, and BUS 207.

CM 413 Jobsite Construction Management (6)

Management activities applicable to the construction process involving techniques, applications, and theory needed in a jobsite environment. Addresses the relationships, roles, and perspectives of all stakeholders. Integrated utilization of temporary structures associated with field construction. 6 laboratories. Prerequisite: CM 115, CM 213, CM 311, CM 313, CM 331, CM 332, ARCE 212, and BUS 207.

CM 415 Interdisciplinary Project Management (5)

Team based collaborative effort to analyze and evaluate the unique interdisciplinary challenges associated with coordinating and integrating the design and construction processes to deliver a project with respect to the design, budget, schedule, quality, and performance expectations of a client. 5 laboratories. Prerequisite: CM 411 and CM 433.

CM 420 Service / Experiential Learning (1-6)

Service and project-based learning and teaching techniques as applied to a variety of construction management concepts. Goals and objectives achieved through service-learning, project-based, and/or experiential pedagogical approaches. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities. Prerequisite: Third-year standing, or consent of instructor.

CM 421 Emerging Trends (1-6)

Emerging trends related to construction management concepts and practices. Goals and objectives achieved through analysis, study, and research of a particular construction emerging trend. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities. Prerequisite: Third-year standing, or consent of instructor.

CM 422 Professional Preparation (1-6)

Professional practice related to the construction management industry. Goals and objectives achieved through analysis, study, and preparation for a particular professional practice. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities. Prerequisite: Third-year standing, or consent of instructor.

CM 423 Construction Materials / Assemblies (1-6)

Various materials and assemblies related to construction process. Goals and objectives achieved through analysis, study, and research of a particular construction material and/or assembly. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities. Prerequisite: Third-year standing, or consent of instructor.

CM 424 Construction Technology (1-6)

Technology related to construction management education and the construction industry. Goals and objectives achieved through analysis, study, and research of a particular construction technology. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities. Prerequisite: Third-year standing, or consent of instructor.

CM 425 Sustainability and Environment (1-6)

Sustainable and environmental issues related to the construction industry. Goals and objectives achieved through analysis of a particular construction related sustainable and/or environmental issue. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities. Prerequisite: Third-year standing, or consent of instructor.

CM 426 International Construction Studies (1-6)

Exploration of international construction studies through several potential teaching techniques, including field trips to countries overseas, research and case studies of companies and projects, and management skills and leadership as they relate to international construction. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities. Prerequisite: Third-year standing, or consent of instructor.

CM 430 Collaborative Process (3)

A comprehensive set of tools and practices that allow for high performance, interdisciplinary collaborative teams to focus on extraordinary outcomes at each step of project development, including planning, design, bidding, permitting, construction and management phases. 3 activities. Prerequisite: Minimum junior standing or consent of instructor. *Crosslisted as CM/EDES 430.*

CM 432 Design-Build Project Management (3)

Management issues applicable to the design and construction integration method of project delivery. Project sponsor/project advocate techniques, monitoring the evolving design, detecting and controlling change, early warning systems, cost trending, schedule impacts, cost impacts, systems integration, contract/scope modifications, procurement, contingencies, quality, and overall process control. 3 activities. Prerequisite: Minimum junior standing.

CM 433 Integrated Project Delivery (2)

Investigation and analysis of special advanced topics in Integrated Project Delivery including Design-Build, CM-at-Risk, Alliance Contracting and other alternative delivery models and application across a wide range of project types. Topics include source selection, acquisitions, contracting, performance criteria, design management, and others. 2 activities. Prerequisite: CM 311 or consent of instructor.

CM 443 Management of the Construction Firm (4)

Applications of strategic management techniques and business strategy for managing and long-range planning of the construction firm, including accounting practices. 4 activities. Prerequisite: CM 413.

CM 452 Project Controls (3)

Planning, organization, scheduling, and control of construction projects including cost control and resource control. Use of Critical Path Method (CPM) in planning and scheduling computer applications for CPM. 3 laboratories. Prerequisite: CM 364.

CM 454 Construction Estimating (3)

Methods, procedures and computer applications associated with estimating the costs of construction projects. Additional topics of study to include analysis of the bidding process and conceptual estimating. 3 laboratories. Prerequisite: CM 364.

CM 461, 462 Senior Project I, II (2) (1-2)

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. Student proposal must be submitted and approved by project advisor and department head prior to registration for course. Construction and team projects encouraged. Prerequisite: Consent of project advisor and department head. See department for additional guidelines and requirements.

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

Practical application of construction management theory and practice solving problems related to the built environment. 3 laboratories. Prerequisite: CM 413; corequisite: CM 443.

CM 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title

selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

CM 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

CM 475 Real Property Development Principles (4)

Development process and its major actors: investors, developers, government agencies, environmental and local stakeholders; their development roles, objectives, approaches. Basics of urban markets and economics, financing, regulation, public planning; value added, contractual, environmental and community context factors. 4 lectures. Prerequisite: Minimum junior standing.

CM 485 Cooperative Education Experience (3-6) (CR/NC)

Full-time work experience in an area directly related to the construction industry for 3 months. Positions are paid and usually require relocation and registration in course for one quarter. Registration in course is required at start of work experience. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. May be repeated for credit. Major credit limited to 6 units; total credit limited to 12 units. See department for additional requirements. Prerequisite: Consent of instructor.

CM 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in an area directly related to the construction industry for 6 months. Positions are paid and usually require relocation for two consecutive quarters. Registration in course is required at start of work experience. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. May be repeated for credit. Major credit limited to 6 units; total credit limited to 24 units. See department for additional requirements. Prerequisite: Consent of instructor.

CM 531 Construction Cost and Material Control (3)

Advanced theory and practice of cost and material control for construction projects. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: Graduate standing 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: Graduate standing or consent of instructor.

CM 542 Advanced Construction Estimating (3)

Advanced theory and practice of cost estimating techniques. Includes standard, conceptual and parameter estimating; bidding strategies, value engineering concepts, and risk analysis. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: Graduate standing 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: Graduate standing or consent of instructor.

CM 570 Selected Advanced Topics in Construction Management (4)

Directed study of selected topics in Construction Management. The Schedule of Classes will list title selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

CM 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

COMS—COMMUNICATION STUDIES**COMS 101 Public Speaking (4)****GE A2**

Introduction to the principles of public speaking. Practical experience in the development, presentation, and critical analysis of speeches to inform, to persuade, and to actuate. Not open to students with credit in COMS 102. 4 lectures. *Crosslisted as COMS/HNRS 101.* Fulfills GE A2.

COMS 102 Principles of Oral Communication (4)**GE A2**

Introduction to the fundamentals and principles which underlie effective oral communication. Practical experience in various types of speaking situations:

informative speaking, persuasive speaking, and panel discussion. Not open to students with credit in COMS 101. 4 lectures. Fulfills GE A2.

COMS 126 Argument and Advocacy (4) GE A3

The nature of critical thinking as applied in written and oral argument. Analysis of inductive and deductive reasoning. Analysis of reasoning, argument, forms of support and fallacies of argument and language. Instruction in and practical experience in writing sound persuasive arguments and engaging in oral argumentation assignments. 4 lectures. Prerequisite: Completion of GE Area A1 with a C- or better, or consent of instructor. Recommended: Completion of GE Area A2. Fulfills GE A3.

COMS 145 Reasoning, Argumentation, and Writing (4) GE A3

The principles of reasoning in argumentation. Examination of rhetorical principles and responsible rhetorical behavior. Application of these principles to written and oral communications. Effective use of research methods and sources. 4 lectures. Prerequisite: Completion of GE Area A1 with a C- or better, or consent of instructor. Recommended: Completion of GE Area A2. *Crosslisted as COMS/ENGL/HNRS 145.* Fulfills GE A3.

COMS 201 Advanced Public Speaking (4)

Further consideration of the principles of public address. Advanced practice in manuscript, extemporaneous, and impromptu speaking. 4 lectures. Prerequisite: COMS 101 or COMS 102.

COMS 208 Performance of Literature (4) GE C3

Poetry, prose, nonfiction and dramatic literature performed to communicate the levels of meaning within each work to the audience. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Fulfills GE C3.

COMS 212 Interpersonal Communication (4)

Introduction to the interaction process in two-person (dyadic) communication settings. Emphasis on the functions of varying messages in the initiation, development, maintenance and termination of personal relationships. 4 lectures. Prerequisite: COMS 101 or COMS 102.

COMS 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: COMS 101 or COMS 102.

COMS 217 Small Group Communication (4)

Basic principles and techniques of small group communication. Survey of the importance of discussion in contemporary society, including study of and practice in informal group discussion, panel discussion, symposium, and forum. 4 lectures. Prerequisite: COMS 101 or COMS 102.

COMS 226 Applied Argumentation (4)

Intermediate level course in the theory and practice of everyday argument. Select theories of argumentation, and practical experience arguing in a wide variety of contexts. 4 lectures. Prerequisite: Completion of GE Area A.

COMS 250 Forensic Activity (2)

Introduction to competitive debate activities. Research, analysis, and debating about contemporary issues. Any student who wishes to receive academic credit for participation in such activities during the quarter should enroll. Total credit limited to 6 units. 2 laboratories. Prerequisite: COMS 101 or COMS 102 or consent of instructor.

COMS 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

COMS 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: COMS 101 or COMS 102.

COMS 308 Group Performance of Literature (4) GE C4

Examination and experience in the various modes of group performance of literature: Readers Theatre, Chamber Theatre, Story Theatre. Scripting; directing; performing and critiquing of group performance of literature. 4 lectures. Prerequisite: Completion of GE Area A and C3. Recommended: Junior standing. Fulfills GE C4 except for Communication Studies majors.

COMS 311 Communication Theory (4)

Survey of human communication theories including interpersonal, small group, organizational, persuasion, nonverbal, intercultural, and media. Philosophical foundations for understanding communication from a social science perspective. 4 lectures. Prerequisite: Completion of GE Area A.

COMS 312 Communication Research Methods (4)

Exploration of communication research strategies and methodologies. Basic methods of designing research in empirical communication studies. 4 lectures. Prerequisite: COMS 311 and STAT 217, junior standing. For majors only.

COMS 315 Intergroup Communication (4)

Survey of theory and research concerning language and communication between various social groups (e.g., age, sex, race, sexual orientation), with an emphasis on understanding the role verbal, nonverbal, and mass communication plays in identity formation and differentiating group members. 4 lectures. Prerequisite: Completion of GE Area A.

COMS 317 Technology and Human Communication (4)

Impact of technological change upon human communication. Past, present, and future technological developments that have affected how humans communicate. Emphasis on new communication technologies. 4 lectures. Prerequisite: Completion of GE Area A.

COMS 322 Persuasion (4)

Theory of persuasion with particular emphasis upon social psychological principles of influence. Analysis of various forms of persuasion, social influence and propaganda. 4 lectures. Prerequisite: Completion of GE Area A.

COMS 330 Classical Rhetorical Theory (4)

Early development of rhetorical theory in Greco-Roman civilization. Analysis of the canons of rhetoric. Rhetorical thought of Sophists, Isocrates, Plato, Aristotle, Cicero and Quintilian. 4 lectures. Prerequisite: Completion of GE Area A.

COMS 331 Contemporary Rhetorical Theory (4)

Rhetoric's role in contemporary culture. Issues: political advocacy; science, technology and mass persuasion; ethics and rhetoric. Representative theorists: Burke, Weaver, Richards, Toulmin and McLuhan. 4 lectures. Prerequisite: Completion of GE Area A and junior standing.

COMS 332 Rhetorical Criticism (4)

Theory and method used in the analysis and evaluation of rhetorical discourse. Study of critical essays. Practice in interpreting and evaluating persuasive discourse. 4 lectures. Prerequisite: Junior standing, COMS 330.

COMS 350 Advanced Forensic Activity (2)

Advanced participation in intercollegiate speech activities. Intercollegiate tournament competition, judging speech competition and other communication-related public service on campus and in the community. Total credit limited to 6 units. 2 laboratories. Prerequisite: COMS 250 or consent of instructor.

COMS 385 Media Criticism (4)

Theory and method used in analyzing media from critical, rhetorical, and cultural perspectives. Practice in interpreting and evaluating news, advertising, prime-time television, the Internet, and other mass-mediated texts, with special attention to relationships among media, identity, and political action. 4 lectures. Prerequisite: Completion of GE Area A, and junior standing.

COMS 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of instructor and junior standing.

COMS 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: COMS 301 and junior standing.

COMS 416 Intercultural Communication (4) USCP

Examination and clarification of cultural aspects of communication within and among ethnic groups. 4 lectures. Prerequisite: Completion of GE Area A. Fulfills USCP.

COMS 418 Health Communication (4)

Communication in health contexts. Topics include interpersonal communication (e.g., health professional/patient), group and organizational communication (e.g., health-related groups), and mass communication (e.g., persuasive health campaigns). Open to all majors and valuable to laypersons who are consumers of

health care, and pre-health professionals. 4 lectures. Prerequisite: Completion of GE Area A and junior standing.

COMS 419 Media Effects (4)

Effects of media on the individual. Influence of mediated message producers, production technologies, and message content. Empirical approaches to data collection using experimental and survey techniques. 4 lectures. Prerequisite: Completion of GE Area A and junior standing.

COMS 420 Nonverbal Communication (4)

Influence of kinesic, proxemic, artifactual, olfactory, paralinguistic and environmental factors in human communication. Theory, research and practice in nonverbal communication. 4 lectures. Prerequisite: Completion of GE Area A.

COMS 421 Gender and Communication (4)

Examination of gender in a variety of communication contexts. Concepts presented will help students understand the theory and practice of communication with members of the same and opposite sex. 4 lectures. Prerequisite: Completion of GE Area A and junior standing.

COMS 424 Classroom Communication (4)

Exploration of classroom communication development. Student-teacher-parent interaction. Communication style, environmental stimuli, dialectal differences and bilingualism, measurement of communication competence. 4 lectures. Prerequisite: Completion of GE Area A and junior standing.

COMS 435 American Political Rhetoric (4)

Role of oratory in American political and social history since Lincoln. Historical and rhetorical analyses of important political speeches delivered by presidents, activists, demagogues, and leaders of social movements. 4 lectures. Prerequisite: Junior standing.

COMS 450 Internship: Communication Studies (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.

COMS 460 Undergraduate Seminar (1)

Discussion and design of individual projects, oral reports on material in current professional writings. 1 seminar. Prerequisite: Completion of COMS 311, COMS 312, COMS 330 and COMS 332, and junior standing. For majors only.

COMS 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: COMS 460. For majors only.

COMS 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Completion of GE Area A and junior standing.

COMS 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. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: 2.5 GPA and consent of instructor.

CPE–COMPUTER ENGINEERING

CPE 100 Computer Engineering Orientation (1) (CR/NC)

Introduction to the computer engineering discipline. Success skills and curricular information. Career paths and opportunities. Professional aspects of engineering and computer science. Interaction with upper division students, alumni, faculty and staff. Introduction to computer software and hardware. Credit/No Credit grading only. 1 lecture.

CPE 101 Fundamentals of Computer Science I (4)

Basic principles of algorithmic problem solving and programming using methods of top-down design, stepwise refinement and procedural abstraction. Basic control structures, data types, and input/output. Introduction to the software development process: design, implementation, testing and documentation. The syntax and semantics of a modern programming language. Credit not available for students who have taken CSC/CPE 108. 3 lectures, 1 laboratory. Prerequisite: Completion of ELM requirement, and passing score on MAPE or MATH 117

with a grade of C- or better or MATH 118 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 101.*

CPE 102 Fundamentals of Computer Science II (4)

Basic design, implementation, testing, and documentation of object-oriented software. Introduction to classes, interfaces, inheritance, algorithms (sort, search, recursion), abstract data types, data structures (lists, stacks, queues), file I/O, and exceptions. Credit not available for students who have taken CSC/CPE 108. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 101 with a grade of C- or better and either MATH 141 or MATH 221 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 102.*

CPE 103 Fundamentals of Computer Science III (4)

Introduction to data structures and analysis of algorithms. Abstract data types. Specification and implementation of advanced data structures. Theoretical and empirical analysis and proofs of properties of recursive and iterative algorithms. Software performance evaluation and testing techniques. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 102 with a grade of C- or better or CPE/CSC 108 with a grade of C- or better, CSC 141 with a grade of C- or better, and MATH 141 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 103.*

CPE 105 Fundamentals of Computer Science I Supplemental Instruction (1) (CR/NC)

Facilitated study and discussion of fundamental concepts of computer science and familiarization with programming environments. Credit/No Credit grading only. 1 laboratory. Prerequisite: Concurrent enrollment in CPE/CSC 101. *Crosslisted as CPE/CSC 105.*

CPE 108 Accelerated Introduction to Computer Science (4)

Accelerated introduction to basic principles of algorithmic and object-oriented problem solving and programming. Introduction to programming language concepts including control structures, data types, classes, and inheritance. Program design principles. Use and implementation of algorithms (searching, sorting, recursion) and data structures (lists, stacks, and queues). Intended for students with experience in algorithmic problem solving and using basic control structures and data types in a modern programming language (CSC/CPE 101), but who are not ready for CSC/CPE 102. Credit not available for students who have taken CSC/CPE 102. 3 lectures, 1 laboratory. Prerequisite: Math 118 (or equivalent) with a grade of C- or better, significant experience in computer programming, and consent of instructor. Corequisite: CSC 141. *Crosslisted as CPE/CSC 108.*

CPE 123 Introduction to Computing (4)

Use of a supportive software development environment to design, develop, and test applications in a selected topic domain that demonstrates the potential of careers in computing. An introduction to computing and to the selected topic domain. The Schedule of Classes will list topic selected. No programming experience required. Not for students with credit in CPE/CSC 103. 3 lectures, 1 laboratory. Prerequisite: Basic computer literacy. *Crosslisted as CPE/CSC 123.*

CPE 129 Digital Design (3)

Number systems, Boolean algebra, Boolean functions, and minimization. Analysis and design of combinational logic circuits. Feedback circuits. Analysis and design of sequential logic circuits. Applying Hardware Description Language (HDL) to synthesize digital logic circuits in Programmable Logic Devices (PLDs). Not open to students with credit in CPE/EE 133. 3 lectures. Prerequisite: An orientation course in student's major (EE 111/151 for EE students, CPE 100 for CPE students), CPE/CSC 101. Concurrent: CPE/EE 169. *Crosslisted as CPE/EE 129.*

CPE 133 Digital Design (4)

Number systems, Boolean algebra, Boolean functions, and function minimization. Analysis and design of combinational and sequential logic circuits. Hardware Description Language (HDL) concepts and applications digital design and synthesis in Programmable Logic Devices (PLDs). Not open to students with credit in CPE/EE 129. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 101. *Crosslisted as CPE/EE 133.*

CPE 169 Digital Design Laboratory (1)

Experiments to analyze and design combinational and sequential logic circuits with discrete ICs and PLDs. Introduction to laboratory equipment such as the logic state analyzer for testing circuits. Introduction to a hardware description language for logic simulation and design. Not open to students with credit in CPE/EE 133. 1 laboratory. Prerequisite: An orientation course in student's major (EE 111/151 for EE students, CPE 100 for CPE students), CPE/CSC 101. Concurrent: CPE/EE 129. *Crosslisted as CPE/EE 169.*

CPE 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

CPE 209 Problem Solving with Computers (1) (CR/NC)

Reinforcement of computer science fundamentals. Review of important algorithms, language features, design, syntax, and testing techniques. Repeated application of techniques to solve problems in a constrained amount of time. Primarily intended to support students preparing for the Association for Computing Machinery's International Collegiate Programming Contest. Credit/No Credit grading only. Total credit limited to 15 units. 1 laboratory. Prerequisite: CSC/CPE 101 or CSC/CPE 108 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 209.*

CPE 225 Introduction to Computer Organization (4)

Introduction to computer systems. Simple instruction set architecture and the computer hardware needed to implement that architecture. Machine and assembly language programming. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 102. *Crosslisted as CPE/CSC 225.*

CPE 229 Computer Design and Assembly Language Programming (3)

Design and implementation of digital computer circuits via CAD tools for programmable logic devices (PLDs). Computer design including datapath components and control unit. Assembly language programming. Instruction set architecture, hardware/software interface, performance evaluation of computer processors. Not open to students with credit in CPE/EE 233. 3 lectures. Prerequisite: CPE/EE 129&169 or CPE/EE 133. Concurrent: CPE/EE 269. *Crosslisted as CPE/EE 229.*

CPE 233 Computer Design and Assembly Language Programming (4)

Design and implementation of digital computer circuits via CAD tools for programmable logic devices (PLDs). Basic computer design with its datapath components and control unit. Introduction to assembly language programming of an off-the-shelf RISC-based microcontroller. Note open to students with credit in CPE/EE 229. 3 lectures, 1 laboratory. Prerequisite: CPE/EE 129 and CPE/EE 169, or CPE/EE 133. *Crosslisted as CPE/EE 233.*

CPE 235 Fundamentals of Computer Science for Scientists and Engineers I (4)

Introduction to the fundamentals of computer programming with an emphasis on mathematical, scientific and engineering applications: principles of algorithmic problem solving and procedural programming using a modern programming language, data types, elementary data structures, input/output and control structures. Not a substitute for CSC/CPE 101 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: MATH 141 or MATH 161 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 235.*

CPE 236 Fundamentals of Computer Science for Scientists and Engineers II (4)

Further study of computer program development with an emphasis on mathematical, scientific and engineering applications. Introduction to more complicated data types and structures. Practice of more complicated techniques of procedural programming. Introduction to the principles of object-oriented programming using a modern programming language. Detailed discussion of lists and classic list algorithms, algorithm analysis, multidimensional arrays, records, dynamic data structures, file input/output, classes. Not a substitute for CSC/CPE 102 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 235 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 236.*

CPE 237 Introduction to Computer Science with Applications I (4)

Introduction to the fundamentals of computer science using a modern programming language. Includes principles of algorithmic problem solving, data types, elementary data structures, input/output, control structures, classes and methods. Not a substitute for CSC/CPE 101 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: MATH 221 or STAT 252 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 237.*

CPE 238 Introduction to Computer Science with Applications II (4)

Continuation of CPE 237. Intermediate study of computer program development using a modern object oriented (OO) programming language. Further study of OO principles including inheritance and interfaces. Introduction to implementation of Graphical User Interfaces, multi-media, streams, database connection, and scripting. Not a substitute for CPE/CSC 102 or for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 237 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 238.*

CPE 269 Computer Design and Assembly Language Programming Laboratory (1)

Experiments to design and test digital computer circuits and systems with programmable logic devices (PLDs). Design projects to implement a basic computer with data path components and control. Assembly language programming projects for an off-the-shelf RISC-based microcontroller. Not open to students with credit in CPE/EE 233. 1 laboratory. Prerequisite: CPE/EE 129&169 or CPE/EE 133. Concurrent: CPE/EE 229. *Crosslisted as CPE/EE 269.*

CPE 270 Computer Graphics Applications (4)

Use of common graphics applications packages. Business graphics, figure editing, animation and image editing, photorealistic image generation, scientific visualization and multimedia. 2 lectures, 2 activities. *Crosslisted as CPE/CSC 270.*

CPE 290 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

CPE 300 Professional Responsibilities (4)

The responsibilities of the computer science professional. The ethics of science and the IEEE/ACM Software Engineering Code of Ethics. Quality tradeoffs, software system safety, intellectual property, history of computing and the social implications of computers in the modern world. Applications to ethical dilemmas in computing. Technical presentation methods and practice. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357 and junior standing. *Crosslisted as CPE/CSC 300.*

CPE 305 Individual Software Design and Development (4)

Practical software development skills needed for construction of mid-sized production-quality software modules, using the CSC upper division programming language. Topics include inheritance, exceptions, and memory and disk-based dynamic data structures. Students must complete an individual programming project of mid-level complexity. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357. *Crosslisted as CPE/CSC 305.*

CPE 307 Introduction to Software Engineering (4)

Requirements, specification, design, implementation, testing and verification of large software systems. Study and use of the software process and software engineering methodologies; working in project teams. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 with a grade of C- or better, or consent of instructor, and CSC/CPE 357. Not open to students with credit in CSC/CPE 308. *Crosslisted as CPE/CSC 307.*

CPE 308 Software Engineering I (4)

Principles for engineering requirements analysis and design of large complex software systems. Software process models. Methods of project planning, tracking, documentation, communication, and quality assurance. Analysis of engineering tradeoffs. Group laboratory project. Technical oral and written presentations. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357. *Crosslisted as CPE/CSC 308.*

CPE 309 Software Engineering II (4)

Continuation of the software lifecycle. Methods and tools for the implementation, integration, testing and maintenance of large software systems. Software development and test environments. Software quality assurance. Group laboratory project. Technical presentation methods and practice. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 308. *Crosslisted as CPE/CSC 309.*

CPE 315 Computer Architecture (4)

In-depth study of the instruction set architecture and hardware design of a specific CPU. Introduction to pipelines, input/output and multi-processors. Computer abstractions and performance measurement. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103, and CPE/EE 229 or CSC 225 or CPE/EE 233. *Crosslisted as CPE/CSC 315.*

CPE 316 Micro Controllers and Embedded Applications (4)

Introduction to micro controllers and their applications as embedded devices. Hardware/software tradeoffs, micro controller selection, use of on-chip peripherals, interrupt driven real-time operation, A/D conversion, serial and parallel communications, watch-dog timers, low power operation and assembly language programming techniques. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 315 or CPE/EE 329. *Crosslisted as CPE/CSC 316.*

CPE 328 Discrete Time Signals and Systems (3)

Discrete-time systems and analysis, with emphasis on linear time-invariant (LTI) systems. Sampling theorem. Classification of discrete-time systems. Convolution and its application to LTI systems. The z transform, discrete-time Fourier transform, and discrete Fourier transform. Introduction to digital filters. 3 lectures. Prerequisite: EE 228. Concurrent: EE/CPE 368. *Crosslisted as CPE/EE 328.*

CPE 329 Programmable Logic and Microprocessor-Based Systems Design (4)

Design, implementation and testing of programmable logic microprocessor-based systems. Hardware/software tradeoffs (such as timing analysis and power considerations), system economics of programmable logic and microprocessor-based system design. Interfacing hardware components (such as ADCs/DACs, sensors, transducers). 3 lectures, 1 laboratory. Not open to students with credit in CPE/EE 336. Prerequisite: EE 307&347, EE 229&269 or CPE/EE 233. *Crosslisted as CPE/EE 329.*

CPE 336 Microprocessor System Design (4)

Introduction to microcontrollers and integrated microprocessor systems. Hardware/software trade-offs, system economics, and functional configurations. Interface design, real-time clocks, interrupts, A/D conversion, serial and parallel communications, watch-dog timers, low power operation, event-based inter-peripheral communication, and assembly and higher-level language programming techniques. Architecture and design of sampled data and low-power systems. 3 lectures, 1 laboratory. Not open to students with credit in CPE/EE 329. Prerequisite: CPE/EE 229&269 or CPE/EE 233. *Crosslisted as CPE/EE 336.*

CPE 349 Design and Analysis of Algorithms (4)

Intermediate and advanced algorithms and their analysis. Mathematical, geometrical, and graph algorithms. NP-complete problems. Additional topics will be chosen from pattern matching, file compression, cryptology, dynamic and linear programming, and exhaustive search. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103, with a grade of C- or better, or consent of instructor, and MATH 142 and either STAT 312 or STAT 321. *Crosslisted as CPE/CSC 349.*

CPE 350 Capstone I (4)

Definition and specification of a system to be constructed in CPE 450; requirements elicitation techniques, research and data gathering methods; project planning, time and budget estimating; project team organization. Ethics and professionalism. 3 lectures, 1 laboratory. Prerequisite: CPE 329, may be concurrent.

CPE 357 Systems Programming (4)

C programming language from a system programming perspective. Standard C language including operators, I/O functions, and data types in the context of system functions. Unix commands, shell scripting, file system, editors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 with a grade of C- or better, or consent of instructor, and CSC 225 or CPE/EE 229 or CPE/EE 233. *Crosslisted as CPE/CSC 357.*

CPE 365 Introduction to Database Systems (4)

Basic principles of database management systems (DBMS) and of DBMS application development. DBMS objectives, systems architecture, database models with emphasis on Entity-Relationship and Relational models, data definition and manipulation languages, the Structured Query Language (SQL), database design, application development tools. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103. *Crosslisted as CPE/CSC 365.*

CPE 366 Database Modeling, Design and Implementation (4)

The database modeling problem. Database modeling levels: external, conceptual, logical and physical. Database models: entity-relationship, relational, object-oriented, semantic, and object-relational. Normal forms. Distributed database design. Functional analysis of database applications and transaction specification, design, and implementation. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 365. *Crosslisted as CPE/CSC 366.*

CPE 368 Signals and Systems Laboratory (1)

Laboratory work pertaining to linear systems, including Fourier analysis, time and frequency responses, and system transfer function. 1 laboratory. Prerequisite: EE 228. Concurrent: EE/CPE 328. *Crosslisted as CPE/EE 368.*

CPE 369 Distributed Computing I (4)

Introduction to distributed computing paradigms and protocols: interprocess communications, group communications, the client-server model, distributed objects, and Internet protocols. Emphasis on distributed software above the operating system and network layers. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357. *Crosslisted as CPE/CSC 369.*

CPE 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 instructor.

CPE 402 Software Requirements Engineering (4)

Software requirements elicitation, analysis and documentation. Team process infrastructure and resource estimation to support appropriate levels of quality. Software architectural design. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 307 or CSC/CPE 309; CSC/CPE 305. *Crosslisted as CPE/CSC 402.*

CPE 405 Software Construction (4)

Design and construction of sizeable software products. Technical management of software development teams. Software development process models, software design, documentation, quality assurance during development, software unit and integration testing; CASE tools, development environments, test tools, configuration management. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 402. *Crosslisted as CPE/CSC 405.*

CPE 406 Software Deployment (4)

Deployment of a sizeable software product by a student team. Software maintenance and deployment economic issues. Management of deployed software: version control, defect tracking and technical support. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 405. *Crosslisted as CPE/CSC 406.*

CPE 409 Current Topics in Software Engineering (4)

Selected topics in software engineering. Topics may include program generation, quality assurance, formal methods, software metrics, design methods, testing, or software development processes. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 309 or CSC/CPE 307. *Crosslisted as CPE/CSC 409.*

CPE 415 Microcomputer Systems (4)

Recent advances in microcomputer architectures. RISC, parallel processing advances, and component communication. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 315.

CPE 416 Autonomous Mobile Robotics (4)

Theory and application of concepts relevant to autonomous mobile robots. Sensor and actuator interfacing, programming mobile robots, mobile robot configurations, software architectures and algorithms. 3 lectures, 1 laboratory. Prerequisite: CPE/EE 329 or both CSC/CPE 315 and CSC/CPE 357 or consent of instructor. *Crosslisted as CPE/CSC 416.*

CPE 427 Digital Computer Subsystems (4)

Design of components and subsystems in digital computers. Use of modern techniques and devices (CPLDs and FPGAs) in implementation. Consideration given to cost/speed tradeoffs. Implementation of a basic digital computer using pre-designed subsystems. 3 lectures, 1 laboratory. Prerequisite: CPE/EE 329 or CPE/EE 336. *Crosslisted as CPE/EE 427.*

CPE 428 Computer Vision (4)

Introduction to the concepts of 2D and 3D computer vision: low-level image processing methods such as filtering and edge detection; feature extraction; segmentation and clustering; stereo vision; appearance-based and model-based algorithms. 3 lectures, 1 laboratory. Prerequisite: EE 328 or CPE/CSC 357 or ME 305 or consent of instructor. *Crosslisted as CPE/EE 428.*

CPE 430 Programming Languages I (4)

Construction of the front end of a compiler including lexical analysis, syntactic analysis, type checking, and formal semantics. Introduction to regular languages, finite automata, and context-free grammars. 3 lectures, 1 laboratory. Prerequisite: CSC 349 and CSC/CPE 357. *Crosslisted as CPE/CSC 430.*

CPE 431 Programming Languages II (4)

Language principles and design issues: bindings, conversion, parameter passing, and dynamic semantics. Language implementation: intermediate code representation, memory management, code optimization, and code generation. Functional programming languages. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 430. *Crosslisted as CPE/CSC 431.*

CPE 432 Digital Control Systems (3)

Theory and applications of digital computers in linear control systems. Discrete time methods are used in analysis and design studies. Digital control systems are synthesized. 3 lectures. Prerequisite: EE 302&342. Prior background in discrete time systems, e.g., EE 328, EE368 recommended. Concurrent: CPE/EE 472. *Crosslisted as CPE/EE 432.*

CPE 435 Introduction to Object Oriented Design Using Graphical User Interfaces (4)

Principles of object-oriented design, with emphasis on use of these principles in the design of graphical interfaces. Comparison and contrasting of two major object-oriented languages and their corresponding GUI class libraries. Language-independent object-oriented design methods, and application of these methods in the construction of a GUI-based project. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 305. *Crosslisted as CPE/CSC 435.*

CPE 437 Dynamic Web Development (4)

Project-based study of web-based three-tiered applications, including current best practices and tools for design, implementation and testing of browser interface, serverside business logic, object-relational mapping, databases, and web services. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357 (C- or better), CSC/CPE 365 or consent of instructor. *Crosslisted as CPE/CSC 437.*

CPE 438 Digital Computer Systems (3)

Design of computer ALU's, microprogram controllers, memory systems, and I/O controllers. Use of LSI components in CPU design. Microprogram and nanoprogram development. 3 lectures. Prerequisite: CPE 427 or consent of instructor. *Crosslisted as CPE/EE 438.*

CPE 439 Computer Peripheral Interfacing (4)

Systems-level design and implementation of common computer peripheral devices with emphasis placed on controller and interface aspects. Use of standard and software microcontroller platforms with communications to discrete peripherals with I2C, SPI, CAN, and other common bus interfaces. 3 lectures, 1 laboratory. Prerequisite: CPE/EE 329 or CPE/EE 336, or consent of instructor. *Crosslisted as CPE/EE 439.*

CPE 441 Computer-Aided Design of VLSI Devices (4)

Design of VLSI circuits, design of subsystems using static CMOS, transmission gates, and other methods. Variety of CAD tools for design, verification, test, and simulation. Several design projects. 3 lectures, 1 laboratory. Prerequisite: EE 307&347, EE 308&348 or consent of instructor. *Crosslisted as CPE 441/EE 431.*

CPE 448 Bioinformatics Algorithms (4)

Introduction to the use of computers to solve problems in molecular biology. The algorithms, languages, and databases important in determining and analyzing nucleic and protein sequences and their structure. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor or the following: CSC/CPE 103, with a grade of C- or better, or consent of instructor, or BIO/CHEM 441 and senior standing. *Crosslisted as CPE/CSC 448.*

CPE 449 Current Topics in Algorithms (4)

Selected aspects of the verification, analysis and design of algorithms. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC 349. *Crosslisted as CPE/CSC 449.*

CPE 450 Capstone II (4)

Team-based design, construction and deployment of an embedded system that includes a custom-built computer. Technical management of product development teams. Technical documentation, configuration management, quality assurance, integration and systems testing. Professionalism. 3 lectures, 1 laboratory. Prerequisite: CPE 350.

CPE 453 Introduction to Operating Systems (4)

Introduction to sequential and multiprogramming operating systems; kernel calls, interrupt service mechanisms, scheduling, files and protection mechanisms, conventional machine attributes that apply to operating system implementation, virtual memory management, and I/O control systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357, and CSC/CPE 225 or CPE/EE 229 or CPE/EE 233. *Crosslisted as CPE/CSC 453.*

CPE 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/CPE 453. *Crosslisted as CPE/CSC 454.*

CPE 456 Introduction to Computer Security (4)

Survey of topics in computer system and network security, including protection, access control, distributed access control, operating system security, applied cryptography, network security, firewalls, secure coding practices, and case studies from real-world systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 453 and either CSC/CPE 300 or CPE 350. *Crosslisted as CPE/CSC 456.*

CPE 458 Current Topics in Computer Systems (4)

Selected aspects of design, implementation and analysis of networks, advanced operating and distributed systems. Topics may include process management, virtual memory, process communication, context switching, file system designs, persistent objects, process and data migration, load balancing, security and networks. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 453. *Crosslisted as CPE/CSC 458.*

CPE 461, 462 Senior Project I, II (3) (2)

Selection and completion of an individual or team project in laboratory environment. Project results are presented in a formal report. CPE 461: 3 laboratories; prerequisite: CPE 350. CPE 462: 2 laboratories; prerequisite: CPE 450.

CPE 464 Introduction to Computer Networks (4)

Computer network architectures; communications protocol standards; services provided by the network; historical and current examples presented. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357. Recommended: STAT 312 or STAT 321 or STAT 350. *Crosslisted as CPE/CSC 464.*

CPE 465 Advanced Computer Networks (4)

Advanced topics in computer networks; greater detail of protocol standards and services provided by the network; focus on current industry and research topics. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 464 and CSC/CPE 453. *Crosslisted as CPE/CSC 465.*

CPE 466 Knowledge Discovery from Data (4)

Overview of modern knowledge discovery from data (KDD) methods and technologies. Topics in On-line Analytic Transaction Processing (OLAP), data mining (association rules mining, classification, clustering), information retrieval. Emphasis on use of KDD techniques in modern software applications. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 365 and one of STAT 312, STAT 321 or STAT 350. *Crosslisted as CPE/CSC 466.*

CPE 468 Database Management Systems Implementation (4)

Data structures and algorithms used in the implementation of database systems. Implementation of data and transaction managers: access methods interfaces, concurrency control and recovery, query processors and optimizers. Introduction to implementation of distributed database systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 365. *Crosslisted as CPE/CSC 468.*

CPE 469 Distributed Computing II (4)

Continued exploration of topics in distributed computing in greater depth, with emphasis on design patterns and team projects. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 369. *Crosslisted as CPE/CSC 469.*

CPE 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

CPE 471 Introduction to Computer Graphics (4)

Graphics software development and use of APIs for 3D graphics. The graphics pipeline, modeling, geometric and viewing transforms, lighting and shading, rendering, interaction techniques and graphics hardware. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357. *Crosslisted as CPE/CSC 471.*

CPE 472 Digital Control Systems Laboratory (1)

Design and programming of microprocessor-based digital controls for electro-mechanical plants. Topics include digital control laws, translation of transfer functions into algorithms, assembly language programming, real-time software design, sample rate selection, finite word-length considerations. 1 laboratory. Concurrent: CPE 432. *Crosslisted as CPE/EE 472.*

CPE 473 Advanced Rendering Techniques (4)

Illumination models, reflectance, absorption, emittance, Gouraud shading, Phong shading, raytracing polyhedra and other modeling primitives, coherence, acceleration methods, radiosity, form factors, advanced algorithms. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471. *Crosslisted as CPE/CSC 473.*

CPE 474 Computer Animation (4)

Basic and advanced algorithms for generating sequences of synthetic images. Interpolation in time and space, procedural and keyframe animation, particle systems, dynamics and inverse kinematics, morphing and video. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471. *Crosslisted as CPE/CSC 474.*

CPE 476 Real-Time 3D Computer Graphics Software (4)

Basic and advanced algorithms for real-time, interactive, 3D graphics software. Modeling (polygon mesh, height field, scene graph), real-time rendering and shading (visibility processing, LOD, texture and light maps), collision detection (bounding volumes, complexity management), interactive controls, multi-player game technology, game engine architecture. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471. *Crosslisted as CPE/CSC 476.*

CPE 478 Current Topics in Computer Graphics (4)

Selected aspects of the design, implementation and analysis of computer graphics. Topics may include rendering, modeling, visualization, animation, virtual reality, computer vision, multimedia, and perception issues. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471. *Crosslisted as CPE/CSC 478.*

CPE 480 Artificial Intelligence (4)

Programs and techniques that characterize artificial intelligence. Programming in a high level language. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 480.*

CPE 481 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/CPE 480. *Crosslisted as CPE/CSC 481.*

CPE 482 Advanced Topics in Systems for Computer Engineering (4)

Selected aspects of design, implementation, verification and analysis of advanced computer systems. Topics may include computer systems, embedded systems, robotics, mechatronics, haptics, human computer interfaces, digital control, digital signal processing, wireless computing, real time operating systems, and networks. The Schedule of Classes will list topic selected. Total credit limited to 8 units, repeatable in same term. 3 lectures, 1 laboratory. Prerequisite or concurrent: CPE 350, or consent of instructor.

CPE 483 Current Topics in Human-Computer Interaction (4)

Selected aspects of the field of human-computer interaction. Topics may include dynamic information visualization, universal access, social impact of technology usage, educational technology, human cognition and performance studies, and extended usability evaluation techniques. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 484. *Crosslisted as CPE/CSC 483.*

CPE 484 User-Centered Interface Design and Development (4)

Introduction to the importance of user-centered principles in the design of good interfaces and effective human-computer interaction. Topics include: study of human characteristics affected by interface design, effective requirements data collection and analysis, user-centered approaches to software engineering, and evaluation of interface and interaction quality. 3 lectures, 1 laboratory. Prerequisite: Junior standing and CSC/CPE 307 or CSC/CPE 308. *Crosslisted as CPE/CSC 484.*

CPE 485 Autonomous Robot Navigation (4)

Overview of existing autonomous mobile robot systems, basic kinematic modeling, control structures, sensing and sensor modeling, localization, and motion planning algorithms. Implementation of autonomous navigation capabilities. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357 or consent of instructor. *Crosslisted as CPE/CSC 485.*

CPE 488 Microelectronics and Electronics Packaging (4)

Materials, processes, and reliability of microelectronics and electronics packaging, surface mount assembly and printed circuit board fabrication. Overview of semiconductor manufacturing and optoelectronics packaging. 3 lectures, 1 laboratory. Prerequisite: MATE 210 and PHYS 133 or consent of instructor. *Crosslisted as CPE 488/IME 458/MATE 458.*

CPE 489 Current Topics in Artificial Intelligence (4)

Selected aspects of the design, implementation and analysis of advanced systems and concepts in the area of artificial intelligence. Topics may include knowledge representation, reasoning, learning, or planning, and specific techniques like intelligent agents, genetic algorithms, semantic web, or robotics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 480. *Crosslisted as CPE/CSC 489.*

CPE 493 Cooperative Education Experience (2) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation

by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units. Prerequisite: Sophomore standing and consent of instructor.

CPE 494 Cooperative Education Experience (6) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units. Prerequisite: Sophomore standing and consent of instructor.

CPE 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

CPE 520 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: CPE 315 and graduate standing, or consent of instructor. *Crosslisted as CPE/CSC 520.*

CPE 521 Computer Systems (4)

Organization of modern general purpose, high speed digital computer systems. Design of arithmetic units, control units, memories and memory subsystems. Cost, power and speed trade-offs in the design of such systems. 3 seminars, 1 laboratory. Prerequisite: CPE/EE 329 or CPE/EE 336, or equivalent, and graduate standing or consent of instructor. *Crosslisted as CPE/EE 521.*

CPE 522 Advanced Real-Time Embedded Systems Design (4)

Theory, design and implementation of real-time operating system-based embedded systems. Scheduling algorithms, operating system resources, peripheral device interfacing and embedded system architecture. Resource management issues in a resource-limited (microcontroller-based) environment. 3 seminars, 1 laboratory. Prerequisite: Advanced C programming skills, CPE/EE 329 or CPE/EE 336 or equivalent, or consent of instructor. *Crosslisted as CPE/EE 522.*

CPE 523 Digital Systems Design (4)

Full-custom design and analysis of digital circuits using full CMOS, pass-transistor and dynamic circuit topologies. Transistor sizing for minimizing power consumption, delay and other design criteria. 3 seminars, 1 laboratory. Prerequisite: CPE/EE 329 or CPE/EE 336 or equivalent, and graduate standing or consent of instructor. *Crosslisted as CPE/EE 523.*

CPE 556 Computer Security (4)

Exploration of advanced topics in computer security with an emphasis on research topics. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 456 and graduate standing, or consent of instructor. *Crosslisted as CPE/CSC 556.*

CPE 564 Computer Networks: Research Topics (4)

Exploration of advanced topics in emerging computer networking technologies; focus on leading edge computer network research topics. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 464 and graduate standing, or consent of instructor. *Crosslisted as CPE/CSC 564.*

CPE 569 Distributed Computing (4)

Principles and practices in distributed computing: interprocess communications, group communications, client-server model, distributed objects, message queue system, distributed services, mobile agents, object space, Internet protocols. Distributed algorithms: consensus protocols, global state protocols. Fault tolerance: classification of faults, replication. Not open to students with credit in CSC/CPE 369 or CSC/CPE 469. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357 and graduate standing, or consent of instructor. *Crosslisted as CPE/CSC 569.*

CPE 580 Artificial Intelligence (4)

Current research in the field of artificial intelligence with emphasis on cooperative agents, distributed agents, and decision making in complex, concurrent environments. AI programming in a distributed environment. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 480 and graduate standing, or consent of instructor. *Crosslisted as CPE/CSC 580.*

CPE 581 Computer Support for Knowledge Management (4)

Use methods and techniques that computer-based systems can provide to make the management of knowledge and information in digital form easier for the user.

Emphasis on support for knowledge-intensive activities performed by users. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 481. *Crosslisted as CPE/CSC 581.*

CRP—CITY AND REGIONAL PLANNING

CRP 101 Introduction to the Profession of City and Regional Planning (1) (CR/NC)

Introduction to what professional planners do in the public and private sectors and how they help manage growth and change. Credit/No Credit grading only. 1 lecture.

CRP 201 Basic Graphic Skills (4)

Basic techniques used in graphic communication for representation of the real world on two-dimensional planes. Use of scale, drawing conventions, orthographic and isometric projections, perspective drawings. Basic design and site analysis skills. Sketching, delineation and rendering including the use of black and white and color techniques. 4 laboratories.

CRP 202 Urban Design Studio I (4)

Exploring elements and principles of environmental design. Understanding the form and character of the designed urban environment. Introduction to problem analysis and problem solving in environmental design. Implications of design decisions and solutions on urban context. Assignments of object, project and system scale in an urban context. 4 laboratories. Prerequisite: CRP 201, CRP 211 or consent of instructor.

CRP 203 Urban Design Studio II (4)

Applications of basic design fundamentals and skills to the design of environments through design exercises applied to planning. Problem analysis and problem solving skills as applied to environmental design issues. 4 laboratories. Prerequisite: CRP 202.

CRP 211 Cities: Form, Culture and Evolution (4)

Historical overview of the evolution of cities – how the form and function of cities evolved among different societies from antiquity to contemporary times. Includes early cities in Mesopotamia, Central America; Greece and Rome; Renaissance, Baroque; and North and South America. 4 lectures.

CRP 212 Introduction to Urban Planning (4)

Understanding the issues of contemporary urban growth and change. Development of theories of urban planning and design. Introduction to zoning, planning regulations and codes, and professional practice. Relationship of environmental design disciplines, citizen groups, and individuals to urban planning. 4 lectures.

CRP 213 Population, Housing and Economic Applications (4)

Collection, organization, and presentation of information and data related to population, housing and employment. Analytical applications to estimate population over time, housing demand by type and income and employment by standard classification. Application of urban economic theory related to jobs and housing. 3 lectures, 1 laboratory. Prerequisite: CRP 212, or consent of instructor.

CRP 214 Land Use and Transportation Studies (4)

How cities and regions work. Relationship between human activities and patterns of land use and circulation. Spatial analysis and location theories. Methods for conducting studies to describe, analyze, and map land uses. Regional-scale transportation analysis, traffic impact studies, and multimodal transportation plans. 3 lectures, 1 activity. Prerequisite: CRP 212, or consent of instructor.

CRP 215 Planning for and with Multiple Publics (4) USCP

How the social/spatial relationships among racial/ethnic and gender groups are expressed in terms of human settlement patterns, civic involvement and everyday negotiations. Ways in which segregation and marginalization are expressed in western and non-western contexts. 4 lectures. Prerequisite: Completion of GE Area D1. Recommended: ES 112. *Crosslisted as CRP/ES 215.* Fulfills USCP.

CRP 216 Computer Applications for Planning (2)

Introduction to the use of computer applications for planners. Includes spreadsheets, statistical applications, database, geographic information systems, and graphics. 1 lecture, 1 laboratory.

CRP 240 Additional Planning Laboratory (1–2)

Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

CRP 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

CRP 310 Community Development and Civic Life (4)

Examination of role of citizen in the planning, design and development of communities. Development of informed, responsible participation in civic life by a diverse citizenry committed to democratic principles. Focus on land use, transportation, and environmental issues. 4 lectures. Prerequisite: Completion of GE Areas A, D1 and D3.

CRP 314 Planning Theory (3)

Theories of planning. Role of planner in society, purpose of planning, administrative framework in which planning takes place. Alternative approaches to planning, values, ethics in planning. 3 lectures. Prerequisite: CRP 212.

CRP 315 Fiscal and Project Feasibility (4)

Analysis of the revenue streams and costs involved in project development. Impact analysis of costs and revenues on private and public sectors included. Construction of pro-formas for various project types. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Area D2.

CRP 334 Cities in a Global World (4)

GE D5

Examination of the changes in the social and spatial organization of urban settlements in the twenty-first century caused by the urbanization and globalization processes. Comparative analysis of the traditional and contemporary cities in the Pacific Rim, South America and Eastern Europe. 4 lectures. Prerequisite: Junior standing; completion of Area A and two courses from D1, D2, D3, D4. Fulfills GE D5 except for City and Regional Planning majors.

CRP 336 Introduction to Environmental Planning (4)

Theories, institutional frameworks, and technologies used in environmental planning for human settlements. Comparative study of practices at international, national, bioregional and state/local levels. Impact assessment technologies used in impact analysis for plan administration. Application of environmental mitigation to community planning. 4 lectures. Prerequisite: CRP 212.

CRP 338 Digital Cities (4)

GE Area F

Explores changes in urban form and urban experience associated with advances in digital technology. Implications for the design of places and the distribution of economic and social benefit. Lecture-discussions and opportunities to explore technology initiatives in community building. 4 lectures. Prerequisite: Junior standing; completion of Area B. Fulfills GE Area F.

CRP 341 Community Design Laboratory (4)

Built environment of the suburb. Urban theories and design methods related to suburban development. Technical aspects of subdivision site planning. 4 laboratories. Prerequisite: CRP 203, or consent of instructor.

CRP 342 Environmental Planning Methods (4)

Case studies and applications of theory and methods to regional and environmental systems. Interrelationships between natural, economic, and social and political systems. Application of California Environmental Quality Act and environmental impact assessment methods. Environmental equity and sustainable bioregions. 2 lectures, 2 laboratories. Prerequisite: CRP 336 or consent of instructor.

CRP 351 Introduction to Emergency Management in California (3)

Emergency management emphasizing the Standardized Emergency Management System (SEMS) and Emergency Operations Center (EOC) operations. Earthquake hazard used as the case to explore potential wide geographic impacts, multiple secondary hazards, and multidisciplinary problem-solving methods in natural disasters faced by local governments and communities. 2 lectures, 1 activity. Prerequisite: Completion of GE Area B3 or D. *Crosslisted as CRP/DMHS/NR 351.*

CRP 375 Technology and the Environment: A Seminar on Contemporary Issues (4)

Interdisciplinary exploration of significant environmental issues (local, regional, national, or global) where technology is a major cause and/or offers a possible solution. 4 seminars. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3. Honors Program membership or nomination by CRP department head. *Crosslisted as CRP/HNRS 375.*

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 instructor.

CRP 401 Disaster Recovery (3)

Strategies and procedures for public sector management of recovery from disasters. Understanding the role of, and relationship between, federal, state and local agencies to provide assistance to individuals and communities in the post-disaster environment. Issues in the recovery process. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as CRP/DMHS/NR 401.*

CRP 402 Contemporary Urban Design in the Americas (4)

Study of contemporary urban design in North, Central and South America through the detailed examination of major cities and country case studies. Analysis of the cultural, social and political factors influencing the practice of urban design and its major trends in different countries. 4 lectures. Prerequisite: ENGL 134 or graduate standing.

CRP 404 Environmental Law (3)

Analysis and critique of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Prerequisite: Senior standing, or graduate standing, or consent of instructor. *Crosslisted as CRP/NR 404.*

CRP 408 Water Resource Law and Policy (3)

Detailed examinations of the various legal systems of water use, regulation and management in California and the United States. Discussion of the key concepts and principles of state, federal and interstate water quantity and quality control; focusing on issues and problems, why conflicts occur and how solutions evolve. 3 lectures. Prerequisite: Junior standing. *Crosslisted as CRP/NR 408.*

CRP 409 Planning Internship (2–4) (CR/NC)

Work experience as a supervised employee in a planning-related agency or private firm. Prior contract specifying the product of internship required between student, agency and faculty. Thirty hours work experience per unit of credit. Total credit limited to 4 units. Credit/No Credit grading. Prerequisite: Consent of instructor.

CRP 410, 411 Community Planning Laboratory I, II (5) (5)

Application of planning theory to the community, its components, and to the city and its region. Relationships of city spaces and structures. Emphasis on developing basic planning studies and plan-making. Field trips. Individual, team, and interdisciplinary approaches utilizing digital methods for analysis and presentation. 5 laboratories. **CRP 410** prerequisite: CRP 336, CRP 341 or consent of instructor. **CRP 411** prerequisite: CRP 342, CRP 410, or consent of instructor.

CRP 412 Plan Implementation (4)

Theory and practice of plan implementation. Regulation and nonregulatory approaches to plan implementation, including development regulation, economic development, growth management, habitat conservation planning, capital improvement planning, redevelopment programs, and transportation system management. The California Specific Plan will serve as the course model. 4 lectures. Prerequisite: CRP 212 or consent of instructor.

CRP 420 Land Use Law (4)

Public controls protecting natural environmental systems. Land use and environmental controls. Review of control mechanisms. State and federal legislation. Legal implications of controls, public planning and policy issues. 4 lectures. Prerequisite: CRP 212 and upper division standing, or consent of instructor.

CRP 424 Reflections of Planning in Cinema (3)

Analysis of the depiction of planning and related themes in film. Critical reflection through these depictions on the effects of planning practices, institutions, and idiosyncrasies on society. Dialectical discussion of planning history, theory, and practice with themes that emerge from particular films. 2 lectures, 1 activity. Prerequisite: CRP 212 (or CRP 501 for graduate students), or equivalent.

CRP 427 Local Economic Development Planning (3)

Processes, skills and approaches for planning local economic development. Analysis of theoretical principles and assumptions underlying local economic development programs. Practical applications of alternative strategies and techniques for implementing economic development. 3 seminars. Prerequisite: Senior standing, or graduate standing, or consent of instructor.

CRP 430 Public Sector Planning Practice (3)

Relationships of planning agencies to other governmental bodies, public agencies and citizen groups. The public planning agency and the private practitioner. Public and personnel relations. Current topics in public sector planning practice. 3 lectures. Prerequisite: CRP 212.

CRP 435 Transportation Theory (3)

Circulation and transportation elements of the General Plan. Transportation planning theory, methods and tools related to systematic analysis of city and regional transportation problems including environmental impact assessment. Application of techniques for assessing transportation systems, gravity models, route selections, land use models and relationship to transportation. 3 seminars. Prerequisite: CRP 212, senior standing, or graduate standing, or consent of instructor.

CRP 436 Collaborative Planning (4)

Focus on processes and skills of citizen participation and consensus building. Application of mediation and negotiation techniques. Use of collaboration in forming visions of the future and reaching agreements among multiple interests. Use of group process skills to establish effective communication and agreements. Organizing and operating public meetings. 3 lectures, 1 laboratory. Prerequisite: CRP 212 or graduate standing or consent of instructor.

CRP 438 Pollution Prevention and Control (4)

Interdisciplinary exploration of policy and planning associated with pollution prevention and control, including institutional, legal, economic, political, social, and technology-related aspects. Includes hands-on activity in small groups. 4 lectures. Prerequisite: Senior standing, or graduate standing, or consent of instructor.

CRP 442 Housing and Planning (3)

Understanding housing issues, policies and programs from a planning perspective. Analysis of the economic underpinnings of land markets and housing markets, housing plans, finance, public programs, affordable housing. 3 seminars. Prerequisite: Upper division standing or graduate standing.

CRP 444 Infrastructure and Planning Management (4)

Basic infrastructure systems necessary to support urban development. Basic components of systems and how they are planned, financed and managed. 4 seminars. Prerequisite: Senior standing or graduate standing.

CRP 445 Planning and Urban Ecology (4)

Introduction to urban ecology as an organizing framework for addressing environmental problems. Provides the opportunity to explore an urban ecological research question through quantitative stream assessment and qualitative social survey data collection and analysis. 3 lectures, 1 laboratory. Prerequisite: Upper division or graduate standing.

CRP 446 Development Review and Entitlement (4)

Application of zoning regulations, subdivision ordinances, design standards, building codes, exactions, fees, and related requirements within the development review process leading to land use entitlement. Land development is evaluated from permit application submittal to condition compliance during the plan check, construction, and operational phases of a project. 4 lectures. Prerequisite: Upper division standing or graduate standing.

CRP 447 Design Regulations (4)

Practical application of fundamental zoning, subdivision, design/development standards, and building codes in the design review process, either in the form of a proposed development project or preparation of ordinances, codes, standards, and/or guidelines to apply to a project. 4 lectures. Prerequisite: Senior standing, or graduate standing, or consent of instructor. *Crosslisted as ARCH/CRP 447.*

CRP 452 Community Design Methods (4)

Introduction to community design as an interdisciplinary subject. Focus on the active involvement of end-users in the creation and management of built environments. Principles and techniques of participatory design and planning, including charrettes, design games and participatory technologies. Demonstration of participatory techniques through case studies and application. 3 lectures, 1 laboratory. Prerequisite: CRP 201 and CRP 202, Upper division or graduate standing.

CRP 453 Planning and Design Laboratory (4)

Selected advanced laboratory applications, including urban and regional design. 4 laboratories. Prerequisite: CRP 341, CRP 342.

CRP 457 Planning Information Systems (3)

GIS applications using computer-based systems in gathering, managing and analyzing information pertinent to planning. Development of skills in systematic

data acquisition, processing and maintenance with applied planning problems within the convenient medium of GIS and general information systems. 2 seminars, 1 laboratory. Prerequisite: Upper-division standing and completion of a basic GIS course (NR 318, GEOG 310, or LA 318), and consent of instructor.

CRP 458 Local Hazard Mitigation Planning and Design (4)

Creation of safer, more resilient cities through systematic application of urban disaster risk reduction and regeneration planning principles and methods. Integration of insights from the design, resource management, and urban administration professions for minimizing disaster losses and improving recovery activities. 4 lectures. Consent of instructor. Prerequisite: GE Areas D2, D3 and F or consent of instructor.

CRP 461, 462 Senior Project I, II (2) (2)

Research and problem analysis in planning. Selection and completion of a project under faculty supervision. Projects typical of problems addressed in planning practice. Project results presented in a formal report. To be completed in two quarters. Minimum 120 hours time. **CRP 461** prerequisite: CRP 341, CRP 342. **CRP 462** prerequisite: CRP 410.

CRP 463 Senior Project Professional Practice (4)

Practical applications of city and regional planning theory and practice solving problems related to the built environment. Assembly of project documents and reports that meet the senior project requirement. 4 seminars. Prerequisite: CRP 410 and senior standing.

CRP 466 Enhanced Exercise Design in Disaster Management (3)

Increasing the competencies of public and private emergency managers in the design, development, evaluation and follow-up of emergency management exercises. Performance based education and skills training for emergency management personnel. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as CRP/DMHS/NR 466.*

CRP 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

CRP 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

CRP 472 Planning Colloquium (1) (CR/NC)

Lecture and discussion by faculty members and invited guests on controversial or topical planning related subject matter at campus and/or off-campus locations. Topics to be announced in advance by CRP Department. Total credit limited to 3 units. Credit/No Credit grading only. 1 seminar. Prerequisite: Upper division standing or graduate standing.

CRP 483 Special Studies in City and Regional Planning (1-12)

Study of special issues and problems through field research and other forms of investigation and involvement in an off-campus setting. Requirements determined prior to individual project through contractual arrangement between the student and the department. Departmental Off-Campus Study Program guidelines apply. The Schedule of Classes will list topic selected. Prerequisite: Upper division or graduate standing.

CRP 500 Individual Study (2–3)

Independent research, studies, or surveys of selected subjects. Total credit limited to 9 units. Prerequisite: Graduate standing with minimum of 12 core units.

CRP 501 Foundations of Cities and Planning (4)

Origins and evolutionary stages of settlement patterns and the use of land and natural environment. Changing spatial structure in the development of cities and regions. Beginnings and the historical development of the planning profession. 4 lectures. Prerequisite: Graduate standing.

CRP 505 Principles of Regional Planning (4)

History, development and major philosophical approaches of regions and regional planning, both in urban-centered and resource-based regions. Effects of relaxing natural, economic and infrastructure limiting factors on growth and development of regions. Normative hierarchical emphasis of contemporary regional planning compared to emerging paradigms that alter the regional/local planning relationship. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

509 Professional Development (1-3) (CR/NC)

Professional development course, including environmental assessment workshop, applied research workshop, internship seminar, and other events. Total credit limited to 3 units. Credit/No Credit grading only. 1-3 activities. Prerequisite: Graduate standing.

CRP 510 Planning Theory (4)

Theory of planning. Development of contemporary planning thought from varying sources and perspectives. Political and social context of planning. Alternative professional roles, and planning processes. Values and ethical issues in planning. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

CRP 512 Introduction to Visual Communication and GIS (4) (CR/NC)

Introduction to geographic information systems (GIS) as a tool for analyzing and managing spatial information pertinent to planning. Introduction to various drawing media and delineation techniques for planners, including three-dimensional visualization and graphic skills. Integration of visual and digital media in presentations. Credit/No Credit grading only. 4 laboratories. Prerequisite: Graduate standing.

CRP 513 Planning Research Methods (4)

Application of research design to planning issues. Comparison of case study, comparative and problem-solving methods. Primary and secondary data sources, including field survey techniques. 3 seminars and supervised work. Prerequisite: Graduate standing, STAT 221 or equivalent, or consent of instructor.

CRP 514 Computer Applications for M.C.R.P. (2)

Microcomputer applications used by planners. Focus on planners' adaptations of spreadsheets, statistical applications, data base systems, graphic presentation. 2 laboratories. Prerequisite: Graduate standing.

CRP 515 Planning Presentation and Communication Techniques (3)

Basic techniques used in effective planning presentations. Introduction to various drawing media and delineation techniques for planners, three-dimensional visualization, graphic skills. Integration of visual and electronic media in presentations. 3 laboratories. Prerequisite: Graduate standing.

CRP 516 Methods of Data Analysis (4)

Problem recognition, data selection, analysis and synthesis with applications of system design, statistical techniques and symbolic modeling to urban design and regional growth and development policies. 3 seminars, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

CRP 518 Public Policy Analysis (4)

Analysis of the social, economic, environmental, political contexts of public policy decisions. Public policy issues and use of concepts and tools related to monitoring and assessment. 4 lectures. Prerequisite: CRP 501 or POLS 360 or consent of instructor.

CRP 520 Feasibility Studies in Planning (4)

Fundamental analysis for assessing feasibility of public and private development projects. Principles and techniques for analyzing markets and assessing cash flow for individual projects. Economic, fiscal and tax impacts as factors determining public participation in private projects. 4 seminars. Prerequisite: CRP 501 or consent of instructor.

CRP 525 Plan Implementation (4)

Theory and practice of plan implementation. Regulatory and non-regulatory frameworks for plan implementation. Growth management, development regulation, capital improvement programs, redevelopment. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

CRP 530 Planning Agency Management (3)

Preparation for mid-level and higher positions in public planning agencies and private firms. Applications of organization theory to planning agencies and firms. Work programs, staff development, budgets, contracting, proposal preparation, conflict management. Relationships with other agencies and firms, clients, public and media. 3 seminars. Prerequisite: CRP 501, CRP 510 or consent of instructor.

CRP 535 Land Use and Planning Law (4)

The role of law in the planning and regulation of land use. Constitutional constraints on land use regulation. Legal and policy issues for environmental protection and public administration. Relevant legislation and case law. 4 lectures. Prerequisite: Graduate standing, or consent of instructor.

CRP 545 Principles of Environmental Planning (4)

Environmental planning as a field of inquiry and action. Review and application of policies and techniques used in environmental planning, especially within the land use planning context. Application of California Environmental Quality Act

and environmental impact assessment methods. 3 seminars, 1 laboratory.
Prerequisite: Graduate standing or consent of instructor.

CRP 548 Principles of Urban Development and Design (4)

Introduction to the philosophy and theory particular to urban development and design. Exploration of evaluation criteria and critical analysis of the human environment related to physical design requirements. Spatial and form relationships, scale, human activities, concept formation, visual organization of the city, landscaping and architecture. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

CRP 552 Community and Regional Planning Studio I (4)

Application of planning theory and methods to community and regional planning projects. Structured for research, analysis, synthesis, and implementation practice. Interrelationships of natural and built environments, transportation systems, and economic and social conditions at various planning scales. Includes field trips and individual, team and interdisciplinary approaches. 2 seminars, 2 laboratories. Prerequisite: CRP 501, CRP 525, or consent of instructor.

CRP 553 Project Planning Laboratory (4)

Project-scale planning problems. Arranging structures, circulation systems, utilities and plant material on natural and urban sites to support human activity while minimizing disruption to natural systems. Includes planned unit developments, waterfronts, hillsides, campuses and commercial centers. Field trips. 4 laboratories. Prerequisite: CRP 512 or consent of instructor.

CRP 554 Community and Regional Planning Studio II (4)

Application of planning theory and methods to community and regional planning projects. Structured for research, analysis, synthesis, and implementation practice. Interrelationships of natural and built environments, transportation systems, and economic and social conditions at various planning scales. Includes field trips, and individual, team and interdisciplinary approaches. 2 seminars, 2 laboratories. Prerequisite: CRP 552.

CRP 556 Community and Regional Planning Studio III (4)

Application of planning theory and methods to community and regional planning projects. Individual faculty-assigned laboratory work leading to the completion of a professional quality project focused on a real-world planning task. Structured for research, analysis, synthesis and implementation practice. 3 seminars and supervised work. Prerequisite: CRP 554, or consent of instructor.

CRP 570 Selected Topics in Planning (4)

Directed group study of selected planning topics. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

CRP 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

CRP 596 Professional Project (2-4)

Individual research under the supervision of the faculty, leading to completion of a professional project based on a real world planning task or carefully constructed simulation. Must be taken in all quarters requiring supervision; minimum of 6 units required for degree. Total credit limited to 8 units. Prerequisite: CRP 513, and consent of the graduate program coordinator.

CRP 597 Policy, Planning and Management (4)

This course provides a synthesis of the MCRP program. Expansion and integration of material on planning principles, practice, theory and quantitative methods. 4 seminars. Prerequisite: CRP 409, CRP 510, CRP 516, CRP 518, CRP 525, CRP 530, CRP 535, CRP 552 and CRP 554.

CRP 599 Thesis (2-4)

Individual research under the general supervision of the faculty, leading to a graduate thesis. Must be taken in all quarters requiring supervision; minimum of 6 units required for degree. Total credit limited to 8 units. Prerequisite: CRP 513, and consent of the graduate program coordinator.

CRSC—CROP SCIENCE

CRSC 123 Forage Crops (4)

Forages as a world resource in food and animal production, soil and water conservation and sustainable agricultural systems. Forage use systems: pasture and range, green chop, silage, hay and cubes. Identification and management of limiting factors of forage plant growth. Botany of legumes and grasses. Grass, legume and weed identification. Forage crop improvement. Forage composition and quality. Antiquity factors. 3 lectures, 1 laboratory.

CRSC 203 Organic Farming Enterprise Project (2-4) (CR/NC)

Beginning field experience in production and marketing of organic vegetable and fruit crops, under faculty supervision. Project participation subject to approval by department head and Cal Poly Corporation. Degree credit limited to 4 units. Credit/No Credit grading only. 1 lecture, 1-3 units of independent study.

CRSC 244 Precision Farming (4)

Precision agriculture applications. Integrating GIS, GPS, and remote sensing technologies with site-specific farming practices to optimize agricultural productivity. Field trip required. 3 lectures, 1 laboratory. Prerequisite: FRSC 133 or VGSC 190 or VGSC 230.

CRSC 333 Greenhouse Vegetable Production (2)

Development, practices, history, and future of crop production in greenhouses. Research applications, commercial applications, production problems, marketing, and economics. Special emphasis on growing transplants in greenhouses and use of nutrient solutions. Field trips to a commercial greenhouse operation and/or analysis lab required. 2 activities. Prerequisite: CHEM 111 and HCS 120 and SS 221.

CRSC 402 Enterprise Project Management (2-4) (CR/NC)

Advanced experience in production of an agronomic crop. Development of a plan for field operations, a marketing plan, and a budget. Management decision-making. Project participation is subject to approval by the department head and the Cal Poly Corporation. Degree credit limited to 4 units. Credit/No Credit grading only. 1 lecture, variable practicum. Prerequisite: CRSC 202, and consent of instructor.

CRSC 411 Experimental Techniques and Analysis (4)

Principal experimental designs used in agriculture and methods of statistical analysis of data collected from each. Statistical software. Field practice in planning and layout of typical experiments. 3 lectures, 1 laboratory. Prerequisite: Junior standing and MATH 118 or equivalent, and STAT 218 or consent of instructor.

CRSC 445 Cropping Systems (4)

Classification and description of agricultural systems of the world. Cropping systems as land management plans. Systems approaches to improvement of agricultural situations. Consideration of human factors and the agroecosystem in efforts to create a more sustainable agriculture. Field trip required. 3 lectures, 1 activity. Prerequisite: BOT 121 and SS 121, or HCS 120.

CRSC 581 Graduate Seminar in Crop/Fruit Production (3)

Group study of current problems, trends and research results pertaining to production or marketing of field, vegetable or fruit crops. 3 seminars. Prerequisite: Graduate standing.

CRSC 599 Thesis in Crop Science (1-9)

Systematic research of a significant problem in Crop Science. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.

CSC—COMPUTER SCIENCE

CSC 100 Computer Science Orientation (2)

Introduction to the computer science discipline for majors. Computer problem solving and the use of computers. Success skills for computer science majors. Career paths and opportunities. Interaction with upper division students and faculty. 2 seminars. Prerequisite: Computer science major or minor or software engineering major.

CSC 101 Fundamentals of Computer Science I (4)

Basic principles of algorithmic problem solving and programming using methods of top-down design, stepwise refinement and procedural abstraction. Basic control structures, data types, and input/output. Introduction to the software development process: design, implementation, testing and documentation. The syntax and semantics of a modern programming language. Credit not available for students who have taken CSC/CPE 108. 3 lectures, 1 laboratory. Prerequisite: Completion of ELM requirement, and passing score on MAPE or MATH 117 with a grade of C- or better or MATH 118 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 101.*

CSC 102 Fundamentals of Computer Science II (4)

Basic design, implementation, testing, and documentation of object-oriented software. Introduction to classes, interfaces, inheritance, algorithms (sort, search, recursion), abstract data types, data structures (lists, stacks, queues), file I/O, and

exceptions. Credit not available for students who have taken CSC/CPE 108. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 101 with a grade of C- or better and either MATH 141 or MATH 221 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 102.*

CSC 103 Fundamentals of Computer Science III (4)

Introduction to data structures and analysis of algorithms. Abstract data types. Specification and implementation of advanced data structures. Theoretical and empirical analysis and proofs of properties of recursive and iterative algorithms. Software performance evaluation and testing techniques. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 102 with a grade of C- or better or CPE/CSC 108 with a grade of C- or better, CSC 141 with a grade of C- or better, and MATH 141 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 103.*

CSC 105 Fundamentals of Computer Science I Supplemental Instruction (1) (CR/NC)

Facilitated study and discussion of fundamental concepts of computer science and familiarization with programming environments. Credit/No Credit grading only. 1 laboratory. Prerequisite: Concurrent enrollment in CPE/CSC 101. *Crosslisted as CPE/CSC 105.*

CSC 108 Accelerated Introduction to Computer Science (4)

Accelerated introduction to basic principles of algorithmic and object-oriented problem solving and programming. Introduction to programming language concepts including control structures, data types, classes, and inheritance. Program design principles. Use and implementation of algorithms (searching, sorting, recursion) and data structures (lists, stacks, and queues). Intended for students with experience in algorithmic problem solving and using basic control structures and data types in a modern programming language (CSC/CPE 101), but who are not ready for CSC/CPE 102. Credit not available for students who have taken CSC/CPE 102. 3 lectures, 1 laboratory. Prerequisite: Math 118 (or equivalent) with a grade of C- or better, significant experience in computer programming, and consent of instructor. Corequisite: CSC 141. *Crosslisted as CPE/CSC 108.*

CSC 110 Computers and Computer Applications: Windows (3)

The computer as a problem-solving tool. A working introduction to microcomputers and fundamental computer concepts. Use of applications software. Credit not allowed for CSC or Software Engineering majors. 2 lectures, 1 activity. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104.

CSC 113 Computers and Computer Applications: Macintosh (3)

The computer as a problem-solving tool. A working introduction to microcomputers and fundamental computer concepts. Use of applications software. Credit not allowed for CSC or Software Engineering majors. 2 lectures, 1 activity. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104.

CSC 119 Information Retrieval and Management (4)

Use of applications software, including database software, to create and manage information. Credit not allowed for CSC or Software Engineering majors. 4 lectures. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104.

CSC 123 Introduction to Computing (4)

Use of a supportive software development environment to design, develop, and test applications in a selected topic domain that demonstrates the potential of careers in computing. An introduction to computing and to the selected topic domain. The Schedule of Classes will list topic selected. No programming experience required. Not for students with credit in CPE/CSC 103. 3 lectures, 1 laboratory. Prerequisite: Basic computer literacy. *Crosslisted as CPE/CSC 123.*

CSC 141 Discrete Structures I (4)

Introduction to structures of computer science: logic, sets, relations, functions, graphs and trees. Propositional and predicate logic. Applications of predicate logic to preconditions, postconditions, and proof techniques. Introduction to complexity of algorithms. 4 lectures. Prerequisite: MATH 118 and MATH 119, or high school equivalent. Recommended: prior programming experience.

CSC 142 Discrete Structures II (4)

Advanced structures of computer science: sequences, strings, graphs, networks. Recursion and recurrence relations. Introduction to combinatorics. Proof techniques. Complexity of algorithms. Advanced application to verification of algorithms. 4 lectures. Prerequisite: CSC/CPE 102 and CSC 141.

CSC 171 Introduction to Interactive Entertainment (4)

Use of click-and-drag software application to create an entertaining or informative, socially responsible application, such as a game. Team collaboration

to design, develop, and test applications. Focus on design, teamwork, and using an iterative development process. An enjoyable introduction to both computer science and interactive entertainment. No computer science experience required. 3 lectures, 1 laboratory.

CSC 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

CSC 209 Problem Solving with Computers (1) (CR/NC)

Reinforcement of computer science fundamentals. Review of important algorithms, language features, design, syntax, and testing techniques. Repeated application of techniques to solve problems in a constrained amount of time. Primarily intended to support students preparing for the Association for Computing Machinery's International Collegiate Programming Contest. Credit/No Credit grading only. Total credit limited to 15 units. 1 laboratory. Prerequisite: CSC/CPE 101 or CSC/CPE 108 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 209.*

CSC 225 Introduction to Computer Organization (4)

Introduction to computer systems. Simple instruction set architecture and the computer hardware needed to implement that architecture. Machine and assembly language programming. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 102. *Crosslisted as CPE/CSC 225.*

CSC 231 Programming for Engineering Students (2)

Programming techniques and procedures with applications to engineering problems. Introduction to numerical methods and simulation. Credit not allowed for CSC, Software Engineering or CPE majors. 2 activities. Prerequisite: MATH 142; PHYS 121 or PHYS 131 or PHYS 141.

CSC 232 Computer Programming for Scientists and Engineers (3)

Computer programming, with an emphasis on procedural programming, taught using a language hosted by applications commonly used in science and engineering. Credit not allowed for CSC, CPE or Software Engineering majors. 2 lectures, 1 activity. Prerequisite: MATH 118 or equivalent.

CSC 234 C and Unix (3)

The C programming language and the UNIX programming environment. Operators, standard I/O functions, strings, pointers and arrays, data types and storage classes. Unix shell programming and basic I/O system calls. Credit not allowed for CSC, Software Engineering or CPE majors. 3 lectures. Prerequisite: MATH 142.

CSC 235 Fundamentals of Computer Science for Scientists and Engineers I (4)

Introduction to the fundamentals of computer programming with an emphasis on mathematical, scientific and engineering applications: principles of algorithmic problem solving and procedural programming using a modern programming language, data types, elementary data structures, input/output and control structures. Not a substitute for CSC/CPE 101 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: MATH 141 or MATH 161 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 235.*

CSC 236 Fundamentals of Computer Science for Scientists and Engineers II (4)

Further study of computer program development with an emphasis on mathematical, scientific and engineering applications. Introduction to more complicated data types and structures. Practice of more complicated techniques of procedural programming. Introduction to the principles of object-oriented programming using a modern programming language. Detailed discussion of lists and classic list algorithms, algorithm analysis, multidimensional arrays, records, dynamic data structures, file input/output, classes. Not a substitute for CSC/CPE 102 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 235 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 236.*

CSC 237 Introduction to Computer Science with Applications I (4)

Introduction to the fundamentals of computer science using a modern programming language. Includes principles of algorithmic problem solving, data types, elementary data structures, input/output, control structures, classes and methods. Not a substitute for CSC/CPE 101 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: MATH 221 or STAT 252 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 237.*

CSC 238 Introduction to Computer Science with Applications II (4)

Continuation of CSC 237. Intermediate study of computer program development using a modern object oriented (OO) programming language. Further study of

OO principles including inheritance and interfaces. Introduction to implementation of Graphical User Interfaces, multi-media, streams, database connection, and scripting. Not a substitute for CSC 102 or for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 237 with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 238.*

CSC 239 Selected Programming Languages (4)

A programming language selected from languages of current interest. Intended for students who want to learn another programming language. The Schedule of Classes will list topic selected. 3 lectures, 1 laboratory. Prerequisite: Knowledge of a programming language.

CSC 270 Computer Graphics Applications (4)

Use of common graphics applications packages. Business graphics, figure editing, animation and image editing, photorealistic image generation, scientific visualization and multimedia. 2 lectures, 2 activities. *Crosslisted as CPE/CSC 270.*

CSC 290 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

CSC 300 Professional Responsibilities (4)

The responsibilities of the computer science professional. The ethics of science and the IEEE/ACM Software Engineering Code of Ethics. Quality tradeoffs, software system safety, intellectual property, history of computing and the social implications of computers in the modern world. Applications to ethical dilemmas in computing. Technical presentation methods and practice. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357 and junior standing. *Crosslisted as CPE/CSC 300.*

CSC 302 Computers and Society (4) GE Area F

Social, ethical, political and technological implications and effects of computers in the modern world. Examination of the benefits and side-effects of computer applications and automation. Case study review and analysis. 4 lectures. Prerequisite: Junior standing and completion of GE Area B. Fulfills GE Area F.

CSC 303 Teaching Computer Science (2)

Practical coverage of educational techniques appropriate for tutoring in CSC/CPE undergraduate courses, including Socratic methods for tutoring of technical topics, design of test questions and grading rubrics, and lecture presentation. Intended for CSC/CPE/SE students interested in tutoring, grading, or a career in teaching computer science. 1 lecture, 1 laboratory. Prerequisite: CSC/CPE 103, with a grade of C- or better, or equivalent, or consent of instructor. Not available for technical elective credit.

CSC 305 Individual Software Design and Development (4)

Practical software development skills needed for construction of mid-sized production-quality software modules, using the CSC upper division programming language. Topics include inheritance, exceptions, and memory and disk-based dynamic data structures. Students must complete an individual programming project of mid-level complexity. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357. *Crosslisted as CPE/CSC 305.*

CSC 307 Introduction to Software Engineering (4)

Requirements, specification, design, implementation, testing and verification of large software systems. Study and use of the software process and software engineering methodologies; working in project teams. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 with a grade of C- or better, or consent of instructor, and CSC/CPE 357. Not open to students with credit in CSC/CPE 308. *Crosslisted as CPE/CSC 307.*

CSC 308 Software Engineering I (4)

Principles for engineering requirements analysis and design of large complex software systems. Software process models. Methods of project planning, tracking, documentation, communication, and quality assurance. Analysis of engineering tradeoffs. Group laboratory project. Technical oral and written presentations. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357. *Crosslisted as CPE/CSC 308.*

CSC 309 Software Engineering II (4)

Continuation of the software lifecycle. Methods and tools for the implementation, integration, testing and maintenance of large software systems. Software development and test environments. Software quality assurance. Group laboratory project. Technical presentation methods and practice. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 308. *Crosslisted as CPE/CSC 309.*

CSC 310 Computers for Poets (4)

GE Area F

How computers and computer devices work. Introduction to software systems and applications. How computers connect with various media including images, speech and data. How information is encoded and transmitted across networks. Relationship between the computer and human information processing. 4 lectures. Prerequisite: Junior standing and completion of GE Area B. *Crosslisted as CSC 310/HNRS 311.* Fulfills GE Area F.

CSC 315 Computer Architecture (4)

In-depth study of the instruction set architecture and hardware design of a specific CPU. Introduction to pipelines, input/output and multi-processors. Computer abstractions and performance measurement. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103, and CPE/EE 229 or CSC 225 or CPE/EE 233. *Crosslisted as CPE/CSC 315.*

CSC 316 Micro Controllers and Embedded Applications (4)

Introduction to micro controllers and their applications as embedded devices. Hardware/software tradeoffs, micro controller selection, use of on-chip peripherals, interrupt driven real-time operation, A/D conversion, serial and parallel communications, watch-dog timers, low power operation and assembly language programming techniques. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 315 or CPE/EE 329. *Crosslisted as CPE/CSC 316.*

CSC 334 Advanced Topics in Unix (4)

Advanced topics in Unix, system calls, library functions, shell scripts, and selected Unix tools. 4 lectures. Prerequisite: CSC/CPE 103, with a grade of C- or better, or consent of instructor, or CSC 234.

CSC 341 Numerical Engineering Analysis (4)

GE B6

An intensive survey of numerical analysis techniques used for solving engineering problems. Topics include solution of nonlinear equations, solution of linear systems, interpolation, numerical quadrature, ordinary differential equations and boundary value problems. Not open to students who have completed CSC 342. 4 lectures. Prerequisite: MATH 244 and one of the following courses: CSC 101, CSC 231, CSC 232, CSC 234, CSC 235, or consent of instructor. Fulfills GE B6.

CSC 342 Numerical Analysis I (3)

Computer solutions of nonlinear equations and systems of linear equations. Polynomial interpolation. Numerical quadrature. Introduction to the solution of ordinary differential equations. 3 lectures. Prerequisite: MATH 143 and knowledge of a high level programming language, or ability to use one of the following systems: Maple, MatLab, Mathematica, or Mathcad.

CSC 349 Design and Analysis of Algorithms (4)

Intermediate and advanced algorithms and their analysis. Mathematical, geometrical, and graph algorithms. NP-complete problems. Additional topics will be chosen from pattern matching, file compression, cryptography, dynamic and linear programming, and exhaustive search. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103, with a grade of C- or better, or consent of instructor, and MATH 142 and either STAT 312 or STAT 321. *Crosslisted as CPE/CSC 349.*

CSC 357 Systems Programming (4)

C programming language from a system programming perspective. Standard C language including operators, I/O functions, and data types in the context of system functions. Unix commands, shell scripting, file system, editors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 with a grade of C- or better, or consent of instructor, and CSC 225 or CPE/EE 229 or CPE/EE 233. *Crosslisted as CPE/CSC 357.*

CSC 358 Computer System Administration (2)

Fundamental concepts of Unix system administration. Use of shell scripts and utilities. Techniques of networks and data communications. Methods of system maintenance and accounting. 2 seminars. Prerequisite: CSC/CPE 103 or permission of instructor.

CSC 361 File Structures (4)

External storage devices. Character, record, and block I/O. Blocking and buffering. File structures: sequential, indexed sequential, B trees, hashing, multi-key and linked. Primary and secondary indexing. Design and implementation of record and object storage managers. Data compression. Multi-media file formats. 4 lectures. Prerequisite: CSC/CPE 103, with a grade of C- or better, or consent of instructor.

CSC 365 Introduction to Database Systems (4)

Basic principles of database management systems (DBMS) and of DBMS application development. DBMS objectives, systems architecture, database models with emphasis on Entity-Relationship and Relational models, data

definition and manipulation languages, the Structured Query Language (SQL), database design, application development tools. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103. *Crosslisted as CPE/CSC 365.*

CSC 366 Database Modeling, Design and Implementation (4)

The database modeling problem. Database modeling levels: external, conceptual, logical and physical. Database models: entity-relationship, relational, object-oriented, semantic, and object-relational. Normal forms. Distributed database design. Functional analysis of database applications and transaction specification, design, and implementation. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 365. *Crosslisted as CPE/CSC 366.*

CSC 369 Distributed Computing I (4)

Introduction to distributed computing paradigms and protocols: interprocess communications, group communications, the client-server model, distributed objects, and Internet protocols. Emphasis on distributed software above the operating system and network layers. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357. *Crosslisted as CPE/CSC 369.*

CSC 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 instructor.

CSC 402 Software Requirements Engineering (4)

Software requirements elicitation, analysis and documentation. Team process infrastructure and resource estimation to support appropriate levels of quality. Software architectural design. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 307 or CSC/CPE 309; CSC/CPE 305. *Crosslisted as CPE/CSC 402.*

CSC 405 Software Construction (4)

Design and construction of sizeable software products. Technical management of software development teams. Software development process models, software design, documentation, quality assurance during development, software unit and integration testing; CASE tools, development environments, test tools, configuration management. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 402. *Crosslisted as CPE/CSC 405.*

CSC 406 Software Deployment (4)

Deployment of a sizeable software product by a student team. Software maintenance and deployment economic issues. Management of deployed software: version control, defect tracking and technical support. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 405. *Crosslisted as CPE/CSC 406.*

CSC 409 Current Topics in Software Engineering (4)

Selected topics in software engineering. Topics may include program generation, quality assurance, formal methods, software metrics, design methods, testing, or software development processes. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 309 or CSC/CPE 307. *Crosslisted as CPE/CSC 409.*

CSC 416 Autonomous Mobile Robotics (4)

Theory and application of concepts relevant to autonomous mobile robots. Sensor and actuator interfacing, programming mobile robots, mobile robot configurations, software architectures and algorithms. 3 lectures, 1 laboratory. Prerequisite: CPE/EE 329 or both CSC/CPE 315 and CSC/CPE 357 or consent of instructor. *Crosslisted as CPE/CSC 416.*

CSC 430 Programming Languages I (4)

Construction of the front end of a compiler including lexical analysis, syntactic analysis, type checking, and formal semantics. Introduction to regular languages, finite automata, and context-free grammars. 3 lectures, 1 laboratory. Prerequisite: CSC 349 and CSC/CPE 357. *Crosslisted as CPE/CSC 430.*

CSC 431 Programming Languages II (4)

Language principles and design issues: bindings, conversion, parameter passing, and dynamic semantics. Language implementation: intermediate code representation, memory management, code optimization, and code generation. Functional programming languages. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 430. *Crosslisted as CPE/CSC 431.*

CSC 435 Introduction to Object Oriented Design Using Graphical User Interfaces (4)

Principles of object-oriented design, with emphasis on use of these principles in the design of graphical interfaces. Comparison and contrasting of two major object-oriented languages and their corresponding GUI class libraries. Language-independent object-oriented design methods, and application of these methods in the construction of a GUI-based project. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 305. *Crosslisted as CPE/CSC 435.*

CSC 437 Dynamic Web Development (4)

Project-based study of web-based three-tiered applications, including current best practices and tools for design, implementation and testing of browser interface, serverside business logic, object-relational mapping, databases, and web services. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357 (with a grade of C- or better) and CSC/CPE 365 or consent of instructor. *Crosslisted as CPE/CSC 437.*

CSC 445 Theory of Computation I (4)

Theory of formal languages and automata. Turing machines. Chomsky hierarchy. Theory of decidability and computability. 4 lectures. Prerequisite: CSC 141 and CSC 349 or consent of instructor.

CSC 448 Bioinformatics Algorithms (4)

Introduction to the use of computers to solve problems in molecular biology. The algorithms, languages, and databases important in determining and analyzing nucleic and protein sequences and their structure. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor or the following: CSC/CPE 103, with a grade of C- or better, or consent of instructor, or BIO/CHEM 441 and senior standing. *Crosslisted as CPE/CSC 448.*

CSC 449 Current Topics in Algorithms (4)

Selected aspects of the verification, analysis and design of algorithms. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC 349. *Crosslisted as CPE/CSC 449.*

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/CPE 357, and CSC/CPE 225 or CPE/EE 229 or CPE/EE 233. *Crosslisted as CPE/CSC 453.*

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/CPE 453. *Crosslisted as CPE/CSC 454.*

CSC 456 Introduction to Computer Security (4)

Computer system and network security, including protection, access control, distributed access control, operating system security, applied cryptography, network security, firewalls, secure coding practices, and case studies from real-world systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 453 and either CSC/CPE 300 or CPE 350. *Crosslisted as CPE/CSC 456.*

CSC 458 Current Topics in Computer Systems (4)

Selected aspects of design, implementation and analysis of networks, advanced operating and distributed systems. Topics may include process management, virtual memory, process communication, context switching, file system designs, persistent objects, process and data migration, load balancing, security and networks. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 453. *Crosslisted as CPE/CSC 458.*

CSC 464 Introduction to Computer Networks (4)

Computer network architectures; communications protocol standards; services provided by the network; historical and current examples presented. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357. Recommended: STAT 312 or STAT 321 or STAT 350. *Crosslisted as CPE/CSC 464.*

CSC 465 Advanced Computer Networks (4)

Advanced topics in computer networks; greater detail of protocol standards and services provided by the network; focus on current industry and research topics. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 464 and CSC/CPE 453. *Crosslisted as CPE/CSC 465.*

CSC 466 Knowledge Discovery from Data (4)

Overview of modern knowledge discovery from data (KDD) methods and technologies. Topics in On-line Analytic Transaction Processing (OLAP), data mining (association rules mining, classification, clustering), information retrieval. Emphasis on use of KDD techniques in modern software applications. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 365 and one of STAT 312, STAT 321 or STAT 350. *Crosslisted as CPE/CSC 466.*

CSC 468 Database Management Systems Implementation (4)

Data structures and algorithms used in the implementation of database systems. Implementation of data and transaction managers: access methods interfaces, concurrency control and recovery, query processors and optimizers. Introduction

to implementation of distributed database systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 365. *Crosslisted as CPE/CSC 468.*

CSC 469 Distributed Computing II (4)

Continued exploration of topics in distributed computing in greater depth, with emphasis on design patterns and team projects. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 369. *Crosslisted as CPE/CSC 469.*

CSC 471 Introduction to Computer Graphics (4)

Graphics software development and use of APIs for 3D graphics. The graphics pipeline, modeling, geometric and viewing transforms, lighting and shading, rendering, interaction techniques and graphics hardware. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357. *Crosslisted as CPE/CSC 471.*

CSC 473 Advanced Rendering Techniques (4)

Illumination models, reflectance, absorption, emittance, Gouraud shading, Phong shading, raytracing polyhedra and other modeling primitives, coherence, acceleration methods, radiosity, form factors, advanced algorithms. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471. *Crosslisted as CPE/CSC 473.*

CSC 474 Computer Animation (4)

Basic and advanced algorithms for generating sequences of synthetic images. Interpolation in time and space, procedural and keyframe animation, particle systems, dynamics and inverse kinematics, morphing and video. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471. *Crosslisted as CPE/CSC 474.*

CSC 476 Real-Time 3D Computer Graphics Software (4)

Basic and advanced algorithms for real-time, interactive, 3D graphics software. Modeling (polygon mesh, height field, scene graph), real-time rendering and shading (visibility processing, LOD, texture and light maps), collision detection (bounding volumes, complexity management), interactive controls, multi-player game technology, game engine architecture. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471. *Crosslisted as CPE/CSC 476.*

CSC 478 Current Topics in Computer Graphics (4)

Selected aspects of the design, implementation and analysis of computer graphics. Topics may include rendering, modeling, visualization, animation, virtual reality, computer vision, multimedia, and perception issues. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471. *Crosslisted as CPE/CSC 478.*

CSC 479 Computer Graphics Seminar (2)

Current topics in computer graphics. Total credit limited to 4 units. 2 seminars. Prerequisite: CSC/CPE 471.

CSC 480 Artificial Intelligence (4)

Programs and techniques that characterize artificial intelligence. Programming in a high level language. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103, with a grade of C- or better, or consent of instructor. *Crosslisted as CPE/CSC 480.*

CSC 481 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/CPE 480. *Crosslisted as CPE/CSC 481.*

CSC 483 Current Topics in Human-Computer Interaction (4)

Selected aspects of the field of human-computer interaction. Topics may include dynamic information visualization, universal access, social impact of technology usage, educational technology, human cognition and performance studies, and extended usability evaluation techniques. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 484. *Crosslisted as CPE/CSC 483.*

CSC 484 User-Centered Interface Design and Development (4)

Introduction to the importance of user-centered principles in the design of good interfaces and effective human-computer interaction. Topics include: human characteristics affected by interface design, effective requirements data collection and analysis, user-centered approaches to software engineering, and evaluation of interface and interaction quality. 3 lectures, 1 laboratory. Prerequisite: Junior standing and CSC/CPE 307 or CSC/CPE 308. *Crosslisted as CPE/CSC 484.*

CSC 485 Autonomous Robot Navigation (4)

Overview of existing autonomous mobile robot systems, basic kinematic modeling, control structures, sensing and sensor modeling, localization, and motion planning algorithms. Implementation of autonomous navigation capabilities. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357 or consent of instructor. *Crosslisted as CPE/CSC 485.*

CSC 486 Human-Computer Interaction Theory and Design (4)

Application of the theories of human-computer interaction to the task of user-centered design. Survey of techniques for studying and involving users in different aspects of the design process, and demonstration of where and when applicable. Combining of theoretical understanding with practical experience to design solutions to problems facing interactive systems designers. 4 seminars. Prerequisite: CSC/CPE 484.

CSC 489 Current Topics in Artificial Intelligence (4)

Selected aspects of the design, implementation and analysis of advanced systems and concepts in the area of artificial intelligence. Topics may include knowledge representation, reasoning, learning, or planning, and specific techniques like intelligent agents, genetic algorithms, semantic web, or robotics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 480. *Crosslisted as CPE/CSC 489.*

CSC 490 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

CSC 491 Senior Project Design Laboratory I (2)

Selection and completion of a project by individuals or team which is typical of problems which graduates must solve in their fields of employment. Project may include students from other disciplines. Formulation of outline, literature review, and project schedule. 2 laboratories. Prerequisite: CSC/CPE 307 or CSC/CPE 309 and consent of instructor.

CSC 492 Senior Project Design Laboratory II (3)

Selection and completion of a project by individuals or team which is typical of problems which graduates must solve in their fields of employment. Project may include students from other disciplines. Project results are presented in a formal report. 3 laboratories. Prerequisite: CSC 491 and consent of instructor.

CSC 493 Cooperative Education Experience (2) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units. Prerequisite: Sophomore standing and consent of instructor.

CSC 494 Cooperative Education Experience (6) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units. Prerequisite: Sophomore standing and consent of instructor.

CSC 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

CSC 500 Directed Study (2-3) (CR/NC)

Individual directed study of advanced topics. Total credit limited to 4 units. Credit/No Credit grading only. Prerequisite: Fully classified graduate standing and consent of instructor.

CSC 508 Software Engineering I (4)

In-depth study of requirements engineering, software project management, formal specifications and object-oriented analysis. 4 seminars. Prerequisite: CSC/CPE 307 or CSC/CPE 308 and graduate standing, or consent of instructor.

CSC 509 Software Engineering II (4)

In-depth study of software modeling and design. Formal design methodologies. Design patterns. Detailed case studies of existing projects. Tools and methods for designing large software systems. 4 seminars. Prerequisite: CSC 508 and graduate standing, or consent of instructor.

CSC 520 Computer Architecture (4)

Comparative study and design of multiprocessor, dataflow, RISC, high level language and other new computer architectures. VLSI processor design

techniques. 3 seminars, 1 laboratory. Prerequisite: CSC/CPE 315 and graduate standing, or consent of instructor. *Crosslisted as CPE/CSC 520.*

CSC 530 Languages and Translators (4)

Advanced programming language and translator concepts. Language concepts to be covered will be selected from current state-of-the-art languages and current issues in language design. Compiler concepts will include retargetable code generation, use of translator-writing systems, and error recovery. 4 seminars. Prerequisite: CSC 430 and graduate standing, or consent of instructor.

CSC 540 Theory of Computation II (4)

Advanced topics in theoretical computer science from such areas as automata theory, cellular automata theory, computational complexity, and program verification. 4 seminars. Prerequisite: CSC 445 and graduate standing, or consent of instructor.

CSC 541 Numerical Methods (4)

Introduction to advanced methods used in numerical analysis. Finite element methods for one and two-dimensional problems. Study of transforms including the Fast Fourier Transform and the Fast Hartley Transform. Review of the software supporting these methods. 4 seminars. Prerequisite: CSC 342 and graduate standing, or consent of instructor.

CSC 550 Operating Systems (4)

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 sub-routines. Intercommunication between input/output and processors. 4 seminars. Prerequisite: CSC/CPE 453 and graduate standing, or consent of instructor.

CSC 556 Computer Security (4)

Exploration of advanced topics in computer security with an emphasis on research topics. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 456 and graduate standing, or consent of instructor. *Crosslisted as CPE/CSC 556.*

CSC 560 Database Systems (4)

Current topics in database systems: distributed databases and transactions, nested and long-running transactions, distributed concurrency control, semantic and object-oriented data models, database systems for non-traditional applications: engineering design databases, active, logic, temporal, multi-media, and real-time databases. 4 seminars. Prerequisite: CSC/CPE 365 and graduate standing, or consent of instructor.

CSC 564 Computer Networks: Research Topics (4)

Exploration of advanced topics in emerging computer networking technologies; focus on leading edge computer network research topics. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 464 and graduate standing, or consent of instructor. *Crosslisted as CPE/CSC 564.*

CSC 568 Distributed Systems (4)

Advanced topics in distributed systems with emphasis on recent and emerging distributed computing paradigms, fault tolerance, and distributed algorithms. 4 seminars. Prerequisite: CSC/CPE 369 or CSC/CPE 569 and graduate standing, or consent of instructor.

CSC 569 Distributed Computing (4)

Principles and practices in distributed computing: interprocess communications, group communications, client-server model, distributed objects, message queue system, distributed services, mobile agents, object space, Internet protocols. Distributed algorithms: consensus protocols, global state protocols. Fault tolerance: classification of faults, replication. Not open to students with credit in CSC/CPE 369 or CSC/CPE 469. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357 and graduate standing, or consent of instructor. *Crosslisted as CPE/CSC 569.*

CSC 570 Current Topics in Computer Science (2-4)

Directed group study of selected topics for graduate students. Topics will normally consist of continuations of those in CSC 520, 530, 540, 550, 560 and 580, and other topics as needed. The Schedule of Classes will list title selected. Total credit limited to 12 units. 2 to 4 seminars. Prerequisite: Graduate standing and evidence of satisfactory preparation in computer science.

CSC 572 Computer Graphics (4)

Advanced topics in computer graphics with emphasis on leading edge computer graphics technologies and advanced topics in graphics fundamentals. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471 and graduate standing, or consent of instructor.

CSC 580 Artificial Intelligence (4)

Current research in the field of artificial intelligence with emphasis on cooperative agents, distributed agents, and decision making in complex, concurrent environments. AI programming in a distributed environment. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 480 and graduate standing, or consent of instructor. *Crosslisted as CPE/CSC 580.*

CSC 581 Computer Support for Knowledge Management (4)

Methods and techniques that computer-based systems can provide to make the management of knowledge and information in digital form easier for the user. Emphasis on support for knowledge-intensive activities performed by users. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 481. *Crosslisted as CPE/CSC 581.*

CSC 590 Thesis Seminar (1)

Preparation for conducting research in the field of computer science, through discussions, selected readings, and student presentations. 1 seminar. Prerequisite: Graduate standing or consent of instructor.

CSC 593 Cooperative Education Experience (2) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

CSC 594 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

CSC 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

CSC 596 Thesis I (2)

Individual research or activity under faculty supervision, beginning work on the master's thesis. Prerequisite: Graduate standing and consent of instructor. Corequisite or prerequisite: CSC 590.

CSC 597 Thesis II (3)

Individual research or activity under faculty supervision, continuing work on the master's thesis. Prerequisite: CSC 596 and consent of instructor.

CSC 599 Thesis III (3)

Individual research or activity under faculty supervision leading to an acceptable thesis. Prerequisite: CSC 597, selection of thesis committee, graduate standing, and consent of instructor.

DANC-DANCE

DANC 130 Pilates/Physicalmind Conditioning Method (2)

Introduction to Joseph Pilates Physicalmind conditioning method, providing the ideal physical fitness for the attainment and maintenance of a uniformly developed body and sound mind. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 131 Beginning Ballet (2)

Fundamentals of ballet technique stressing alignment, turn-out, five basic positions, seven movements of dance, and terminology. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 132 Beginning Modern Dance (2)

Fundamentals of modern technique stressing alignment, off-centered use of torso, floorwork, movement phrases, and improvisation exercises. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 133 Beginning Jazz Dance (2)

Introduction of jazz dance techniques stressing a variety of styles, alignment, isolation, polyrhythms, syncopation, improvisation, and phrasing. Performance technique and presentation of simple dance phrases. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 134 Beginning Ballroom Dance (2)

Selected ballroom dances including the cha-cha-cha, foxtrot, merengue, rumba, samba, swing, tango, waltz, and line dance hustle. Emphasis on alignment, etiquette, leading and following, performance techniques, and presentation of simple dance phrases. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 135 International Folk Dance (2)

Introduction to international folk dances including round, longway, and square sets. Study of various dance steps, formation, positions, historical and cultural background. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 139 Beginning Tap (2)

Introduction to tap dance technique stressing rhythms and breaks, syncopation, and improvisation. Different tap styles and related cultural influences. Performance of beginning tap dance phrases. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 211 Dance Fundamentals (2)

Body placement, alignment, rhythmic analysis and movement techniques. Theory and practice of fundamentals to promote ease and efficiency of movement. Introduction to dance forms such as ballet, modern, jazz, folk, square and social. Purchase of concert ticket(s) may be required. 2 activities.

DANC 221 Dance Appreciation (4)**GE C3**

Diverse dance forms. Focus on major western dance artists and their works from the 19th century to the present. Cultural context, style and forms in dance. Introductory survey of major experiments in dance. Purchase of concert ticket(s) may be required. 4 lectures. Fulfills GE C3.

DANC 231 Intermediate Ballet (2)

Continuation of training in basic technical skills in ballet stressing phrasing, performance, and more complex step patterns. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities. Prerequisite: Intermediate level experience as determined by instructor at first class meeting.

DANC 232 Intermediate Modern Dance (2)

Continuing study of DANC 132 with emphasis on various movement styles, phrasing, more complex step patterns, and performance. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities. Prerequisite: Intermediate level experience as determined by instructor at first class meeting.

DANC 233 Intermediate Jazz Dance (2)

Continuation of DANC 133 with emphasis on more extensive movement vocabulary. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities. Prerequisite: Intermediate level experience as determined by instructor at first class meeting.

DANC 234 Intermediate Ballroom Dance (2)

Continuation of DANC 134. Selected ballroom dances: cha cha, foxtrot, merengue, rumba, swing, tango, hustle, paso doble, polka and samba. Emphasis on variations, styles, and performance skill. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities. Prerequisite: DANC 134 or intermediate level experience as determined by instructor at first class meeting.

DANC 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

DANC 311 Dance in American Musical Theatre (4)**GE C4**

Cultural norms portrayed through dance and musical production. Major works with multicultural, racial, class, and gender issues associated with American themes. Artists, role of dance in musical theatre, and significance of dance in human society. Purchase of concert ticket(s) may be required. 4 lectures. Prerequisite: Completion of GE Areas A and C3. Recommended: Junior standing. Fulfills GE C4 except for Theatre Arts majors.

DANC 321 Cultural Influence on Dance in America (4)**GE C4 USCP**

Multicultural approach to history of dance in America, with emphasis on American Indian, West African, Caribbean, Mexican, European, and Asian contributions and influences. Explores culture through dance. Purchase of concert ticket(s) required. 4 lectures. Prerequisite: Completion of GE Areas A and C3. Recommended: Junior standing. Fulfills GE C4 except for Theatre Arts majors. Fulfills USCP.

DANC 331 Advanced Ballet and Repertory (2)

Advanced ballet technique and reconstruction of historical ballet repertoires from the romantic, classical, neoclassical, and modern periods. Participation in dance performance of selected repertory. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities. Prerequisite: DANC 231 or intermediate level experience as determined by instructor at first class meeting.

DANC 332 Modern Dance Repertory (2)

Intermediate to advanced dance skills learned through the study and performance of selected modern dance repertory. Addresses problems in advanced performance technique. Informal presentation in performance situation. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities. Prerequisite: Intermediate level experience as determined by instructor at first class meeting.

DANC 340 Dance Composition (4)

Principles of dance composition. Exploration of creative potential and development of movement motifs through choreographic studies. Preparation for informal public presentation of student generated choreographic works. Purchase of concert ticket(s) may be required. Total credit limited to 8 units. 1 lecture, 1 laboratory, 2 activities. Prerequisite: Intermediate level experience as determined by instructor at first class meeting.

DANC 345 Choreography/Workshop in Dance Concert Preparation (4)

Workshop in concert preparation for major public dance production. Exploration and process of concert dance choreography. Purchase of concert ticket(s) may be required. Total credit limited to 16 units. 2 activities, 2 laboratories. Prerequisite: By audition only.

DANC 346 Dance Production (4)

Directed production of annual Orchestral Dance Company Concert and other public performances. Attendance of professional dance concert(s) required. Purchase of concert ticket(s) may be required. Total credit limited to 16 units. 1 activity, 3 laboratories. Prerequisite: DANC 345.

DANC 381 Dance for KINE/Dance Minors (4)

Dance skills and techniques. Experience in selected dance forms. Rhythmic structure and analysis of dance steps. Includes introduction to dance pedagogy, curricular materials and evaluative procedures. Purchase of concert ticket(s) may be required. 2 lectures, 2 activities. Prerequisite: KINE 419 or KINE 310, Dance Minor or consent of instructor.

DANC 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research and studies or survey of selected problems in dance and related areas. Total credit limited to 8 units with a maximum of 4 units per quarter. Prerequisite: Consent of instructor and department head.

DANC 470 Selected Advanced Topics (1–4)

Directed study of selected topics for advanced dance students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Consent of instructor.

DANC 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for dance students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

DMHS–DISASTER MANAGEMENT and HOMELAND SECURITY**DMHS 351 Introduction to Emergency Management in California (3)**

Emergency management emphasizing the Standardized Emergency Management System (SEMS) and Emergency Operations Center (EOC) operations. Earthquake hazard used as the case to explore potential wide geographic impacts, multiple secondary hazards, and multidisciplinary problem-solving methods in natural disasters faced by local governments and communities. 2 lectures, 1 activity. Prerequisite: Completion of GE Area B3 or D. *Crosslisted as CRP/DMHS/NR 351.*

DMHS 352 Terrorism: Understanding the Threat (3)

Theories, procedures, and practices to prepare field responders, first level governmental supervisors and managers in appropriate local emergency operations centers' response to a terrorist incident. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as DMHS/NR 352.*

DMHS 353 Introduction to Crisis Communications and the Media (3)

Theories, practices and procedures to educate public and private officials on methods and practices used to communicate with the media in time of local or

national disasters or crises. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as DMHS/NR 353.*

DMHS 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research and studies or survey of selected problems in dance and related areas. Total credit limited to 8 units with a maximum of 4 units per quarter. Prerequisite: Consent of instructor and department head.

DMHS 401 Disaster Recovery (3)

Strategies and procedures for public sector management of recovery from disasters. Understanding the role of, and relationship between, federal, state and local agencies to provide assistance to individuals and communities in the post-disaster environment. Issues in the recovery process. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as CRP/DMHS/NR 401.*

DMHS 405 Managing Sustained Operations (3)

Methods and techniques for managing Emergency Management Operations Centers in order to ensure support to local government efforts in rebuilding after a disaster. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as DMHS/NR 405.*

DMHS 432 Disaster Operations Planning (3)

Developing emergency operations plans in support of the local, state and federal emergency management community needs. Major aspects and necessary elements of emergency planning required in a multi-hazard emergency operations plan. 3 lectures. Prerequisite: NR/CRP/DMHS 351. *Crosslisted as DMHS/NR 432.*

DMHS 466 Enhanced Exercise Design in Disaster Management (3)

Increasing the competencies of public and private emergency managers in the design, development, evaluation and follow-up of emergency management exercises. Performance based education and skills training for emergency management personnel. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as CRP/DMHS/NR 466.*

DMHS 470 Selected Advanced Topics (1–4)

Directed study of selected topics for advanced dance students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Consent of instructor.

DMHS 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for dance students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

DSCI–DAIRY SCIENCE

DSCI 100 Enterprise Project (1–4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the project supervisor and the Cal Poly Corporation. Degree credit limited to 12 units. Credit/No Credit grading only.

DSCI 101 Dairy Feeds and Feeding (4)

Introduction to Dairy Cattle/Ruminant Nutrition. Classification and metabolism of nutrients. Nutrient content and identification of feeds common to dairy cattle. Nutrient analysis procedures and requirements. Ration formulation, feeding practices for maximizing growth and milk production. 3 lectures, 1 laboratory.

DSCI 121 Elements of Dairying (4)

General information on statistics and opportunities in the dairy industry. Dairy cattle record keeping systems and their use in dairy herds. Principles of reproduction management, milking and milking machine function. Principles and practices of the feeding and management of dairy cattle. 3 lectures, 1 laboratory.

DSCI 123 Dairy Science Orientation (1) (CR/NC)

Curricula, career paths, and opportunities for involvement in the dairy industry. Campus resources and tips for academic success. Student and professional organizations and affiliations. Meet and interact with each member of the faculty, Dairy Club officers, and industry guests. Credit/No Credit grading only. 1 lecture.

DSCI 134 Introduction to Dairy Products Technology (4)

Science and technology in the development and manufacture of dairy food products. Equipment and dairy processing techniques for fluid milk, butter, cheeses, ice cream, yogurt, concentrated dairy foods and dried dairy foods. 3 lectures, 1 laboratory.

DSCI 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

DSCI 202 Dairy Promotion and Marketing (4)

National and state dairy promotional programs, advertising and merchandising. Marketing and pricing of milk and dairy products at the state and national level. 4 lectures. Recommended prerequisite: DSCI 231.

DSCI 223 Frozen Dairy Foods (4)

Technology, equipment, mix calculations and preparation required to process, freeze, package, harden and distribute ice cream and related products. 3 lectures, 1 laboratory. Prerequisite: DSCI 231 and DSCI 232, or FSN 125, or FSN 230.

DSCI 230 General Dairy Husbandry (4)

Selection, breeding, feeding, and management of dairy cattle. Composition and food value of dairy products. Milk pricing, political influences, dairy industry statistics and opportunities. Producing and handling products. Intended as introductory course for non-dairy science majors. 3 lectures, 1 laboratory.

DSCI 231 General Dairy Manufacturing (3)

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. 3 lectures.

DSCI 232 General Dairy Manufacturing Laboratory (1)

Laboratory to complement DSCI 231 and provide experiences in the processes and equipment involved in the manufacturing of butter, cheeses, and other fermented dairy products, frozen, condensed, and dried dairy foods. 1 laboratory. Concurrent: DSCI 231 for DSCI majors only.

DSCI 233 Milk Processing and Inspection (4)

Composition and properties of fluid milk and its constituents. Equipment used to handle, process, and distribute fluid milk and related products. California dairy codes used for dairy farms and plants, with practice inspections of dairy farms and factories. 3 lectures, 1 laboratory. Prerequisite: DSCI 231 and DSCI 232, or FSN 125, or FSN 230.

DSCI 234 Dairy Foods Evaluation (2)

Basic principles of sensory evaluation of dairy foods, physiology of various senses and their relationship to distinguishing the quality of dairy products by sight, flavor, body and texture. Product defects, causes, and methods of prevention. 1 lecture, 1 laboratory. Prerequisite: DSCI 231, or FSN 125, or FSN 230.

DSCI 241 Dairy Cattle Selection, Breeds, Fitting and Showing (4)

Selection of dairy cattle on type conformation and the correlation between type and production. Dairy cattle breeds and breed comparisons. Techniques to properly condition, groom and present dairy cattle for evaluation and merchandising. 2 lectures, 2 activities. Prerequisite: DSCI 121 or DSCI 230.

DSCI 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

DSCI 301 Dairy Cattle Nutrition (4)

Principles of dairy cattle nutrition and management and their application to economical feeding practices and computerized ration formulation. 3 lectures, 1 activity. Prerequisite: DSCI 101 and DSCI 121 or DSCI 230.

DSCI 321 Lactation Physiology (4)

Mechanisms of milk component secretion, including protein, lactose and fat metabolism. Disorders of the mammary gland (mastitis) and control strategies. Endocrine aspects of mammary gland development and lactogenesis. 4 lectures. Prerequisite: DSCI 101, DSCI 121/DSCI 230, BIO 111.

DSCI 330 Artificial Insemination and Embryo Biotechnology (4)

Techniques in the collection, evaluation and processing of semen, along with embryo culturing and manipulation. Insemination procedures, fertility problems, record keeping, estrous synchronization, endocrine control of reproduction, treating reproductive disorders and embryo transfer. 3 lectures, 1 laboratory. Prerequisite: DSCI 121 or DSCI 230 or ASCI 229 or consent of instructor.

DSCI 333 Dairy Cattle Management, Safety and Animal Well-Being (4)

Modern dairy management techniques, livestock handling and animal comfort. Dairy safety and development of an injury illness prevention program. Animal

well-being issues and the Pasteurized Milk Ordinance. 3 lectures, 1 activity. Prerequisite: DSCI 121 or DSCI 230.

DSCI 339 Internship in Dairy Science (1–12) (CR/NC)

Selected Dairy Science students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit credit may be allowed for each full week of completed and reported internship. Degree credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

DSCI 340 Dairy Waste Management and Resource Recovery (3)

Management of dairy wastes to protect the environment while providing a return on investment. Selection of waste management systems, considering capital and operating costs and benefits from nutrient, biogas, and heat recovery. Best practices that meet current regulatory requirements. 3 lectures. Prerequisite: MCRO 221.

DSCI 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

DSCI 401 Physical and Chemical Properties of Dairy Products (4)

Composition, structure and properties of milk and milk products. Physical and chemical changes that occur during processing and storage of dairy products. Objective measurement of chemical and physical properties. 3 lectures, 1 laboratory. Prerequisite: CHEM 212 or CHEM 312.

DSCI 402 Quality Assurance and Control of Dairy Products (4)

Current methods used to evaluate dairy products with respect to plant economics and consumer safety. Accurate procedures for chemical and biological testing, statistical approach to sampling and design and interpretation of HACCP programs for assuring product quality and safety. 3 lectures, 1 laboratory. Prerequisite: DSCI 444.

DSCI 412 Dairy Farm Consultation (4)

Student consultation teams of three or four students visit dairies and/or attend management training seminars followed by presenting management recommendations to the dairy owners, consultants, and other industry leaders. 1 seminar and supervised work. Prerequisite: DSCI 333.

DSCI 422 Breeding and Genetics of Dairy Cattle (4)

Evaluation of inherited characteristics in dairy cattle from an economic standpoint. Proving and selecting sires and dams. 4 lectures. Prerequisite: DSCI 241.

DSCI 432 Advanced Dairy Herd Management (4)

Dairy herd management skills needed in dairy operations. Instruction and lab experience in management, records, labor, waste management, and milking management. 4 lectures. Prerequisite: DSCI 333.

DSCI 433 Dairy Plant Management and Equipment (4)

Basic management principles applied to the dairy industry. Industrial organization and control. Dairy plant design, facilities, layout. Inventory control and records. Milk pooling and stabilization records. Maintenance and operation of equipment. 3 lectures, 1 laboratory. Prerequisite: DSCI 233 and DSCI 434, or FSN 204 and FSN 474.

DSCI 434 Cheese and Fermented Dairy Foods (4)

Scientific methods, ingredients, and equipment used in the manufacture of various fermented dairy products, including cheeses, buttermilk, sour cream, and yogurt. 3 lectures, 1 laboratory. Prerequisite: DSCI 231 and DSDI 232 and MCRO 221 or MICRO 224, or consent of instructor.

DSCI 435 Concentration/Fractionation and Butter Technology (4)

Technology of evaporation, drying and membrane separation processes applied to dairy fluids. Design and performance of evaporators, driers, and membrane processing systems. Equipment, ingredients, and methods needed to manufacture butter and dairy spreads. 3 lectures, 1 laboratory. Prerequisite: DSCI 233 or FSN 204.

DSCI 444 Dairy Microbiology (4)

Microorganisms involved in the fermentation and ripening processes in the dairy industry, as well as those involved in spoilage of milk and dairy products, in the transmission of disease through these products, and indicator systems used to determine sanitary quality of these products. 3 lectures, 1 laboratory. Prerequisite: DSCI 233, and MCRO 221 or MCRO 224, and STAT 130 or STAT 218, or consent of instructor.

DSCI 461 Senior Project (3)

Selection and completion of a project under faculty supervision. Projects are typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal written report. 2 lectures and supervised work. Prerequisite: Junior standing.

DSCI 463 Undergraduate Seminar (2)

Reports on student papers, bulletins, periodical articles, and dairy research experiments. Sources of dairy husbandry information. Practice in oral reporting. Recent developments and research work in the dairy industry. 2 seminars.

DSCI 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

DSCI 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

DSCI 500 Individual Study in Dairy Science (1–6)

Advanced independent study planned and completed under the direction of a member of the Dairy Science faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

DSCI 522 Bioseparation Processes in Dairy Product Technology (4)

Physical and chemical principles governing bioseparation processes in dairy product technology. Factors influencing mass transport phenomena as it relates to filtration, chromatography, ion exchange, dialysis, centrifugation, adsorption, crystallization and other unit operations. Laboratories to emphasize application of bioseparations of commercial importance. Field trips to be required. 3 lectures, 1 laboratory. Prerequisite: DSCI 401, FSN 444.

DSCI 539 Graduate Internship in Dairy Science (1–9)

Application of theory to the solution of problems of agricultural production or related business in the field of Dairy Science. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

DSCI 560 Recent Developments in Dairy Science and Technology (1-3)

Presentation and critical review of current research publications. Methodological advances and applications in dairy food systems. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Senior or graduate standing and approval of instructor.

DSCI 570 Selected Topics in Dairy Science (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

DSCI 571 Selected Advanced Laboratory in Dairy Science (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

DSCI 581 Graduate Seminar in Dairy Science (1–3) (CR/NC)

Current findings and research problems in the field and their application to industry. Group study of current problems of industry. Current experimental and research findings as applied to production and marketing. Credit/No Credit grading only. 1 or 3 seminars. Prerequisite: Graduate standing or consent of instructor.

DSCI 585 Cooperative Education Experience in Dairy Science (1-6) (CR/NC)

Advanced study, analysis and part-time work experience in the field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

DSCI 599 Thesis in Dairy Science (1–9)

Systematic research of a significant problem in Dairy Science. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.

ECON–ECONOMICS**ECON 200 Special Problems for Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Sophomore standing and consent of department head.

ECON 201 Survey of Economics (4)**GE D2**

Basic principles of microeconomics and macroeconomics. Emphasis on applications to current national and global economic issues. For majors requiring one quarter of economics. Not open to students having previous credit in ECON 222 or equivalent. 4 lectures. *Crosslisted as ECON/HNRS 201*. Fulfills GE D2.

ECON 221 Microeconomics (4)

Microeconomic principles. Marginal and equilibrium analysis of commodity and factor markets in determination of price and output. Normative issues of efficiency and equity. 4 lectures.

ECON 222 Macroeconomics (4)**GE D2**

Introduction to economic problems. Macroeconomic analysis and principles. Aggregate output, employment, prices, and economic policies for changing these variables. International trade and finance. Issues of economic growth and development. Comparative economic systems and economies in transition. 4 lectures. Fulfills GE D2.

ECON 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

ECON 303 Economics of Poverty, Discrimination and Immigration (4)**GE D5 USCP**

Economic analysis of the cause, extent and impact of poverty, discrimination and immigration and of the policies designed to address these socioeconomic issues. Emphasis on the experience of African-Americans, Latinos, and women in the United States. 4 lectures. Prerequisite: Junior standing; completion of GE Areas A, D1, and either ECON 221 and ECON 222, or ECON 201. *Crosslisted as ECON/HNRS 303*. Fulfills GE D5 except for Economics majors. Fulfills USCP.

ECON 304 Comparative Economic Systems (4)**GE D5**

Analysis of economic systems as a set of mechanisms and institutions for decision making, and the implementation of decisions regarding income distribution, the levels of consumption and production, and the level of economic welfare. 4 lectures. Prerequisite: Junior standing; completion of GE Areas A, D3, and either ECON 221 and ECON 222, or ECON 201. Fulfills GE D5 except for Economics majors.

ECON 311 Intermediate Microeconomics I (4)

Consumer behavior and the theory of demand; production, cost, supply functions; perfect competition; monopoly and oligopoly; the economics of information technology. 4 lectures. Prerequisite: MATH 142 or MATH 221, and STAT 252 or STAT 302, and either ECON 221 and ECON 222, or ECON 201.

ECON 312 Intermediate Microeconomics II (4)

Game theory; risk, uncertainty and information; choice over time; asset markets; general equilibrium; welfare economics, externalities and public goods. 4 lectures. Prerequisite: ECON 311.

ECON 313 Intermediate Macroeconomics (4)

Analysis of national income, price level, employment, international trade and economic growth. Development of the theory of national income determination. Evaluation of roles of monetary and fiscal policy. 4 lectures. Prerequisite: ECON 312.

ECON 322 Economic History of the Advanced World (4)**GE D5**

Analysis of the growth of economic institutions from about 600. Includes the spread of economic structures and institutions to colonies. Analyzes the internal development of the industrial economy in Europe and its expansion to other parts of the globe. 4 lectures. Prerequisite: Junior standing; completion of GE Areas A, D3, and either ECON 221 and ECON 222, or ECON 201. Fulfills GE D5 except for Economics majors.

ECON 324 American Economic History (4)

Topical and statistical analysis of the major trends and events of American economic history. Examines the causes and evolution of the United States economy from colonial times to the present. Assessment of agriculture, transportation, industrial and government sectors and their interconnections. 4 lectures. Prerequisite: Completion of GE Areas A, D1, and either ECON 221 and ECON 222, or ECON 201.

ECON 325 Economics of Development and Growth (4)

Analysis of the economy of less developed countries, and a survey of public policies designed to stimulate economic growth and reduce poverty. Topics include financing development, technology, population problems, human capital, rural and urban development, trade policy and the economic relationships between developed and developing nations. 4 lectures. Prerequisite: Completion of GE Areas A, D3, and either ECON 221 and ECON 222, or ECON 201.

ECON 330 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. Not open to students with credit in ECON 404 or equivalent. Prerequisite: Either ECON 221 and ECON 222, or ECON 201.

ECON 337 Money, Banking and Credit (4)

Financial markets and institutions. Structure of the banking industry and impacts of technological change in banking. Structure and operations of the Federal Reserve. Impacts of monetary policy on the economy. 4 lectures. Prerequisite: Either ECON 221 and ECON 222, or ECON 201.

ECON 339 Econometrics (4)

Application of statistical methods useful in economics. General linear regression model. Specific issues and problems related to economic models: multicollinearity, autocorrelation, heteroscedasticity, dummy variables, lagged variables, and simultaneous equation estimation. Application and evaluation of selected examples of empirical economic research. Microcomputer applications. 3 lectures, 1 activity. Prerequisite: MATH 142 or MATH 221, and STAT 252 or STAT 302, and either ECON 221 and ECON 222, or ECON 201, or consent of instructor.

ECON 340 Advanced Econometrics (4)

Advanced topics in undergraduate econometrics. Single equation estimation topics including: distributed lag models, causality, cointegration and error correction models and nonlinear estimation. Forecasting with a single equation model. Simultaneous equation estimation, including instrumental variables, two stage least squares and seemingly unrelated regression. 3 lectures, 1 activity. Prerequisite: ECON 339.

ECON 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of department head.

ECON 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 311 or consent of instructor.

ECON 404 International Trade Theory (4)

Theory of comparative advantage, neoclassical model of trade, offer curves and terms of trade, edgeworth boxes, valuation of factor inputs, effects of migration and mobility of funds, emerging growth and trade distortions, welfare effects of trade, and recent developments in trade theory. 4 lectures. Prerequisite: ECON 311 or consent of instructor.

ECON 405 International Monetary Economics (4)

Nature of international payments, U.S. balance of payments. Theory and practice of foreign exchange rate determination under the gold standard, paper standard, and IMF system; international money and capital markets; problems of international liquidity and monetary stability. 4 lectures. Prerequisite: ECON 311 or consent of instructor.

ECON 406 Applied Forecasting (4)

Causes and measurement of business fluctuations. Techniques of forecasting with microcomputer applications. 3 lectures, 1 activity. Prerequisite: ECON 311 and ECON 339, or consent of instructor.

ECON 408 Mathematical Economics (4)

Applications of quantitative techniques to topics in microeconomic and macroeconomic theory. Use of multivariate calculus and linear algebra in formulating static economic models. Applications of statistical inference, estimation and forecasting in economic models. 4 lectures. Prerequisite: ECON 313, or consent of instructor.

ECON 409 Probability Models for Economic Decisions (4)

Decision making in complex, realistic situations. Simulation of random variables in Excel. Risk aversion. Subjective assessment of probabilities and correlations. Decision trees. Optimal bidding in auctions. The winner's curse. Moral hazard and risk sharing. Repeated investment decisions under risk. 4 lectures. Prerequisite: ECON 311, or consent of instructor.

ECON 410 Public Finance and Cost-Benefit Analysis (4)

Principles of rational decision making with respect to government revenues and spending. Measurement of costs and benefits, and criterion selection. Taxation, user fees, deficit financing, public goods, neighborhood effects and zoning. Microcomputer applications. 4 lectures. Prerequisite: ECON 311, or consent of instructor.

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 311, or consent of instructor.

ECON 417 Development of Economic Analysis (4)

Analysis of ideas related to the development of economic theory in the Western civilization from the Greeks through the classical, neoclassical, and Keynesian to the current post-Keynesian concepts. 4 lectures. Prerequisite: ECON 311, or consent of instructor.

ECON 420 Advanced Macroeconomics (4)

Macroeconomics for advanced students. Inflation, unemployment, interest rates, real output, exchange rates, business cycles and macroeconomic policy. Analysis of current data on the macro-economy within the scope of competing views on the macro-economy. 4 lectures. Prerequisite: ECON 313, or consent of instructor.

ECON 424 Monetary Economics (4)

The role of money in our economy. Focus on the links between monetary policy, interest rates, prices, housing markets, mortgage lending and overall economic activity. Public policy issues relating to real estate markets. 4 lectures. Prerequisite: ECON 311 or consent of instructor. Recommended: ECON 313.

ECON 430 Internship (2-8) (CR/NC)

Placement of student for part-time supervised work experience in a business enterprise or government agency approved by the area chair. Collateral reading correlated with work assignments and periodic written progress reports required. Credit/No Credit grading only. Prerequisite: approval of area chair, junior standing, and a CPSLO cumulative GPA of at least 2.5 without being on academic probation.

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 311, or consent of instructor.

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 311, or consent of instructor.

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 311, or consent of instructor.

ECON 435 Economics of Land and Water (4)

Economic analysis of natural resource issues, policies and management with an emphasis on land and water use decisions in the western U.S. Urban demand for water; water supply and economic growth; economic impacts of surface water

law and institutions; economics of land management. 4 lectures. Prerequisite: ECON 311, or consent of instructor.

ECON 461, 462 Senior Project I, II (2) (2)

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time. Prerequisite: ECON 313 and senior standing.

ECON 464 Applied Senior Project (4)

Analysis of selected economic topics and problems in directed individual or group-based projects, which require application of economic models, principles and theory to investigate important business, economic or social issues. Formal report required. 4 seminars. Prerequisite: ECON 313 and senior standing.

ECON 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ECON 500 Independent Study (1-4)

Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head.

ECON 510 Quantitative Methods (4)

Review and discussion of the basic math tools needed for graduate work in economics, including set theory, linear algebra, properties of functions, static and dynamic optimization. 4 lectures. Prerequisite: ECON 408 or MATH 244 or equivalent, and graduate standing, or consent of instructor.

ECON 511 Microeconomic Analysis (4)

Basic microeconomic theory including theory of the firm, consumer theory, general equilibrium, capital theory, and welfare economics. 4 lectures. Prerequisite: Concurrent with ECON 510 and graduate standing, or consent of instructor.

ECON 512 Macroeconomic Analysis (4)

Basic macroeconomic theory including markets for commodities and credit, the demand for money, market-clearing and the labor market, inflation and interest rates, investment, real business cycles and unemployment, economic growth, government consumption and the role of public services, and taxes, transfers, and the public debt. 4 lectures. Prerequisite: ECON 511 and graduate standing, or consent of instructor.

ECON 520 Advanced Econometrics I (4)

The use of statistical procedures to measure theoretical economic relationships and to verify and reject theories. Advanced coverage of regression analysis and hypothesis testing. 4 lectures. Prerequisite: ECON 339, ECON 511 and graduate standing, or consent of instructor.

ECON 522 Advanced Econometrics II (4)

The use of statistical procedures to deal with simultaneous equations, limited dependent variables and time-series data. Includes methods of instrumental variables, generalized method of moments and maximum likelihood. 4 lectures. Prerequisite: ECON 520 and graduate standing, or consent of instructor.

ECON 532 Environmental and Natural Resource Economics (4)

Economic analysis of pollution, congestion, public good provision, and natural resource conservation. Static and dynamic efficiency, economic growth and sustainability, pollution taxes, marketable permits, and the design of market-based regulations. 4 lectures. Prerequisite: ECON 511 and graduate standing, or consent of instructor.

ECON 534 International Economics (4)

Analysis of the international movement of goods, services, capital and payments. The role of exchange rates, tariffs, quotas, and transport costs. Relationship between international trade and economic growth. 4 lectures. Prerequisite: ECON 511 and graduate standing, or consent of instructor.

ECON 536 Public Economics (4)

Economic analysis of the rationale for public expenditure and taxation. Externalities, pollution and public policy, income redistribution and public welfare, public goods, collective choice and political institutions, public budgeting techniques and cost-benefit analysis, taxation and tax policy, state-local finance and fiscal federalism. 4 lectures. Prerequisite: ECON 511 and graduate standing, or consent of instructor.

ECON 538 Industrial Economics (4)

Economic theories of industrial organization with specific reference to such topics as cartels, market concentration and performance, vertical integration, franchise contracts, ownership and control of firms, multipart and discriminatory pricing, and tie-in sales. Economic aspects of antitrust law and government regulation of industry. 4 lectures. Prerequisite: ECON 511 and graduate standing, or consent of instructor.

ECON 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing or consent of instructor.

ECON 580 Seminar in Economics (1-4)

Advanced topics in economics chosen according to the common interests and needs of the students enrolled. Schedule of Classes will list topic selected. 1-4 seminars. Prerequisite: Graduate standing or consent of instructor.

ECON 599 Thesis (4)

Individual research under the general supervision of the faculty, leading to a graduate thesis of suitable quality. Minimum of 8 units required for degree. Prerequisite: Graduate standing and consent of thesis committee.

EDES—ENVIRONMENTAL DESIGN**EDES 101 Introduction to Architecture and Environmental Design (2) (CR/NC)**

Familiarization with the professional fields of architecture, landscape architecture, structural engineering, construction, and city planning. Introduction to the college's programs as they relate to individual aptitudes. The design process. Visiting speakers. Credit/No Credit grading. 2 lectures.

EDES 333 Professional Presentations (4)

Skills and tools for employment acquisition or graduate school admissions. Individual resume design and production. Documentation of personal, professional and academic experience via written, oral and image based systems. Employment interview dynamics. Electronic and hardcopy portfolio production. Internet marketing. 1 lecture, 3 activities. Prerequisite: Third-year standing or permission of instructor.

EDES 350 The Global Environment (4)**GE Area F**

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Areas A and B. *Crosslisted as AG/BUS/EDES/ENGR/HUM/SCM/UNIV 350.* Fulfills GE Area F.

EDES 406 Sustainable Environments (4)

Collaboration of interdisciplinary faculty and guest speakers/panelists. Introduction, illustration and analysis of concepts and principles for sustainability to be used in all aspects of environmental design. Integration and application of knowledge of human and natural systems with environmental, social and economic concerns, from a global-to-local perspective. 4 lectures. Prerequisite: Fourth year or graduate standing, or consent of instructor.

EDES 408 Implementing Sustainable Principles (4)

A primarily project-based course, intended to aid students who wish to collaborate with the purpose of implementing sustainability principles by developing tools, process or designs, for community-based projects and proposals at various scales of planning, architecture and design of the human environment to address social, environmental and economic issues. 4 lectures. Prerequisite: EDES 406 or consent of instructor.

EDES 410 Advanced Implementation of Sustainable Principles (4)

Advanced continuation of community-based projects defined and initiated in EDES 408. Ongoing projects, individual and group, address variable scales of planning, architecture, and environmental design, with required completion at the end of the course. 2 seminars and supervised work. Prerequisite: EDES 408.

EDES 420 Historic Preservation and Adaptive Reuse in the Built Environment (4)

Historic preservation, restoration, and rehabilitation issues in the built environment. Focus on the process and issues of preserving cultural heritage through preserving environmental artifacts (i.e., structure and landscape). The importance of preserving historical districts, buildings and landscapes as well as

techniques for accomplishing preservation goals within the existing regulatory environments. Total credit limited to 8 units. 2 lectures, 2 seminars. Prerequisite: Any GE Area D course or consent of instructor.

EDES 430 Collaborative Process (3)

A comprehensive set of tools and practices that allow for high performance, interdisciplinary collaborative teams to focus on extraordinary outcomes at each step of project development, including planning, design, bidding, permitting, construction and management phases. 3 activities. Prerequisite: Third-year standing or consent of instructor. *Crosslisted as CM/EDES 430.*

EDUC—EDUCATION**EDUC 125 First Year Seminar (2) (CR/NC)**

Issues associated with the successful transition from high school or community college to Cal Poly. Links fostered between student needs and campus resources. Coverage of academic policies and procedures, university study skills, goal setting, career planning, wellness and other topics relevant to student success. Credit/No Credit grading only. 1 lecture, 1 activity. *Crosslisted as UNIV 125.*

EDUC 207 The Learner's Development, Culture and Identity in Educational Settings (4)

Theoretical background of child and early adolescent development within diverse cultural settings and implications for the teaching-learning process. Observations of children in everyday settings. 3 lectures, 1 activity. Participation in public schools requires mandated fingerprint clearance. Prerequisite: PSY 201 or PSY 202. *Crosslisted as CD/EDUC 207.*

EDUC 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

EDUC 300 Introduction to the Teaching Profession (3) (CR/NC)

Historical, philosophical, and social foundations of public education. Public school curriculum and professional education dispositions. Structured observation and participation in K-12 public schools with attention to instructional practices for diverse learners. Total credit limited to 6 units. Credit/No Credit grading only. 2 lectures, 1 activity. Participation in public schools requires mandated fingerprint clearance. Prerequisite: Junior standing or consent of instructor.

EDUC 304 Orientation to the Teaching of Students with Disabilities (2) (CR/NC)

Introduction to the Education Specialist Credential and role of special education in the public school. Required first course in program. Orientation to program and study of self and others, laws and current conditions of special education. Required field observations and activities. 1 seminar, 1 activity. Credit/No Credit grading only. Prerequisite: Acceptance into Level I Special Education Credential Program, and must have fulfilled early field experience requirement.

EDUC 310 Effective Teaching and Classroom Management with a Multicultural Perspective in K-3 and 4-8 Settings (4)

Knowledge, theory, fieldwork and research related to effectively managing, planning, and teaching in K-3 and 4-8 classrooms; connections between preventing discipline problems and choices about curriculum, instruction, and management; creating a positive learning environment for all students. Participation in public schools requires mandated fingerprint clearance. 2 seminars, 2 activities. Prerequisite: Junior standing, and either LS 230 and LS 250 or EDUC 300 (may be taken concurrently), or consent of instructor.

EDUC 400 Special Problems for Undergraduates (1-4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Junior standing and consent of instructor.

EDUC 410 Social, Historical and Ethical Perspectives on Teaching and Learning (4) (CR/NC)

Inquiry into the social, historical, philosophical and psychological foundations of education with an emphasis on applying theory to practice. Prepares single subject credential students for teaching. Credit/No Credit grading only. 2 lectures, 2 activities. Prerequisite: EDUC 300 or equivalent course. Admission to the Single Subject Credential Program or consent of instructor. Concurrent: EDUC 412 and EDUC 414.

EDUC 412 Access to Learning in a Pluralistic Society (4) (CR/NC)

The role of culture, status, identity, and development in public school experiences for diverse learners. Organization and management of secondary

classrooms as related to adolescent development and access to learning. PACT assessments embedded in course prepare credential candidates for the teaching event. Credit/No Credit grading only. 2 lectures, 2 activities. Prerequisite: EDUC 300 or equivalent course. Admission to the Single Subject Credential Program. Concurrent: EDUC 410 and EDUC 414.

EDUC 414 Curriculum and Inquiry in Public Schools (4) (CR/NC)

Principles, methods and practices of organizing curriculum, instruction, and assessment for secondary subject area content, with an emphasis on backward design in curriculum development and assessment. Site visits to local schools to allow analysis of planning, instruction, and assessment in secondary classrooms. PACT assessments embedded in course prepare credential candidates for the teaching event. Credit/No Credit grading only. 2 lectures, 2 activities. Prerequisite: EDUC 300 or equivalent course. Admission to the Single Subject Credential Program or consent of instructor. Concurrent: EDUC 410 and EDUC 412.

EDUC 416 Literacy, Language, and Culture in Content Area Classrooms (4) (CR/NC)

Theories and application of literacy learning, assessment and second language acquisition in content classrooms. Observing classrooms, tutoring English language learners, and designing and teaching literacy lessons. Planning and implementing assessments for learners across content areas. Developing theories of literacy teaching and learning consistent with content teaching standards. Recognizing the role of culture in language acquisition. Accommodating multiple literacies in teaching and learning. Credit/No Credit grading only. 2 lectures, 2 activities. Prerequisite: Admission to the Single Subject Credential Program or senior standing for Agricultural Education candidates. Concurrent: EDUC 418 and EDUC 469 (except students enrolled in Agricultural Education Credential Program).

EDUC 418 Culturally Responsive Teaching in Diverse Classrooms (4) (CR/NC)

Differentiated instruction and further theoretical knowledge and skills needed for successful teaching of linguistically and culturally diverse learners, as well as students with special learning needs. PACT assessments embedded in course prepare credential candidates for the teaching event. Credit/No Credit grading only. 2 lectures, 2 activities. Prerequisite: EDUC 412, EDUC 414, and content methods course. Concurrent: EDUC 416 and EDUC 469, or AGED 438 for students enrolled in Agricultural Education Credential Program.

EDUC 423 Bilingual Literacy (4)

Patterns of classroom organization, application of reading programs, approaches, methods in English and Spanish, and supervised field experiences in elementary classrooms with bilingual students. 3 seminars, 1 activity. Limited to students seeking BCLAD certification. Prerequisite: Junior standing, Spanish proficiency and/or consent of instructor.

EDUC 427 Theories, Methods, and Assessment for First and Second Language Acquisition in Secondary Schools (3)

Theories, methods, materials and assessment involved in the instruction of limited English proficient (L.E.P.) students. Bilingual, transitional, and English only programs compared across a historical framework. An integrated language arts approach emphasized, including application of reading programs based on theories of language acquisition. 2 seminars, 1 activity. Prerequisite: Admission to single subject teaching credential program or junior standing in agricultural education major.

EDUC 430 Teaching Reading and Language Arts with a Multicultural Perspective (6)

Development of knowledge and skills for planning, teaching, and assessing a balanced, comprehensive, research-based K-8 reading and language arts program. State/national standards and trends. Attention to children of all abilities and backgrounds. PACT assessment task and RICA preparation. 4 seminars, 2 activities. Prerequisite: Admission into the Multiple Subject Credential Program.

EDUC 431 Teaching Social Science and the Arts with a Multicultural Perspective (4)

Development of knowledge and skills related to planning, implementing and evaluating integrated social science units of instruction; effects of culture on the selection and implementation of curriculum; knowledge and integration of physical education, art, and music. 2 seminars, 2 activities. Prerequisite: Admission into the Multiple Subject Credential Program.

EDUC 432 Teaching Science and Mathematics with a Multicultural Perspective (4)

Curriculum and instruction in elementary school science and mathematics. Selecting, organizing, and teaching science and mathematics at the appropriate

level throughout the elementary school curriculum. Emphasis on teaching via inquiry in science and through problem solving in mathematics following state standards. 2 seminars, 2 activities. Prerequisite: Admission to Multiple Subject Credential Program. Can be taken concurrently with Student Teaching I (EDUC 434 or EDUC 454). Prerequisite for Liberal Studies majors: Completion of MATH 227 and MATH 326.

EDUC 433 Foundations of Bilingual Education (4)

History, theories, and practices associated with contemporary bilingual education in California and the U.S. Observation and limited teaching in bilingual classrooms. Approximately one-half of the class taught in Spanish. 3 seminars, 1 activity. Prerequisite: Spanish proficiency demonstrated by passing SPAN 122 or equivalent with a grade of B or better, or consent of instructor.

EDUC 434 Student Teaching – Multiple Subject Credential (10) (CR/NC)

Field assignment involving observation, teaching, research and related activities in public elementary and middle school classrooms. Credit/No Credit grading only. Concurrent: EDUC 455. Prerequisite: EDUC 430 and EDUC 432, and admission to STEP II or STEP B of the Multiple Subject Credential Program.

EDUC 435 Learning to Teach K-8 Mathematics with a Multicultural Perspective (4)

Planning, instruction, assessment and reflection on teaching mathematics through problem solving to culturally diverse groups of students in grades K-8, with emphasis on the historical and cultural development of mathematics, using manipulatives to promote students' understanding and development of mathematical knowledge and reasoning. 3 seminars, 1 activity. Prerequisite: Admission to STEP 1 or A of the Multiple Subject Credential Program. For Liberal Studies majors, MATH 227 and MATH 328 must be successfully completed with a grade of C- or better, or consent of instructor; prerequisite or concurrent: MATH 329.

EDUC 436 Learning to Teach K-8 Science with a Multicultural Perspective (4)

Planning, instruction, assessment and reflection on teaching science via inquiry and problem solving to culturally diverse students in grades K-8, with emphasis on the historical and cultural development of scientific inquiry, and teaching through investigation to promote the development of scientific knowledge and reasoning. 3 seminars, 1 activity. Prerequisite: Completion of Area B (for Liberal Studies majors) and admission to STEP 1 or A of the Multiple Subject Credential Program.

EDUC 440 Educating Individuals with Exceptional Needs (4)

Characteristics, incidence, and etiology of individuals with exceptional needs. Problems, assessment, and approaches toward accommodating students with exceptional needs in the regular classroom. 3 seminars, 1 activity. Prerequisite: Post baccalaureate status or consent of instructor.

EDUC 441 Education Specialist Level II Induction Seminar (2) (CR/NC)

Orientation class to develop a two (minimum) to five (maximum) year plan that will result in a Professional Clear Education Specialist Credential. Plan to contain elements that extend the learning of the Level I credential, foster critical reflection, include involvement of employer (i.e., school district) representatives, and include both university and non-university academic work. Credit/No Credit grading only. 1 seminar, 1 activity. Prerequisite: Admission into Level II Special Education Credential Program.

EDUC 442 Elementary Field Experience in General and Special Education (2-4) (CR/NC)

Public school classroom experiences in both general education classrooms and special education classrooms at the elementary level. Teaching individuals and small groups, emphasis on reading skills. Minimum 20 hours per week. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 304, EDUC 440. Must be taken concurrently with EDUC 451.

EDUC 443 Assessment of Level II Education Specialists (2) (CR/NC)

Use of multifaceted assessment process to verify that candidates have met the Level II Performance standards, including portfolio review, coursework competency review, and oral presentation before an assessor panel composed of trained professional practitioners. Credit/No Credit grading only. 1 seminar, 1 activity. Prerequisite: Admission into the Professional Level II Special Education Credential Program and completion of all Level II coursework and related activities.

EDUC 444 The Atypical Infant (4)

Exploration of issues pertinent to the development of atypical infants. Relationship of theory and research to intervention efforts with handicapped, developmentally delayed infants, and other at-risk infants. 3 seminars, 1 activity. Prerequisite: Junior standing, PSY 256, and EDUC 440 or consent of instructor. *Crosslisted as EDUC/PSY 444.*

EDUC 445 Reading/Language Arts Instruction for Special Educators (4)

Diagnosis and remediation of reading problems. Review of reading programs. General education (K-12) reading instructions. Alternative methods of developing English language reading skills. Field activities required. 3 seminars, 1 activity. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 440, EDUC 446.

EDUC 446 Adapting Instruction for Students with Disabilities in General Education Programs (4)

Adapting instructional methods in science, social science, mathematics, reading and the arts in elementary and secondary general education settings for students with disabilities and English language learners. 3 seminars, 1 activity. Prerequisite: EDUC 440.

EDUC 447 Secondary Field Experience in General and Special Education (2-4) (CR/NC)

Public school classroom experiences in both general education classrooms and special education classrooms at the secondary level. Teaching individuals and small groups, emphasis on behavior management. Minimum 20 hours per week. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 440. Must be taken concurrently with EDUC 451.

EDUC 449 Special Education Student Teaching (8) (CR/NC)

Participation in public schools as a student teacher in activities representing different roles of special education teachers. Assumption of a teacher's responsibility for individual and small groups. Minimum 4 days per week. Credit/No Credit grading only. Prerequisite: Acceptance into Level I Special Education Credential Program, and completion of all program requirements. Must be taken concurrently with EDUC 451.

EDUC 451 Special Education Student Teaching Seminar (4) (CR/NC)

Educational issues and research, development and assessment of teaching portfolio, completion of materials for a job search, and beginning the first year as a special educator. 3 seminars, 1 activity. Must be taken concurrently with EDUC 449. Prerequisite: Acceptance into Level I Special Education Credential Program; completion of program requirements for the Level I Special Education Program.

EDUC 454 Multiple Subject Student Teaching I (7) (CR/NC)

Field assignment involving observation, teaching, professional growth and related activities in public K-8 classrooms. Taken concurrently with EDUC 455. Credit/No Credit grading only. Prerequisite: Senior standing in BS in Liberal Studies and completion of LS 461, acceptance in STEP II or STEP B of the Multiple Subject Credential Program.

EDUC 455 Multiple Subject Student Teaching Seminar I (3)

Educational issues and research; rights and legal responsibilities (teachers and students); reform movements and moral dimensions in education; self evaluation based on teaching performance expectations (TPEs); student assessment and evaluation and development; assessment of MSCP Program Portfolio; and preparing a job search. 3 seminars. Prerequisite: Senior standing in BS in Liberal Studies and completion of LS 461, admission into STEP II or STEP B of the Multiple Subject Credential Program. Taken concurrently with EDUC 434 or EDUC 454.

EDUC 456 Multiple Subject Student Teaching II (12) (CR/NC)

Second field assignment involving observation, teaching, professional growth and related activities in public K-8 classrooms. Credit/No Credit grading only. Taken concurrently with EDUC 457. Prerequisite: Successful completion of EDUC 455 and LS 461.

EDUC 457 Multiple Subject Student Teaching Seminar II (3)

Issues related to teaching, moral responsibilities of educators, setting professional goals, parent conferencing, self-assessment, implementation of formal and standardized assessments, interviews, completion of materials for a job search, and beginning the first year as a teacher. Planning, implementation, and evaluation of units of instruction, teaching performance assessments, and multiple subject program portfolio. 2 seminars, 1 activity. Taken concurrently with EDUC 456. Prerequisite: Successful completion of EDUC 434 or EDUC 454 and EDUC 455.

EDUC 458 Summer Quarter Field Experiences: General and Special Education (4) (CR/NC)

Participation in public schools in activities representing different teaching roles in general and special education. Assumption of a teacher's responsibility for individual and small groups. May include student teaching in special education. Minimum 20 hours per week. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: EDUC 304 and acceptance into Education Specialist Credential program. Must be taken concurrently with EDUC 459.

EDUC 459 Summer Quarter Special Education Seminar (4) (CR/NC)

Provides support and understanding of field experiences and the role of general and special education. Total credit limited to 8 units. 4 seminars. Credit/No Credit grading only. Prerequisite: EDUC 304 and acceptance into Level I Special Education Credential Program. Must be taken concurrently with EDUC 458.

EDUC 469 Part-Time Student Teaching (6) (CR/NC)

Part-time assignment in a classroom (Single Subject only). Includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor. Assignment consists of an entire morning in the classroom (or the equivalent) for one quarter. Credit/No Credit grading only. Prerequisite: Completion of courses and requirements to begin student teaching and approval of campus screening committee for credential candidates. Taken concurrently with EDUC 416, EDUC 418, content seminar (except AGED).

EDUC 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

EDUC 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

EDUC 479 Student Teaching (12) (CR/NC)

Full-time assignment in a classroom (Single Subject only). Includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor. Assignment consists of an entire teaching day in the school for one quarter. Credit/No Credit grading only. Prerequisite: Completion of all courses and requirements prerequisite to full-time student teaching and approval by campus screening committee for credential candidates.

EDUC 480 Computer Based Curriculum (2)

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. 1 seminar, 1 activity. Prerequisite: Junior standing.

EDUC 481 Advanced Educational Technology Methods and Integration (4)

Exploration of advanced educational technology methods and review of constructivist approaches to lesson design. Designing and running technology-based lessons in local K-12 classrooms, and preparing portfolio to meet Level II technology requirements as defined by CCTC. 3 seminars, 1 activity. Prerequisite: EDUC 480 or test equivalent.

EDUC 500 Individual Study (1-4)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limited to 8 units. Prerequisite: Consent of department head, graduate major advisor, and supervising faculty member.

EDUC 501 Applied Practices in Curriculum Development (4)

Overview of major curriculum trends; planning and development of a comprehensive curriculum project geared toward use of technology in teaching. Emphasis on practicality. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 503 Seminar in Language Arts Curriculum and Methods (4)

Language arts curriculum: objectives, methods, content, materials, evaluation, current trends, research and field work activities. 3 seminars. 1 activity. Prerequisite: Graduate standing.

EDUC 504 Seminar in Science and Mathematics Curriculum and Methods (4)

In-depth study of science and mathematics curriculum. Objectives, methods, content, materials, evaluation, current trends, and assessments. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 505 Seminar in Social Studies Curriculum and Methods (4)

In-depth study of the social studies curriculum: objectives, methods, content, materials, evaluation, current trends and field work activities. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 506 Models of Instruction (4)

Analysis of a wide variety of approaches to elementary and secondary teaching that guide instruction in the classroom and in other educational settings. In-depth analysis and implementation of selected teaching strategies. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 507 Instructional Materials and Technology (4)

Examination of technology-supported instruction with special focus on the use of technology to enable constructivist learning experiences for K-12 students. A survey of advanced technologies including electronic media, digital geography, digital story telling, probeware, simulation, and blogging. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 508 Digital Moviemaking for K-12 Educators (4)

Digital moviemaking as the centerpiece of constructivist learning projects in K-12 classrooms. Project-based. Tools and skills for digital moviemaking. Designing constructivist lessons that require K-12 students to make their own movies. 3 seminars, 1 activity. Prerequisite: EDUC 481 or EDUC 507 or consent of instructor.

EDUC 509 Robotics for K-12 Educators (4)

The use of robots as the centerpiece of constructivist learning projects in K-12 classrooms. Project-based. Learning to build and program robots and design constructivist lessons around them. No engineering background required. 3 seminars, 1 activity. Prerequisite: EDUC 480 or EDUC 481 or EDUC 507 or consent of instructor.

EDUC 510 Educational Finance and Resource Allocation (4)

Financing public schools in America: historical and current sources and types of funding. District level and site level funding and budgeting including priorities and purchasing procedures. Financial implications of personnel contracts and obligations. 3 seminars, 1 activity. Prerequisite: Graduate standing and consent of instructor.

EDUC 511 Educational Law and Governance (4)

Legal aspects of school administration including unions, collective bargaining, and contract administration. Governing roles of federal, state, and local agencies including boards and district administrators. 3 seminars, 1 activity. Prerequisite: Graduate standing and consent of instructor.

EDUC 512 Educational Organization and Management (4)

Principles of organization, management, and leadership and their relationship to educational effectiveness and productivity. Activity experience in the application of management theory in schools. 3 seminars, 1 activity. Prerequisite: Graduate standing and consent of instructor.

EDUC 513 Educational Planning and Decision Making (4)

Concepts of planning and decision making in educational administration that utilize a wide range of data gathering and analysis procedures. 3 seminars, 1 activity. Prerequisite: Graduate standing and consent of instructor.

EDUC 514 School Site Administration (4)

Principles and practices of effective building level administration in multicultural/multilingual environment. 4 seminars. Prerequisite: Graduate standing and consent of instructor.

EDUC 515 Educational Program Management and Evaluation (4)

Supervision, management, and evaluation of educational curriculum and educational programs. Current trends in program management including mapping, monitoring, alignment. 3 seminars, 1 activity. Prerequisite: Graduate standing and consent of instructor.

EDUC 516 Educational Personnel Supervision and Evaluation (4)

Principles and processes for the supervision and evaluation of certificated and classified staff including legal, research, and professional considerations. 3 seminars, 1 activity. Prerequisite: Graduate standing and consent of instructor.

EDUC 518 Administrative Services Fieldwork (3) (CR/NC)

Supervised fieldwork in school administration for supervision at the elementary and secondary level. Assignments must encompass three of the four academic quarters and must involve some multicultural experience. Total credit limited to 18 units, only 9 of which may be applied toward master's degree. Credit/No Credit grading only. Prerequisite: Admittance to the Administrative Services Credential program and consent of instructor.

EDUC 525 Literacy and Reading Processes, Programs and Technology (4)

Physiological, psychological and psycholinguistic components of the reading process. Applications of research findings of teaching reading, including innovative programs and the use of reading technology. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 526 Diagnostic Procedures in Literacy and Reading (4)

Formal and informal methods of diagnosing and remediating reading problems in classrooms and reading clinics. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 527 Language and Literacy Models for Second Language Learners (4)

Theory and models of learning in a second language at the high levels needed for school success. Analysis and synthesis of research in bilingualism and second language acquisition for teachers of second language learners. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 activity. Prerequisite: EDUC 423 or EDUC 433 or comparable BCLAD coursework.

EDUC 529 Bilingual Special Education and Reading Instruction (4)

Principles, procedures and materials for teaching reading to bilingual students coupled with diagnostic and prescriptive methods for understanding reading problems of the bilingual and bilingual special education student. 2 seminars, 2 activities. Prerequisite: Graduate standing.

EDUC 530 Secondary, College, and Adult Literacy Practices (4)

Principles, procedures, and materials for improving literacy and reading in the subject matter areas with students of different backgrounds and abilities in grades 7 through college. Field experiences in teaching reading to adults, college, or secondary students. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 532 Advanced Field Experiences in Education (3-12) (CR/NC)

Supervised advanced field experience and practical application of specialty for classroom teachers, reading and special education specialists, administrators and school support personnel. Total credit limited to 18 units for specialist credentials. Total credit limited to 6 units for the master's degree. 30 hours work experience per unit of credit. Credit/No Credit grading only. Prerequisite: Graduate standing, completion of basic teaching or administrative credential, or consent of instructor.

EDUC 542 Administration of Special Programs and Services (4)

Principles and practices of organizing and administering special education, reading, counseling, and other support programs. Assessment and placement procedures, middle management's role, overview of specially funded programs, historical precedents and future trends. 3 seminars, 1 activity. Prerequisite: Graduate standing and consent of instructor.

EDUC 543 Advanced Studies in Assessment, Behavioral Support, Curriculum for Transition in Special Education (4)

Advancement of Level II candidate's knowledge and skills in assessment driven decision making for pupils with disabilities, supporting pupils with serious emotional or behavioral problems, and preparing pupils with disabilities, including English Language Learners, for major life cycle school transitions. Analyzing assessment data to determine how to modify academic instruction, provide behavioral support, social skills training, career and vocational preparation. 3 seminars, 1 activity. Prerequisite: Admission into the Professional Level II Special Education Credential Program, EDUC 441.

EDUC 544 Advanced Collaboration and Consultation for Teachers of Students with Special Needs (5)

Advanced studies and skills in educational consultation. Emphasis on the collaborative and consultative role of the special educator with a wide range of individuals from diverse cultural backgrounds including school personnel, parents, outside agencies, and paraprofessionals. 3 seminars, 2 activities. Prerequisite: Admission into the Level I Special Education Credential Program and master's degree program in education.

EDUC 545 Characteristics and Instruction of Pupils with Mild/Moderate Disabilities (5)

Characteristics of, and instructional strategies for students with mild/moderate disabilities. Organization and management of the special classroom. Evaluation of the instructional system. Individualization of instruction, appropriate methods for English language learners and interaction in the total school environment. 3 seminars, 2 activities. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 440.

EDUC 547 Advanced Curricular and Instructional Adaptations for Students with Special Needs (4)

Advanced studies and skills in adaptation and modification of curriculum and instructional techniques to meet the needs of students with special needs. Educational implications of current learning theories as applied to individuals with special needs. Development and application of a remedial therapy with appropriate individual(s). Development of instruction based on the adopted instructional program for English Language Development. 3 seminars, 1 activity. Prerequisite: Acceptance into Level II Special Education Credential Program and EDUC 441

EDUC 548 Advanced Collaboration, Consultation and Instructional Techniques for Teachers of Pupils with Disabilities (4)

Advanced studies in assessment, adaptation and modification of curriculum, and instructional techniques for teachers of pupils with disabilities. Emphasis on the collaborative, consultative, and management roles of the special educator, focus on interactions with school staff, parents, and outside agencies. 1 activity. Prerequisite: Admission into the Professional Level II Special Education Credential Program, EDUC 441.

EDUC 550 Assessment Strategies for Special Education (5)

Using norm referenced, criterion referenced, and curriculum based testing for assessing academic, behavioral, and physical status of individuals with exceptional needs, including English language learners, for referral purposes. Instructional and evaluation decisions regarding exceptional students in school settings. 3 seminars, 2 activities. Prerequisite: Acceptance into Level I Special Education Credential Program and MA in Education, EDUC 440, EDUC 446.

EDUC 551 Characteristics and Instruction of Pupils with Moderate/Severe Disabilities (4)

Definition and social behavioral characteristics of students with moderate to severe disabilities. Instructional strategies emphasizing law, assessment, educational settings, and the collaborative strategies necessary for facilitating the inclusion of students with moderate/severe disabilities in general education settings. Emphasis on the communication, social skills, movement, mobility, sensory and specialized health care issues of students with moderate to severe disabilities. 3 seminars, 1 activity. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 440.

EDUC 552 Support and Transition Strategies in Special Education (5)

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, 2 activities. Prerequisite: Acceptance into Level I Special Education Credential Program and MA in Education, EDUC 440, EDUC 446.

EDUC 553 Current Issues, Emerging Research and Practices in Special Education (4)

Consideration of assumptions and techniques of educational research regarding the educational, personal, social and vocational difficulties affecting the development of individuals with exceptional needs; emphasizing their applicability to general and specific educational

programs. 4 seminars. Prerequisite: Admission to Level I Special Education Credential Program or masters degree program.

EDUC 554 Behavior Disorders and Positive Behavior Support Strategies (5)

Assessment of students whose behavior impedes either their own learning or the learning of other students. Strategies for facilitating proactive educational, environmental and social-emotional techniques for supporting students with challenging behavior. 3 seminars, 2 activities. Prerequisite: Acceptance into Level I Special Education Credential Program and MA in Education, EDUC 440, EDUC 446.

EDUC 555 Introduction to the Counseling Profession (4)

Overview of the counseling profession, history, philosophy, theory and ethics. Required activity. 3 seminars, 1 activity. Prerequisite: Admission to MA Education program.

EDUC 556 Multicultural Counseling (4)

Initiation of critical analysis of personal beliefs and attitudes regarding counseling in a diverse society. Focus on a variety of approaches to explore the beliefs and attitudes of the student in counseling settings, and examination of strategies considered effective in working with diverse populations. 3 seminars, 1 activity. Prerequisite: Admission to MA Education program.

EDUC 557 Career Counseling (4)

Focus on the study and application of career development theories in career counseling. Utilizing appraisal instruments, community referral resources, occupational information, computerized retrieval systems, and personal and social data and required activities. 3 seminars, 1 activity. Prerequisite: Admission to MA Education program.

EDUC 558 Elementary School Counseling (4)

Focus on the development of skills for the integration of counseling activities into elementary school curriculum – specifically the role of the counselor in the development of a comprehensive guidance program, classroom guidance, counseling, consultation, program design and evaluation, curriculum and administration of special programs. 3 seminars, 1 activity. Prerequisite: PPS credential candidate, or consent of instructor.

EDUC 559 Secondary School Counseling (4)

A basic understanding of the secondary school environment, the role and responsibilities of the counselor within the school environment/community, the components of a secondary school counseling program, the developmental issues of 13-18 year olds, emerging standards for school counselors and the changing nature of student populations. 3 seminars, 1 activity. Prerequisite: PPS credential candidate, or consent of instructor.

EDUC 560 Counseling Theories (4)

Theories and practice of counseling with special emphasis on the counseling process. Emphasis of conditions of counseling, counseling techniques, counseling diverse populations and the counselor as a professional helper. 3 seminars, 1 activity. Prerequisite: EDUC 555 and admission to MA Education program.

EDUC 561 Group Counseling (4)

Theory and practice of group counseling, client selection, group structure, process and termination, and application of theories to specific developmental groups. Communication and facilitation skills emphasized with relevant ethics and law. 3 seminars, 1 activity. Prerequisite: EDUC 555, EDUC 560 or consent of instructor.

EDUC 562 Student Development—Higher Education (4)

Exploration of the roles and competencies of the student development specialist in higher education. Review of relevant developmental theory with emphasis on practical implementation. Explore current issues and trends in higher education, and organizational framework. 4 seminars. Prerequisite: Admission to MA Education program.

EDUC 563 Violence Prevention in Schools (4)

Specific counseling strategies and issues related to violence in the schools. Alienation, violence, parenting, as they relate to the factors associated with school violence. Evaluation of effective intervention programs for K-12 schools. 3 seminars, 1 activity. Prerequisite: Admission to MA Education program.

EDUC 564 Legal and Ethical Issues in Counseling (4)

Consideration of legal, ethical, cultural and related professional issues as they affect the practice of counseling. 3 seminars, 1 activity. Prerequisite: Admission to MA Education Program or PPS Credential Program.

EDUC 565 Counseling Measurement and Assessment (4)

Training and evaluation in the utilization of tests, scales, measures, and other instruments with K-12, and college-age students. An understanding of culturally appropriate tests and measures, collaboration with school personnel, parents, and students in the review and interpretation of test scores and measures. 3 seminars, 1 activity. Prerequisite: Admission to MA Education Program, Counseling and Guidance Specialization, or to PPS Credential Program.

EDUC 566 Leadership and Consultation in Counseling (4)

Development of skills in planning, organizing, coordinating, and delivering programs that generate systemic change through establishing collaboration within schools, communities and other stakeholders. Emphasis on social action and its role in the counseling profession. 3 seminars, 1 activity. Prerequisite: Admission to MA Education Program or PPS Credential Program.

EDUC 568 Individual Counseling Techniques (4)

Theory and practice of individual counseling, process and termination, and application of theories to specific developmental issues working with K-12 students. Communication and facilitation skills emphasized, working with diverse populations and following legal and ethical guidelines. 3 seminars, 1 activity. Prerequisite: Admission to MA Education Program, Counseling and Guidance Specialization, or to PPS Credential Program.

EDUC 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing or consent of instructor.

EDUC 573 Field Experience, Counseling (1-12) (CR/NC)

Practical application of guidance services and counseling in public schools, colleges and community settings. Seminars with university staff included. Total credit limited to 24 units. Credit/No Credit grading only Maximum of 6 units may be applied toward MA Education. Prerequisite: EDUC 555, EDUC 560 and Advancement to Candidacy.

EDUC 581 Graduate Seminar in Education (1-3)

Contemporary problems in education. Trends, developments, and issues. Total credit limited to 9 units. Prerequisite: Graduate standing.

EDUC 586 Introduction to Inquiry in Education (4)

Introduction to professional literature search techniques and to professional organizations as a basis for educational inquiry. Explanation of social construction of knowledge, and the philosophical basis of quantitative and qualitative research. 3 seminars, 1 activity. Prerequisite: Admission to School of Education master's program.

EDUC 587 Educational Foundations and Current Issues (4)

Historical, organizational, legal and philosophical characteristics of American education. Emphasis on the analysis of contemporary issues focusing on these characteristics. 4 seminars. Prerequisite: Graduate standing.

EDUC 588 Education, Culture, and Learning (4)

Cultural characteristics of educational institutions and practice. Review of theory and research relating to the social and organizational context in which learning and teaching takes place. 4 seminars. Prerequisite: Graduate standing.

EDUC 589 Educational Research Methods (4)

Introduction to research methodologies, application of inferential and descriptive statistics, critical analysis of research designs and data collection techniques. 3 seminars, 1 activity. Prerequisite: EDUC 586.

EDUC 590 Research Applications in Education (4)

Application of social science research techniques to problems in education and human services. Capstone experience for the School of Education

master's inquiry course sequence. Completion of an inquiry project required. 2 seminars, 2 activities. Prerequisite: EDUC 589.

EDUC 599 Thesis or Project (3)

Completion of a thesis or project pertinent to the field of education. Student must register for each quarter of advisement. Total credit limited to 6 units. Prerequisite: Consent of graduate committee and supervising faculty member(s).

EE-ELECTRICAL ENGINEERING**EE 111 Introduction to Electrical Engineering (1)**

A general overview of the field of electrical engineering. Preparation for successful completion of the Electrical Engineering (EE) program at Cal Poly. 1 lecture. Concurrent: EE 151. Not required for students with transfer credit for EE 211 or EE 241.

EE 112 Electric Circuit Analysis I (2)

Introduction to basic circuit analysis. Resistive circuits, voltage and current sources, network theorems. 2 lectures. Prerequisite: MATH 142 or equivalent. Recommended: EE 111/151.

EE 129 Digital Design (3)

Number systems, Boolean algebra, Boolean functions, and minimization. Analysis and design of combinational logic circuits. Feedback circuits. Analysis and design of sequential logic circuits. Applying Hardware Description Language (HDL) to synthesize digital logic circuits in Programmable Logic Devices (PLDs). Not open to students with credit in CPE/EE 133. 3 lectures. Prerequisite: An orientation course in student's major (EE 111/151 for EE students, CPE 100 for CPE students), CPE/CSC 101. Concurrent: CPE/EE 169. *Crosslisted as CPE/EE 129.*

EE 133 Digital Design (4)

Number systems, Boolean algebra, Boolean functions, and function minimization. Analysis and design of combinational and sequential logic circuits. Hardware Description Language (HDL) concepts and applications digital design and synthesis in Programmable Logic Devices (PLDs). Not open to students with credit in CPE/EE 129. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 101. *Crosslisted as CPE/EE 133.*

EE 151 Introduction to Electrical Engineering Laboratory (1)

A variety of hands-on experiments and demonstrations in electrical engineering, providing background and motivation for successful completion of the Electrical Engineering (EE) program at Cal Poly. 1 laboratory. Concurrent: EE 111. Not open to students with credit for EE 241.

EE 169 Digital Design Laboratory (1)

Experiments to analyze and design combinational and sequential logic circuits with discrete ICs and PLDs. Introduction to laboratory equipment such as the logic state analyzer for testing circuits. Introduction to a hardware description language for logic simulation and design. Not open to students with credit in CPE/EE 133. 1 laboratory. Prerequisite: An orientation course in student's major (EE 111/151 for EE students, CPE 100 for CPE students), CPE/CSC 101. Concurrent: CPE/EE 129. *Crosslisted as CPE/EE 169.*

EE 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

EE 201 Electric Circuit Theory (3)

Application of fundamental circuit laws and theorems to the analysis of DC, and steady-state single-phase and three-phase circuits. Not for electrical engineering majors. 3 lectures. Prerequisite: MATH 244, PHYS 133.

EE 211 Electric Circuit Analysis II (3)

Continuation of basic circuit analysis. Op-amp circuits. Energy storage elements, RC and RL circuits, and AC steady state analysis. 3 lectures. Prerequisite: EE 112. Prerequisite or Concurrent: PHYS 133, MATH 244. Concurrent: EE 241.

EE 212 Electric Circuit Analysis III (3)

AC power, 3-phase circuits. Mutual inductance, series and parallel resonance and two-port networks. Frequency response, including Bode plots. 3 lectures. Prerequisite: MATH 244, EE 211. Concurrent: EE 242.

EE 228 Continuous-Time Signals and Systems (4)

Continuous-time systems analysis, with emphasis on linear time-invariant (LTI) systems. Classification of continuous-time systems. Convolution and its application to LTI systems. The Laplace transform, Fourier transform, and Fourier series, and their application to the analysis of LTI systems. 4 lectures. Prerequisite: EE 212&242. Recommended: MATH 241.

EE 229 Computer Design and Assembly Language Programming (3)

Design and implementation of digital computer circuits via CAD tools for programmable logic devices (PLDs). Computer design including datapath components and control unit. Assembly language programming. Instruction set architecture, hardware/software interface, performance evaluation of computer processors. Not open to students with credit in CPE/EE 233. 3 lectures. Prerequisite: CPE/EE 129&169 or CPE/EE 133. Concurrent: CPE/EE 269. *Crosslisted as CPE/EE 229.*

EE 233 Computer Design and Assembly Language Programming (4)

Design and implementation of digital computer circuits via CAD tools for programmable logic devices (PLDs). Basic computer design with its datapath components and control unit. Introduction to assembly language programming of an off-the-shelf RISC-based microcontroller. Note open to students with credit in CPE/EE 229. 3 lectures, 1 laboratory. Prerequisite: CPE/EE 129 and CPE/EE 169, or CPE/EE 133. *Crosslisted as CPE/EE 233.*

EE 241 Electric Circuit Analysis Laboratory II (1)

Use of electrical and electronic test equipment. Experimental verification of circuit analysis concepts including Kirchhoff's Laws, Thevenin's Theorem, maximum power transfer and superposition. 1 laboratory. Prerequisite: EE 112, EE 151 for EE students and CPE 169 for CPE students. Prerequisite or concurrent: MATH 244, PHYS 133. Concurrent: EE 211.

EE 242 Electric Circuit Analysis Laboratory III (1)

Observation of transient and steady-state phenomena, phase-shift circuits, resonance. Use of phasor diagrams. 1 laboratory. Prerequisite: MATH 244, EE 241 or consent of department chair. Concurrent: EE 212.

EE 251 Electric Circuits Laboratory (1)

Techniques of measurement of DC and steady-state AC circuit parameters. Equivalent circuits, nonlinear elements, resonance. 1 laboratory. Concurrent: EE 201.

EE 255 Energy Conversion Electromagnetics (3)

Fundamentals of electro-mechanical energy conversion. Magnetic circuits and electromagnetic devices. Theory of operation and operating characteristics of transformers, DC machines, and AC induction and synchronous machines. 3 lectures. Prerequisite: EE 212&242, or EE 201&251. Concurrent: EE 295.

EE 269 Computer Design and Assembly Language Programming Laboratory (1)

Experiments to design and test digital computer circuits and systems with programmable logic devices (PLDs). Design projects to implement a basic computer with data path components and control. Assembly language programming projects for an off-the-shelf RISC-based microcontroller. Not open to students with credit in CPE/EE 233. 1 laboratory. Prerequisite: CPE/EE 129&169 or CPE/EE 133. Concurrent: CPE/EE 229. *Crosslisted as CPE/EE 269.*

EE 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

EE 295 Energy Conversion Electromagnetics Laboratory (1)

Single-phase and three-phase transformers. Starting of rotating machines, evaluation of characteristics of rotating machines. 1 laboratory. Prerequisite: EE 212&242 or EE 201&251. Concurrent: EE 255.

EE 302 Classical Control Systems (3)

Introduction to feedback control systems. System modeling. Transfer functions. Graphical system representation. System time response, stability. Root Locus. Frequency response. Compensation. 3 lectures. Prerequisite: EE 228. Concurrent: EE 342. Recommended: EE 368.

EE 306 Semiconductor Device Electronics (3)

Internal operation, semiconductor physics, terminal characteristics, models and application of diodes (LEDs, solar cells, and photo-diodes) and transistors (field-effect and bipolar). 3 lectures. Prerequisite: CHEM 124, EE 212&242, IME 156 or IME 157 or IME 458, PHYS 211. Concurrent: EE 346.

EE 307 Digital Electronics and Integrated Circuits (3)

Analysis, design, application and interfacing of integrated logic circuits, including NMOS, CMOS, TTL, ECL, and other logic families. 3 lectures. Prerequisite: EE/CPE 129&169 or EE/CPE 133, EE 306&346. Concurrent: EE 347, EE/CPE 229 or EE/CPE 233 (may be taken previously).

EE 308 Analog Electronics and Integrated Circuits (3)

Analysis and design of integrated circuits for use in analog applications. Gain, frequency response, and feedback of linear small-signal amplifiers. 3 lectures. Prerequisite: EE 302&342, EE 307&347. Concurrent: EE 348.

EE 314 Introduction to Communication Systems (3)

Analog modulation, including: double-sideband modulation, amplitude modulation, single-sideband modulation, frequency modulation, phase modulation. Performances of such systems in the presence of white Gaussian noise. Implementations of transmitters and receivers. 3 lectures. Prerequisite: STAT 350.

EE 321 Electronics (3)

Semiconductor devices and circuits. Instrumentation amplifiers, power control rectifiers, feedback, pulse circuits, digital logic circuits. Not for Electrical Engineering majors. 3 lectures. Prerequisite: EE 201 or BRAE 216 for BRAE majors.

EE 328 Discrete Time Signals and Systems (3)

Discrete-time systems and analysis, with emphasis on linear time-invariant (LTI) systems. Sampling theorem. Classification of discrete-time systems. Convolution and its application to LTI systems. The z transform, discrete-time Fourier transform, and discrete Fourier transform. Introduction to digital filters. 3 lectures. Prerequisite: EE 228. Concurrent: EE/CPE 368. *Crosslisted as CPE/EE 328.*

EE 329 Programmable Logic and Microprocessor-Based Systems Design (4)

Design, implementation and testing of programmable logic microprocessor-based systems. Hardware/software tradeoffs (such as timing analysis and power considerations), system economics of programmable logic and microprocessor-based system design. Interfacing hardware components (such as ADCs/DACs, sensors, transducers). 3 lectures, 1 laboratory. Not open to students with credit in CPE/EE 336. Prerequisite: EE 307&347, EE 229&269 or CPE/EE 233. *Crosslisted as CPE/EE 329.*

EE 335 Electromagnetic Fields and Transmission (4)

Maxwell's equations. Plane wave propagation in free space. Static electric and magnetic fields. Distributed-circuit concepts and transmission line parameters. Reflections and standing waves. The Smith chart and its applications. Transmission line measurements and impedance matching techniques. 4 lectures. Prerequisite: MATH 241, EE 212&242. Concurrent: EE 375.

EE 336 Microprocessor System Design (4)

Introduction to microcontrollers and integrated microprocessor systems. Hardware/software trade-offs, system economics, and functional configurations. Interface design, real-time clocks, interrupts, A/D conversion, serial and parallel communications, watch-dog timers, low power operation, event-based inter-peripheral communication, and assembly and higher-level language programming techniques. Architecture and design of sampled data and low-power systems. 3 lectures, 1 laboratory. Not open to students with credit in CPE/EE 329. Prerequisite: CPE/EE 229&269 or CPE/EE 233. *Crosslisted as CPE/EE 336.*

EE 342 Classical Control Systems Laboratory (1)

Laboratory work pertaining to classical control systems, including servo control, transient and frequency responses, stability, and computer-aided analysis of control systems. 1 laboratory. Prerequisite: EE 228. Concurrent: EE 302. Recommended: EE 368.

EE 346 Semiconductor Device Electronics Laboratory (1)

Experimental determination of device characteristics and models. 1 laboratory. Prerequisite: CHEM 124, EE 212&242, IME 156 or IME 157 or IME 458, PHYS 211. Concurrent: EE 306. Recommended: ENGL 134.

EE 347 Digital Electronics and Integrated Circuits Laboratory (1)

Computer simulation and experimental investigation of the characteristics, applications and interfacing of different logic families. 1 laboratory. Prerequisite: EE/CPE 129&169 or EE/CPE 133, EE 306&346. Concurrent: EE 307, EE/CPE 229 or EE/CPE 233 (may be taken previously).

EE 348 Analog Electronics and Integrated Circuits Laboratory (1)

Design, simulation, construction and testing of solid state amplifiers and sub-circuits to meet stated specifications. 1 laboratory. Prerequisite: EE 302&342, EE 307&347. Concurrent: EE 308.

EE 361 Electronics Laboratory (1)

Instrumentation amplifiers, feedback, rectifiers and power control, pulse and digital logic circuits. 1 laboratory. Prerequisite: EE 251 or BRAE 2216 for BRAE majors. Concurrent: EE 321.

EE 368 Signals and Systems Laboratory (1)

Laboratory work pertaining to linear systems, including Fourier analysis, time and frequency responses, and system transfer function. 1 laboratory. Prerequisite: EE 228. Concurrent: EE/CPE 328. *Crosslisted as CPE/EE 368.*

EE 375 Electromagnetic Fields and Transmission Laboratory (1)

Transmission line and passive component measurements at microwave frequencies. Response to pulse excitation using time domain techniques and sinusoidal excitation using frequency domain techniques. Application of the Smith Chart and network analyzers in transmission line characterization and impedance matching techniques. 1 laboratory. Concurrent: EE 335.

EE 400 Special Problems for Advanced Undergraduates (1-5)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 5 units. Prerequisite: Consent of department chair.

EE 402 Electromagnetic Waves (4)

Maxwell's equations and plane wave propagation in materials. Reflection and transmission of normal and oblique incidence plane waves at planar boundaries between different media. Wave guides. Antennas. 4 lectures. Prerequisite: EE 335.

EE 403 Fiber Optic Communication (3)

Propagation of light in optical fibers, attenuation and bandwidth. LED and Laser Diode sources for use with optical fibers. Optical sources, detectors, and receivers. Design of optical communication systems with applications in telecommunications and local area networks (LANs). 3 lectures. Prerequisite: EE 335 or PHYS 323. Concurrent: EE 443.

EE 405 High-frequency Amplifier Design (3)

Design of modern electronic amplifiers and amplifier systems with advanced techniques. UHF and microwave small signal amplifier design utilizing microstrip transmission lines, S parameters of GaAs FET, and bipolar transistors. Low noise, broadband, and power amplifier designs. Oscillator designs. 3 lectures. Prerequisite: EE 308&348, EE 335. Concurrent: EE 445.

EE 406 Power Systems Analysis I (4)

Introduction to electric power systems. Representation of power systems and its components including transmission lines, synchronous machines, transformers and loads. One line diagrams and per unit calculations. symmetrical faults. Load flow analysis. 4 lectures. Prerequisite: EE 335, EE 255&295.

EE 407 Power Systems Analysis II (4)

Symmetrical components, unbalanced faults, power system stability, system protection, relays and relay systems, power system instrumentation and

measurement techniques, economic operation. 4 lectures. Prerequisite: EE 406.

EE 409 Electronic Design (3)

Design of electronic systems and subsystems using analog and digital integrated circuits. Design principles and techniques. Analysis and design of feedback amplifiers; operational amplifier applications. Design of analog/digital and digital/analog converters. Power supply design. Emphasis on IC implementation. 3 lectures. Prerequisite: EE 308&348; CPE/EE 328&368; CPE/EE 329 or CPE/EE 336. Concurrent: EE 449.

EE 410 Power Electronics I (4)

Introduction to power electronics and power semiconductor devices. Analysis, performance characterization, and design of power electronics converters such as: rectifiers, DC choppers, AC voltage controllers, and single-phase inverters. Operation of DC motor drives. Use of commercially available software. 3 lectures, 1 laboratory. Prerequisite: EE 308&348, or EE 321 and consent of instructor.

EE 411 Power Electronics II (4)

Switching losses. Analysis, performance characterization, and design of snubber circuits and resonant converters. Operation of DC transmission lines, flexible AC transmission system (FACTS) controllers, three-phase inverters, and AC motor drives. Use of commercially available software. 3 lectures, 1 laboratory. Prerequisite: EE 410.

EE 412 Advanced Analog Circuits (3)

Application of linear integrated circuits to data acquisition problems: transducer interfacing, linear and nonlinear preprocessing, phase-locked loops, and high performance quantization and recovery (A/D, D/A conversion). 3 lectures. Prerequisite: EE 409&449, EE 314. Concurrent: EE 452.

EE 413 Advanced Electronic Design (4)

Advanced design of electronic circuits and subsystems. Sustainability. Design as a process. Implementation of specific design projects. Teamwork. Automated test using GPIB instruments. 3 lectures, 1 laboratory. Prerequisite: CSC 101, EE 409&449.

EE 415 Communication Systems Design (3)

Design of modern electronic communication and telemetry systems. Emphasis: practical implementation and comparative evaluation of various modulation systems. 3 lectures. Prerequisite: EE 409&449, EE 314.

EE 416 Digital Communication Systems (3)

Baseband (PCM, PAM, DM) signals and transmission. Bandpass (PSK, FSK, ASK) modulation and demodulation techniques. Digital communication signals in the presence of noise and detection of signals in Gaussian noise. Other topics such as: quantization, multiplexing and multiple access, spread spectrum techniques, coding, synchronization. 3 lectures. Prerequisite: EE 314, EE 328.

EE 417 Alternating Current Machines (4)

Alternating current machines. Generalized, operational and dynamic analysis. Steady-state and transient operation of synchronous machines and linear induction machines. 3 lectures, 1 laboratory. Prerequisite: EE 255&295.

EE 418 Photonic Engineering (3)

Modern optical design with emphasis on the use of computers to design simple optical systems and to evaluate existing optical designs. Paraxial and exact ray tracing through thin and thick lenses, mirrors, and prisms. Radiometry and photometry. Electro-optic, acousto-optic, and magneto-optic modulators and their applications. Thermal detectors, semiconductor detectors, and charge coupled device (CCD) arrays. 3 lectures. Prerequisite: EE 335 or PHYS 323. Concurrent: EE 458.

EE 419 Digital Signal Processing (3)

Review of Z-transform, convolution and discrete Fourier Transform. Digital filter design. Fast Fourier Transform. Theory and applications of digital signal processors. 3 lectures. Prerequisite: CSC 101, EE 328&368. Concurrent: EE 459.

EE 420 Sustainable Electric Energy Conversion (4)

Electrical engineering aspects of photovoltaic and wind power generation and usage, and electrochemical energy conversion. Power control, processing, and quality for grid-connected and stand-alone systems. Distribution and storage of electric energy. Hydrogen and synthetic fuels. Distributed generation. 3 lectures, 1 laboratory. Prerequisite: CHEM 124 and EE 255&295 or consent of instructor.

EE 421 Solid-state Microelectronics (3)

Physical basis of solid-state microelectronics. Passive and active integrated circuit components in Bipolar, MOS, thin and thick film systems. Diffusion, oxidation, ion implantation and other fabrication techniques. Microcircuit layout and design: system development, reliability and economic considerations. Future trends. 3 lectures. Prerequisite: EE 307.

EE 422 Polymer Electronics Laboratory (1)

Experimental procedures in polymer electronics. Investigation of the characteristics of a polymer electronic device. 1 laboratory. Prerequisite: EE 347 or MATE 340 or CHEM 319 or PHYS 340. *Crosslisted as EE/PHYS 422.*

EE 424 Introduction to Remote Sensing (4)

Radiation characteristics, sensor technology and platforms, satellite systems, system design tradeoffs, collection and transmission of radio-metric data, GPS, thermal remote sensing, active radar and microwave remote sensing, interpretation and exploitation of remotely sensed data for various applications. 3 lectures, 1 laboratory. Prerequisite: MATH 244, senior or graduate standing in engineering, or consent of instructor.

EE 425 Analog Filter Design (3)

Approximation Theory. All pole filters. Frequency transformations. Elements of passive synthesis. Time delay filters. Theory and design of active filters. Sensitivity analysis. 3 lectures. Prerequisite: EE 409&449. Concurrent: EE 455.

EE 427 Digital Computer Subsystems (4)

Design of components and subsystems in digital computers. Use of modern techniques and devices (CPLDs and FPGAs) in implementation. Consideration given to cost/speed tradeoffs. Implementation of a basic digital computer using pre-designed subsystems. 3 lectures, 1 laboratory. Prerequisite: CPE/EE 329 or CPE/EE 336. *Crosslisted as CPE/EE 427.*

EE 428 Computer Vision (4)

Introduction to the concepts of 2D and 3D computer vision: low-level image processing methods such as filtering and edge detection; feature extraction; segmentation and clustering; stereo vision; appearance-based and model-based algorithms. 3 lectures, 1 laboratory. Prerequisite: EE 328 or CPE/CSC 357 or ME 305 or consent of instructor. *Crosslisted as CPE/EE 428.*

EE 431 Computer-Aided Design of VLSI Devices (4)

Design of VLSI circuits, design of subsystems using static CMOS, transmission gates, and other methods. Variety of CAD tools for design, verification, test, and simulation. Several design projects. 3 lectures, 1 laboratory. Prerequisite: EE 307&347, EE 308&348 or consent of instructor. *Crosslisted as CPE 441/EE 431.*

EE 432 Digital Control Systems (3)

Theory and applications of digital computers in linear control systems. Discrete time methods are used in analysis and design studies. Digital control systems are synthesized. 3 lectures. Prerequisite: EE 302&342. Prior background in discrete time systems, e.g., EE 328, EE 368 recommended. Concurrent: CPE/EE 472. *Crosslisted as CPE/EE 432.*

EE 433 Introduction to Magnetic Design (4)

Design of magnetic components. Fundamentals of magnetics, magnetic cores, design of power transformer, three-phase transformer, dc inductor, ac inductors, dc-dc converter transformer design, actuators. Use of commercially available software. 3 lectures, 1 laboratory. Prerequisite: EE 255&295 or consent of instructor.

EE 438 Digital Computer Systems (3)

Design of computer ALUs, microprogram controllers, memory systems, and I/O controllers. Use of LSI components in CPU design. Microprogram and nanoprogram development. 3 lectures. Prerequisite: EE 427 or consent of instructor. *Crosslisted as CPE/EE 438.*

EE 439 Computer Peripheral Interfacing (4)

Systems-level design and implementation of common computer peripheral devices with emphasis placed on controller and interface aspects. Use of standard and softcore microcontroller platforms with communications to discrete peripherals with I2C, SPI, CAN, and other common bus interfaces. 3 lectures, 1 laboratory. Prerequisite: CPE/EE 329 or CPE/EE 336, or consent of instructor. *Crosslisted as CPE/EE 439.*

EE 440 Wireless Communications (3)

Wireless microwave system design and analysis. RF transmission lines, microwave networks, receiver design, modulation techniques, and mixer characterization and realizations. Noise and distortion, RF oscillators and frequency synthesizers, filter design. Radiating systems and electromagnetic wave propagation, microwave amplifier design. 3 lectures. Prerequisite: EE 335, EE 314. Corequisite: EE 480.

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 335 or PHYS 323. 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 406.

EE 445 High Frequency Amplifier Design Laboratory (1)

Experimental investigation employing advanced techniques. Design of high-frequency electronic amplifiers utilizing S-parameters of bipolar transistors, network analyzers, and computer simulation techniques. 1 laboratory. Prerequisite: EE 308&348, EE 335. Concurrent or prerequisite: EE 405.

EE 449 Electronic Design Laboratory (1)

Design of electronic systems and subsystems using integrated circuits. 1 laboratory. Prerequisite: EE 308&348; CPE/EE 328&368; CPE/EE 329 or CPE/EE 336. Concurrent: EE 409.

EE 452 Advanced Analog Circuits Laboratory (1)

Advanced laboratory study of LC and VCO oscillators, phase detectors, phase-locked loop circuits, transducer interface circuits, noise sources and signal-to-noise determination, ADC and DAC for data conversion. Formal experiments and computer SPICE simulation. 1 laboratory. Prerequisite: EE 314, EE 409&449. Concurrent: EE 412.

EE 455 Analog Filter Design Laboratory (1)

Advanced laboratory study of sensitivity and stability of active networks prescribed for realization of transfer functions by active network synthesis techniques. Formal experiments and individual project work. 1 laboratory. Prerequisite: EE 409&449. Concurrent: EE 425.

EE 456 Communication Systems Laboratory (1)

Methods of analog modulation and demodulation. Emphasis on spectral analysis, bandwidth requirements and other practical considerations of modulation and demodulation. 1 laboratory. Prerequisite: EE 328&368, EE 314.

EE 458 Photonic Engineering Laboratory (1)

Experimental investigation of the techniques used in processing optical signals. Formal experiments on electro-optic modulation, acousto-optic modulation. Construction of an RF spectrum analyzer. Analog processing of optical signals, and charge-coupled array devices. 1 laboratory. Concurrent: EE 418.

EE 459 Digital Signal Processing Laboratory (1)

Experiments in digital filter design and digital signal processing emphasizing various areas of applications (communications, audio signals, speech processing). Formal experiments and individual project work. 1 laboratory. Prerequisite: CSC 101, EE 328&368. Concurrent: EE 419.

EE 460 Senior Project Preparation (2)

Introduction to teamwork and team-oriented project execution. Project planning, scheduling and analysis. Usage of tools for project management including Gantt and Pert Charts. Project development, cost and time

estimation using top-down and bottom-up approaches. Ethics and ethical issues as they pertain to the conduct of engineering. Development of senior project proposal. 2 lectures. Prerequisite: EE 314, EE 335. Concurrent: EE 409&449.

EE 461, 462 Senior Project I, II (3) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: EE 409&449, EE 460.

EE 463, 464 Senior Project Design Laboratory I, II (3) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. EE 463: 3 laboratories; prerequisite: EE 409&449, EE 460. EE 464: 2 laboratories; prerequisite: EE 463. Note: although EE 463, 464 substitute for EE 461, 462, students may not use repeat credit for the purpose of increasing GPA.

EE 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Consent of instructor.

EE 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

EE 472 Digital Control Systems Laboratory (1)

Design and programming of microprocessor-based digital controls for electro-mechanical plants. Topics include digital control laws, translation of transfer functions into algorithms, assembly language programming, real-time software design, sample rate selection, finite word-length considerations. 1 laboratory. Concurrent: EE 432. *Crosslisted as CPE/EE 472.*

EE 480 Wireless Communications Laboratory (1)

Wireless microwave system design and analysis. RF transmission lines, microwave networks, receiver design, modulation techniques, and mixer characterization and realizations. Noise and distortion, RF oscillators and frequency synthesizers, filter design. Radiating systems and electromagnetic wave propagation, microwave amplifier design. 1 laboratory. Prerequisite: EE 335, EE 314. Concurrent: EE 440.

EE 494 Cooperative Education Experience (6-12) (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. Evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

EE 495 Cooperative Education Experience (6-12)

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. Major credit limited to 4 units; total credit limited to 12 units. Prerequisite: Two consecutive quarters of EE 494 immediately preceding EE 495. Sophomore standing and consent of instructor.

EE 500 Individual Study (1–3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department chair, graduate advisor, and supervising faculty member. Total credit limit at discretion of graduate advisor, not to exceed 9 units.

EE 502 Microwave Engineering (4)

Application of Maxwell's equations and boundary value problems to waveguide structures. Striplines and microstrip lines. S-parameters.

Microwave equivalent circuit theorem. Passive microwave devices. Charge and field interactions in oscillators and amplifiers. Transferred electron devices, avalanche transit-time devices, and microwave transistors. Circuits associated with oscillators and reflection type amplifiers. 4 seminars. Prerequisite: EE 402 or equivalent.

EE 511 Electric Machines Theory (4)

Advanced topics in electric machines theory. Introduction to Park's transformation. Analysis of electric machines using Kron's generalized concept. Vector control of induction machines. 4 seminars. Prerequisite: EE 255 or equivalent, and graduate standing or consent of instructor.

EE 513 Control Systems Theory (4)

State representation of dynamic systems. Mathematical models of physical devices, controllability and observability. Design of closed-loop systems. Optimal control theory. 4 seminars. Prerequisite: EE 302 or equivalent, and graduate standing or consent of instructor.

EE 514 Advanced Topics in Automatic Control (4)

Summary course covering five selected graduate-level topics in automatic control theory and practice; implementation issues in digital control, nonlinear control theory and design, LQ and time optimal control, variable structure control, and fuzzy logic/model-free control. 4 seminars. Prerequisite: EE 513 or equivalent, EE 328 or similar course on discrete-time linear systems.

EE 515 Discrete Time Filters (4)

Advanced topics in filter design and implementation. Emphasis placed on current applications and on the processing of real signals. Topics may include signal analysis via spectral estimation, short time Fourier transforms, and spectrograms. Effects of coefficient quantization, and limits of practical filters. State space realization. Optimal and adaptive filters for signal prediction, system identification, and noise cancellation. Techniques implemented in programming assignments. 4 seminars. Prerequisite: EE 314 or equivalent, and graduate standing or consent of instructor.

EE 517 Information Theory (4)

Introduction to information theory and coding. Self and mutual information. Discrete and continuous information sources and transmission channels. Additive white Gaussian noise channel. Channel capacity. The Source- and Channel-Coding Theorems. Data compression. Huffman code. Block codes, including Hamming and linear codes. Parity and syndrome decoding. Convolutional codes. 4 seminars. Prerequisite: EE 314 or equivalent, EE 525, and graduate standing or consent of instructor.

EE 518 Power System Protection (4)

Unsymmetrical faults. Protection fundamentals. Instrument transformers. Power system grounding. Generator protection, transformer protection, busbar protection, line and motor protection. 4 seminars. Prerequisite: EE 406 or equivalent, and graduate standing or consent of instructor.

EE 519 Advanced Analysis of Power Systems (4)

Advanced power system stability analysis, numerical methods in power system analysis. 4 seminars. Prerequisite: EE 406 or equivalent, and graduate standing or consent of instructor.

EE 520 Solar-Photovoltaic Systems Design (4)

Solar radiation and insolation variability. Solar cell theory. Photovoltaic module and array design. Interfacing PV generators with various kinds of loads. Power processing circuits and systems. Energy storage options. Stand-alone and grid-connected systems. Economic and policy issues. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

EE 521 Computer Systems (4)

Organization of modern general purpose, high speed digital computer systems. Design of arithmetic units, control units, memories and memory subsystems. Cost, power and speed trade-offs in the design of such systems. 3 seminars, 1 laboratory. Prerequisite: CPE/EE 329 or CPE/EE 336, or equivalent, and graduate standing or consent of instructor. *Crosslisted as CPE/EE 521.*

EE 522 Advanced Real-Time Embedded Systems Design (4)

Theory, design and implementation of real-time operating system-based embedded systems. Scheduling algorithms, operating system resources, peripheral device interfacing and embedded system architecture. Resource

management issues in a resource-limited (microcontroller-based) environment. 3 seminars, 1 laboratory. Prerequisite: Advanced C programming skills, CPE/EE 329 or CPE/EE 336 or equivalent, or consent of instructor. *Crosslisted as CPE/EE 522.*

EE 523 Digital Systems Design (2)

Full-custom design and analysis of digital circuits using full CMOS, pass-transistor and dynamic circuit topologies. Transistor sizing for minimizing power consumption, delay and other design criteria. 3 seminars, 1 laboratory. Prerequisite: CPE/EE 329 or CPE/EE 336 or equivalent, and graduate standing or consent of instructor. *Crosslisted as CPE/EE 523.*

EE 524 Solid State Electronics (3)

Physical theory of solid-state devices. Properties of metal-semiconductor junctions and p-n junctions. Derivation of properties of diodes, transistors, and four-layer devices from basic physical and mathematical considerations. 3 seminars. Prerequisite: PHYS 412 or equivalent, and graduate standing or consent of instructor.

EE 525 Stochastic Processes for Engineers (4)

Probability and stochastic processes used in random signal analysis. Response of linear systems to random inputs. Auto-correlation and power spectral densities. Applications in signal processing using the discrete Kalman filter. 4 seminars. Prerequisite: STAT 350 or equivalent, and graduate standing or consent of instructor.

EE 526 Digital Communications (4)

M-ary signals. Vector space representation of signals. Optimum receiver principles. Common signal sets. Signal space dimensionality versus time-bandwidth product. 4 seminars. Prerequisite: EE 314 or equivalent, EE 525, and graduate standing or consent of instructor.

EE 527 Advanced Topics in Power Electronics (4)

Selected advanced topics in power electronics such as dc-dc converters, phase-controlled rectifiers, switched-mode inverters, ac and dc drives, HVDC transmission, or utility applications of power electronics. 4 seminars. Prerequisite: EE 410 or equivalent, and graduate standing or consent of instructor.

EE 528 Digital Image Processing (4)

Processing and interpretation of images by computer. Emphasis on current applications with real images used in programming assignments. Topics may include histogram equalization, 2-D convolution, correlation, frequency-domain processing, median filtering, compression, Hough transform, segmentation and region growing, morphological operations, texture description, shape description, Bayes classifier. 4 seminars. Prerequisite: EE 314 or equivalent, EE 525, and graduate standing or consent of instructor.

EE 529 Advanced Topics in Microwave Device Electronics (3)

Emphasis on device and circuit principles of active microwave solid-state devices, their noise aspects and systems applications. 3 seminars. Prerequisite: EE 402 or equivalent, PHYS 412 or equivalent, and graduate standing or consent of instructor.

EE 530 Fourier Optics (4)

Approach to the design and analysis of optical systems using linear communication theory, including Fourier analysis. Analysis of two-dimensional signals and systems, foundations of scalar diffraction theory. Fresnel and Fraunhofer diffraction. Wave-optics analysis of coherent optical systems, frequency analysis of optical imaging systems, holography. 4 seminars. Prerequisite: EE 402 or equivalent, EE 314 or equivalent, and graduate standing or consent of instructor.

EE 533 Antennas (4)

Principles of antenna theory. Antenna parameters, radiation integrals. Duality and reciprocity theorems. Wire antennas. Antenna arrays. Traveling wave antennas. Broadband and frequency independent antennas. Aperture and reflector antennas. Microstrip antennas. Antenna design. 4 seminars. Prerequisite: EE 402 or equivalent.

EE 541 Advanced Microwave Laboratory (2)

Experimental measurement in waveguide and microstrip circuits employing the advanced Network Analyzer. Design of both passive and active microwave circuits using microstrip. Graphical and analytical design

techniques as well as the use of computer-aided design codes. 2 laboratories. Prerequisite: EE 402 or equivalent. Concurrent or prerequisite: EE 502, and graduate standing or consent of instructor.

EE 544 Solid-state Electronics Laboratory (1)

Experimental procedures in solid-state electronics. Investigation and improvement of the characteristics of a solid-state electronic device. 1 laboratory. Prerequisite: Graduate standing or consent of instructor. Concurrent: EE 524, and graduate standing or consent of instructor.

EE 563 Graduate Seminar (1) (CR/NC)

Current developments in the fields of electrical and electronic engineering. Participation by students, faculty and guest lecturers. Credit/No Credit grading only. Total credit limited to 3 units. 1 seminar. Prerequisite: Graduate standing in electrical engineering.

EE 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors with electrical and electronic engineering background. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 seminars. Prerequisite: Graduate standing or consent of instructor.

EE 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

EE 594 Cooperative Education Experience (6-12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Total credit limited to 24 units. Prerequisite: Graduate standing and consent of instructor.

EE 595 Cooperative Education Experience (6-12)

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. A fully-developed formal report and evaluation by work supervisor required. Total credit limited to 12 units. Prerequisite: Graduate standing and consent of instructor.

EE 599 Design Project (Thesis) (1-9)

Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the requirement for the degree. An appropriate experimental or analytical thesis or project may be accepted. Prerequisite: Graduate standing and consent of instructor.

EHS-ENVIRONMENTAL HORTICULTURAL SCIENCE

EHS 123 Landscape Installation and Maintenance (4)

Planting and maintenance of trees, shrubs, ground covers, perennial plantings, color beds, specialty plantings, and small turf areas. Site selection, cultural requirements, scheduling of maintenance activities, pruning, landscape renovation and irrigation system repair. Equipment operation, maintenance, and safety. Speakers from industry. 3 lectures, 1 laboratory. Prerequisite: HCS 120.

EHS 126 Landscape Construction (3)

Design, construction techniques and materials used in landscape and horticulture construction. Material quantity estimating, sustainable building practices, construction material substitutions, tools and equipment associated with landscape and horticulture construction. 2 lectures, 1 laboratory. Prerequisite: HCS 110 and HCS 120.

EHS 127 Horticulture and Landscape Design (4)

Aesthetic aspects of environmental horticulture, introduction to computer aided design, drafting presentation techniques and garden history. Field trip required. 2 lectures, 2 laboratories.

EHS 210 Enterprise Project I (1–4)

Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Corporation. Degree credit limited to two units. Credit/No Credit grading only. Prerequisite: HSC 110 and consent of instructor.

EHS 215 Floral Design I (3)

Fundamentals of theory, techniques and skills currently practiced in the floral industry. Intended as consumer education for non-majors as well as initial preparation for pre-professionals. Includes applied art principles, post-harvest care and handling practices, and proper use of florist tools and materials in developing basic designs. 1 lecture, 2 laboratories. *Formerly EHS 125.*

EHS 225 Floral Design II (3)

Expanded exploration and application of design theory to commercial products and services in the retail floral industry. Appropriate utilization of current sales and business practices in a florist setting. Advanced techniques and skills for construction of designs for weddings, advanced arrangements, and designs for events. 1 lecture, 2 laboratories. Prerequisite: EHS 215.

EHS 230 Environmental Horticulture (4)

Technical information and recommendations for the residential horticulturist. Propagation, pruning, planting, media, fertilizers, pest and weed control, landscaping, maintenance, identification and care of ornamental plants. Being a wise horticultural consumer. Not open to AEPS or EHS majors. 3 lectures, 1 laboratory.

EHS 231, 232 Plant Materials I, II (4) (4)

Identification, habits of growth, cultural requirements, and use of ornamental plants in the landscape. 3 lectures, 1 laboratory.

EHS 245 Horticultural Production Techniques (3)

Applied principles of plant growth in relation to the production horticulture industry. Emphasis on container media, fertilizing practices, irrigation, plant growth regulators, and sustainable practice. 2 activities, 1 laboratory. Prerequisite: HCS 120, HCS 124, SS 121, CHEM 110 or CHEM 111.

EHS 301 Principles of Landscape Design (4)

Introduction to basic principles and elements of residential landscape design, design theory, plant composition, creative problem solving, functional and aesthetic uses of landscape materials, client and maintenance criteria, and sustainable design concepts. Intermediate computer aided design drafting and drawing skills. 2 lectures, 2 laboratories. Prerequisite: EHS 127, and EHS 231 or EHS 232.

EHS 310 Enterprise Project II (2–4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Corporation. Degree credit limited to two units. Maximum degree credit for EHS 210 and EHS 310 limited to four units. Credit/No Credit grading only. Prerequisite: Consent of instructor.

EHS 315 Herbaceous and Specialty Plant Production (4)

An in-depth view of three herbaceous and specialty plant groups (annuals, perennials, cacti/succulents) that are an important part of the wholesale and retail nursery industry. Plant identification, specific techniques of propagation, production, scheduling, growing media and forcing structures for these plants. 3 lectures, 1 laboratory. Prerequisite: EHS 245, HCS 327, SS 221.

EHS 324 Interior Plant Management (4)

Plant materials used in the interior plantscape. Identification, production, utilization, placement. Interior plant specifics and maintenance. 3 lectures, 1 laboratory. Prerequisite: EHS 245 and HCS 120 and HCS 124.

EHS 331 Landscape Contracting (4)

Practices in supervising personnel and applying standard techniques in landscape construction. Cost finding and estimating for landscape trades. 3 lectures, 1 laboratory. Prerequisite: EHS 126 and EHS 301.

EHS 341 Cut Flower Production (4)

Production of cut flowers and other fresh florists' commodities in greenhouses and outdoors. Preparation and scheduling of such commodities for major markets. Field trip required. 3 lectures, 1 laboratory. Prerequisite: HCS 120.

EHS 342 Potted Plant Production (4)

Production of major commercial flowering potted plants in greenhouses and outdoors. Preparation and scheduling of potted flowering greenhouse crops for major markets. Field trip required. 3 lectures, 1 laboratory. Prerequisite: EHS 245.

EHS 343 Turfgrass Management (4)

Turfgrass species and uses. Principles of turfgrass physiology and communities under different environments. Overview of procedures and equipment for propagation, mowing, irrigation, fertilization, aeration, and pest control. 3 lectures, 1 laboratory. Prerequisite: EHS 123 and SS 121.

EHS 381 Native Plants for California Landscapes (4)

Horticultural investigation of the California flora with emphasis on landscape use and potential. Plant recognition, identification, propagation and culture. Utilization of native plants in landscape design and habitat restoration. Field trips required. 3 lectures, 1 laboratory. Prerequisite: BOT 121 and junior standing.

EHS 382 Restoration Horticulture (4)

Role of horticulture in the successful implementation of restoration projects, including mitigation, revegetation, and erosion control. Practical application of restoration methods and guidelines for specific California plant communities including site-specific plant production. 3 lectures, 1 laboratory. Prerequisite: HCS 124, EHS 381, SS 121.

EHS 402 Retailing Horticultural Products (4)

Economics of operating and managing retail horticulture outlets. Location, selection, layout, and demographic studies. Personnel management, merchandising, advertising, pricing strategies and selling techniques, cooperative buying and industry contributions. 3 lectures, 1 laboratory. Field trip required. Prerequisite: HCS 124.

EHS 421 Arboriculture (4)

Theory and practice for the care and management of ornamental trees. Selection, planting, establishment, maintenance of specimen trees. Professional use of ropes and safety equipment. Tree evaluation, scheduling cultural practices, bracing, cabling, specialty hand and power equipment operation, safety regulations. 2 lectures, 2 laboratories. Prerequisite: EHS 123, EHS 231, and EHS 232 or NR 208 for FNR majors.

EHS 424 Nursery Crop Production (4)

Comprehensive and historical overview of the nursery industry. Types of wholesale nurseries and their products. Plant production systems, scheduling, and marketing. Emphasis on medium to large woody plants and deciduous field-grown ornamental trees and shrubs in the western U.S. Field trips required. 3 lectures, 1 laboratory. Prerequisite: HCS 124.

EHS 427 Advanced Landscape Design (4)

Advanced principles of landscape design for residential properties. Design process, form, and space composition emphasized. Application of sustainable design concepts. Computer aided design applications, including three-dimensional design, emphasized. Required field trips. 2 lectures, 2 laboratories. Prerequisite: EHS 231, EHS 232, EHS 301. Recommended: EHS 381. *Formerly EHS 321.*

EHS 430 Sports Field Construction and Management (4)

Construction and maintenance of sports fields. Basic agronomics including sports field construction, sports turf establishment and maintenance, environmental issues, and personnel management. 3 lectures, 1 laboratory. Prerequisite: EHS 343, and junior standing. *Crosslisted as EHS/RPTA 430.*

EHS 433 Golf Course Management Operations (4)

Advanced maintenance and operation of golf course facilities. Systems of management, maintenance, business and finance. 3 lectures, 1 laboratory. Prerequisite: EHS 343.

EHS 434 Landscape Management (4)

Maintenance procedures and operations. Operating a landscape management business. Estimating, scheduling, recordkeeping and implementation of landscape maintenance projects. Interior landscape maintenance. 3 lectures, 1 laboratory. Prerequisite: EHS 123 and EHS 126 and junior standing.

EHS 437 Park and Public Space Management (4)

Management and maintenance of private and public parks, arboreta, botanical gardens and recreational areas. Maintenance personnel management, safety and liability issues. Field trips required. 3 lectures, 1 laboratory. Prerequisite: Junior standing. *Formerly EHS 337.*

EHS 438 Teaching Methods in Environmental Horticulture (4)

Use of horticulture as a context for teaching core academic subjects in science, mathematics, English and history/social science. Daily and unit lesson plans that adopt horticultural content, teaching methods and assessment for English language learners and students with special needs. Class demonstrations, analysis, assessment and reflection. 2 lectures, 2 activities. Prerequisite: Completion of GE B2 and EHS 230 and AGED 102 and junior standing.

EHS 581 Graduate Seminar in Ornamental Horticulture (3)

Group study of current problems of the ornamental horticulture industry; current experimental and research findings as applied to production and management. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing.

EHS 599 Thesis in Environmental Horticultural Science (1-9)

Systematic research of a significant problem in environmental horticulture. Thesis will include problem identification, significance, methods, data analysis and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.

ENGL-ENGLISH**ENGL 102 Basic Writing II (4) (CR/NC)**

Instruction in the writing process. Practice in the strategies of writing, revising, and editing paragraphs and essays with attention paid to focus, support, and organization. Directed readings of exemplary prose. Not for baccalaureate credit. Credit/No Credit grading only. Repeatable. 4 lectures.

ENGL 103 Writing Laboratory (1) (CR/NC)

Directed practice in writing in a laboratory environment. Required of all students scoring below 151 on the English Placement Test (EPT). Students scoring below 146 must take an additional remedial course before registering for ENGL 103. Not for baccalaureate credit. Credit/No Credit grading only. 1 laboratory. Concurrent: ENGL 133 or ENGL 134.

ENGL 104 Writing Lab Tutorial (1) (CR/NC)

Individual tutorials of at least three hours a week in the University Writing Lab. Practice in various essay writing strategies based on a student's needs and at a student's own pace. Preparation for freshman composition. Not for baccalaureate credit. Credit/No Credit grading only. Repeatable. 1 laboratory. Prerequisite: ENGL 102.

ENGL 111 English Sentence Structure for ESL/EFL Students (4) (CR/NC)

Focus on the fundamentals of sentence patterns, sentence construction, and sentence combining within the context of the paragraph and story. Practice in writing a variety of effective sentences; practice in linking sentences in a unified paragraph controlled by a topic sentence. Not for baccalaureate credit. Credit/No Credit grading only. 4 lectures. Prerequisite: Non-native English speakers who need to develop skill in writing English sentences.

ENGL 112 English Paragraph Development for ESL/EFL Students (4) (CR/NC)

Focus on the fundamentals of paragraph development within the context of the essay and story. Writing paragraphs with strong topic sentences that control paragraph unity; linking paragraphs for a unified essay through transitions and the control of the thesis statement. Not for baccalaureate credit. Credit/No Credit grading only. 4 lectures.

ENGL 113 Essay Writing/ESL (4) (CR/NC)

Practice in essay writing with special attention paid to the writing process. Focus on using details and examples for effective development. Review of grammar problems specific to ESL students. Journal writing to enhance fluency. Directed readings of essays and fiction. Not for baccalaureate credit. Credit/No Credit grading only. 4 lectures. Prerequisite: ENGL 111 or ENGL 112, or consent of instructor.

ENGL 115 Graduation Writing Requirement Preparation (4) (CR/NC)

Writing practice of extemporaneous expository and argumentative essays under time pressure. Discussion and application of rhetorical and grammatical principles through critical reading of student and professional essays. Satisfactory completion of the course fulfills the Graduate Writing Requirement. Not for baccalaureate credit. Credit/No Credit grading only. 4 lectures. Prerequisite: At least two unsuccessful attempts at the GWR.

ENGL 133 Writing and Rhetoric for English as a Second Language Students (4) GE A1

Rhetorical principles and tactics applied to written work. Writing as a recursive process that leads to greater organizational coherency, stylistic complexity, and rhetorical awareness with an emphasis on grammatical elements appropriate for English as a Second Language students. 4 lectures. Prerequisite: ENGL 111, 112, and 113, or satisfactory score on the English Placement Test, or consent of instructor. Fulfills GE A1.

ENGL 134 Writing and Rhetoric (4) GE A1

Rhetorical principles and tactics applied to written work. Writing as a recursive process that leads to greater organizational coherency, stylistic complexity, and rhetorical awareness. 4 lectures. Prerequisite: Satisfactory score on the English Placement Test. Fulfills GE A1.

ENGL 145 Reasoning, Argumentation, and Writing (4) GE A3

The principles of reasoning in argumentation. Examination of rhetorical principles and responsible rhetorical behavior. Application of these principles to written and oral communications. Effective use of research methods and sources. 4 lectures. Prerequisite: Completion of GE Area A1 with a C- or better, or consent of instructor. Recommended: Completion of GE Area A2. *Crosslisted as COMS/ENGL/HNRS 145.* Fulfills GE A3.

ENGL 148 Reasoning, Argumentation and Professional Writing (4) GE A3

The principles of reasoning in professional writing. Discussion and application of rhetorical principles, both oral and written, in professional environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Prerequisite: Completion of GE Area A1 with a C- or better, or consent of instructor. Recommended: Completion of GE Area A2. *Crosslisted as ENGL/HNRS 148.* Fulfills GE A3.

ENGL 149 Technical Writing for Engineers (4) GE A3

The principles of technical writing. Discussion and application of rhetorical principles in technical environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Prerequisite: Completion of GE Area A1 with a C- or better, or consent of instructor. Recommended: Completion of GE Area A2. For Engineering students only. *Crosslisted as ENGL/HNRS 149.* Fulfills GE A3.

ENGL 202 Introduction to Literary Studies (4)

Introduction to literary genres, concepts, and terms. Emphasis on explication and interpretation, and on writing about literature. 4 lectures. Prerequisite: Completion of GE A1; for English majors only.

ENGL 203 Core I: 450-1485 (4)

Representative canonical and non-canonical readings in the literature of the period. Selections may include such readings as *Beowulf*, Chaucer, Dante, a mystery or morality play, the Pearl Poet and others, as chosen by the instructor. 4 lectures. Prerequisite: Completion of GE Area A, and ENGL 251; for English majors only.

ENGL 204 Core II: 1485-1660 (4)

Representative canonical and non-canonical readings in the literature of the period. Selections may include such readings as Bradstreet, Donne, Milton, Shakespeare, Spenser, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 203; for English majors only.

ENGL 205 Core III: 1660-1789 (4)

Representative canonical and non-canonical readings in the literature of the period. Selections may include such readings as Defoe, Franklin, Pope,

Swift, Wheatley, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 204; for English majors only.

ENGL 210 New Media Technology (4) (CR/NC)

An introduction to and application of new media software used for the production of online help, professional live technical presentations, and high-level technical document design, production and distribution. Credit/No Credit grading only. 4 lectures.

ENGL 230 Masterworks of British Literature through the Eighteenth Century (4) GE C1

Covers a thousand years of British literature, from the eighth to the eighteenth century and may include such readings as *Beowulf*, *The Canterbury Tales*, *Utopia*, *Othello*, *Paradise Lost*, *Oroonoko* and *Gulliver's Travels*. 4 lectures. Prerequisite: Completion of GE Area A. Fulfills GE C1.

ENGL 231 Masterworks of British Literature from the Late 18th Century to the Present (4) GE C1

Broadly surveys Romantic, Victorian, Modern, and Contemporary British literature in an historical-cultural context. Investigates works from several genres and a variety of national and cultural voices. May include such writers as Wordsworth, Wollstonecraft, Dickens, G. Eliot, Wilde, Woolf, Yeats, and Gordimer. 4 lectures. Prerequisite: Completion of GE Area A. *Crosslisted as ENGL 231/HNRS 232*. Fulfills GE C1.

ENGL 240 The American Tradition in Literature (4) GE C1

A broadly based survey of American literature, exploring the impact of various world cultures on the evolving definition of the American experience. Literary expression of movements that shape the American character over time, such as Puritanism, Transcendentalism, and Naturalism. 4 lectures. Prerequisite: Completion of GE Area A. Fulfills GE C1.

ENGL 251 Great Books I: Introduction to Classical Literature (4) GE C1

Examination of the ancient epics and classical literature of Mesopotamia, Greece, and Rome. May include such readings as *The Epic of Gilgamesh*, the *Iliad*, the *Odyssey*, *Genesis*, *Exodus*, *Antigone*, the *Symposium*, the *Aeneid*, and Marcus Aurelius's *Meditations*. 4 lectures. Prerequisite: Completion of GE Area A. *Crosslisted as ENGL/HNRS 251*. Fulfills GE C1.

ENGL 252 Great Books II: Medieval to Enlightenment Literature (4) GE C1

Examination of key works marking the transition from Mediterranean Classicism (c. 500 CE) to an emergent European tradition (c. 1800 CE). May include such readings as Augustine's *Confessions*, *Song of Roland*, *Egil's Saga*, the *Consolation of Philosophy*, *The Romance of Tristan*, the *Inferno*, Cellini's *Autobiography*, *Utopia*, *Princess of Cleves*, *Candide*, *Discourse on Method*, and Rousseau's *Confessions*. 4 lectures. Prerequisite: Completion of GE Area A. Fulfills GE C1.

ENGL 253 Great Books III: Romanticism to Modernism Literature (4) GE C1

Examination of key works marking the Romantic Revolution and the realist and modernist movements that followed in its wake. May include such readings as the poetry of Blake, Wordsworth, Eliot, Rimbaud, Plath, Ginsberg, and Stein; *Notes from Underground*, *The Death of Ivan Ilych*, *The Metamorphosis* and/or *The Hunger Artist*, *Heart of Darkness*, "Sonny's Blues," and Virginia Woolf's short fiction and essays. 4 lectures. Prerequisite: Completion of GE Area A. Fulfills GE C1.

ENGL 260 Children's Literature (4)

Analysis and evaluation of traditional literature, fantasy, realistic fiction, historical fiction, informational books, picture books, and poetry for children in multiple subject classroom grades K–6. Emphasis on multicultural texts. 4 lectures. Prerequisite: Completion of GE Area A. *Crosslisted as ENGL/LS 260*.

ENGL 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

ENGL 290 Introduction to Linguistics (4)

Introduction to the nature of language; concepts and methods of linguistic science. 4 lectures. Prerequisite: Completion of GE Area A.

ENGL 301 Advanced Composition – ESL (4) GWR

Writing and critical analysis of expository and argumentative papers. Emphasis on rhetorical, stylistic, and grammatical problems specific to non-native speakers. Critical reading of essays and/or fiction. Practice in revision and editing of papers. Journal writing to promote fluency. 4 lectures. Prerequisite: Completion of GE Area A. Fulfills GWR.

ENGL 302 Writing: Advanced Composition (4) GWR

Writing and analysis of expository and argumentative papers at an advanced level. Special attention paid to issues of style and voice. Critical reading of models of effective writing. 4 lectures. Prerequisite: Completion of GE Area A. Fulfills GWR.

ENGL 303 Core IV: 1789–1861 (4)

Representative canonical and non-canonical readings in the literature of the period. May include such authors as Austen, Emerson, Hawthorne, Keats, Wordsworth, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 205; for English majors only.

ENGL 304 Core V: 1861–1914 (4)

Representative canonical and non-canonical readings in the literature of the period. May include such authors as Arnold, Dickinson, James, Tennyson, Whitman, and others, as chosen by the instructor. 4 lecture. Prerequisite or concurrent: ENGL 303; for English majors only.

ENGL 305 Core VI: 1914–Present (4)

Representative canonical and non-canonical readings in the literature of the period. May include such authors as Eliot, Faulkner, Morrison, Woolf, Yeats, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 304; for English majors only.

ENGL 310 Corporate Communication (4) GWR

Instruction and practice in forms of communication characteristic of business and industry. 4 lectures. Prerequisite: Completion of GE Area A. Recommended: Junior standing. Fulfills GWR.

ENGL 317 Technical Editing (4) GWR

Instruction and practice in editing skills commonly used in workplace settings. Includes practical instruction in copyediting, sentence level editing, and substantive editing for accuracy and consistency. Editing documents, illustrations, web pages for consistency and use. Application of grammar and punctuation. 4 lectures. Prerequisite: Completion of GE Area A. Recommended: Junior standing. Fulfills GWR.

ENGL 319 Information Design and Production (4)

Mid-level presentation of the theory and practice involved with the production of technical documents. Focus on history, typography, information design principles, the effective integration of text and graphics, project management, and recent industry trends in software use. 4 lectures. Prerequisite: ENGL 148 or ENGL 149, ENGL 210 or consent of instructor.

ENGL 326 Literary Criticism (4) GWR

Theory and practice of current and traditional literary criticism, including writing and revising critical statements based on current models. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GWR.

ENGL 330 British Literature in the Age of Belief: to 1485 (4) GE C4 GWR

The historical development of medieval English literature through selected canonical and non-canonical works of various genres. Medieval authorship and textual practice, the relationship between gender and writing, and the forging of a national poetic identity. Interdisciplinary support material (artwork and music) illustrating key themes. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 331 British Literature in the Age of the Renaissance: 1485-1660 (4) GE C4 GWR

The literary, historical, political, religious and scientific concerns of the Age of the Renaissance. May include such readings as More's *Utopia*, Spenser's *Faerie Queene*, Shakespeare's *Othello*, Donne's *Songs and Sonnets*, Milton's *Paradise Lost*. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

**ENGL 332 British Literature in the Age of Enlightenment:
1660-1798 (4) GE C4 GWR**

In-depth exploration of the dominant themes and preoccupations of the Age of Enlightenment. Historical and cultural contexts of canonical and non-canonical literature emphasized to illustrate 18th century Britons' views of themselves and their changing world. May include such writers as Dryden, Behn, Defoe, Swift, Pope, and Johnson. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. *Crosslisted as ENGL/HNRS 332.* Fulfills GWR for students with junior standing (90 units).

**ENGL 333 British Literature in the Age of Romanticism:
1798-1832 (4) GE C4 GWR**

In-depth exploration of the literature of the British Romantic period. Cultural, historical, and philosophic contexts will also be examined in both canonical and non-canonical works. May include such writers as Blake, Wordsworth, Keats, and Wollstonecraft. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. *Crosslisted as ENGL/HNRS 333.* Fulfills GWR for students with junior standing (90 units).

**ENGL 334 British Literature in the Age of Industrialism:
1832-1914 (4) GE C4 GWR**

In-depth study of historical, philosophical, and literary reaction to the rise of the modern industrial state. Special focus on the literary response to the following: industry, democracy, class, art, and culture. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

**ENGL 335 British Literature in the Age of Modernism:
1914-Present (4) GE C4 GWR**

In-depth exploration of the dominant concerns and achievements of British literature from Modernism through Postmodernism. Historical and cultural contexts of canonical and non-canonical literature explored to illustrate 20th century Britain's reactions to the breakdown of traditional beliefs, the World Wars, the legacy of colonialism, the changing politics and problems of a multicultural nation. May include such writers as Conrad, Joyce, Woolf, Yeats, Heaney, Ishiguro, Walcott. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 338 Introduction to Shakespeare-London Study (4) GE C4

Shakespeare's works as texts, productions, and major historical, aesthetic and cultural touchstones. The author's intellectual and social influences on four centuries of theatre and his subsequent impact on literature and other arts in London. Attendance at play performances required. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors.

ENGL 339 Introduction to Shakespeare (4) GE C4 GWR

Shakespeare's works as texts, productions and major historical, aesthetic and cultural touchstones. The author's intellectual and social influences on four centuries of theatre and his subsequent impact on literature and other arts. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

**ENGL 340 The Literary Sources of the American Character:
1600-1865 (4) GE C4 GWR**

The literature of the United States from its sources in the accounts of the early British and Spanish explorers to the works of the American Renaissance. The relationship between mainstream and marginalized voices in the American character. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

**ENGL 341 The Literary Sources of the American Character:
1865-1914 (4) GE C4 GWR**

Analysis of literary Realism and Naturalism in their cultural and historical contexts. May include such writers as Whitman, Dickinson, Twain, Chopin, James, Wharton, Dreiser, Norris, and Crane who are seen to accommodate the sense of danger, doubt, and disorder of the time. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

**ENGL 342 The Literary Sources of the American Character:
1914-1956 (4) GE C4 GWR**

The writers of the modern period and those of the early post-modern age, including writers marked by stylistic innovation and a willingness to challenge traditionally accepted standards. May include such writers as Hemingway, Fitzgerald, Stein, Hughes. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 343 Multiple Voices of Contemporary American Literature: 1956-Present (4) GE C4 GWR

In-depth study of American fiction, poetry, and drama written since 1956. How contemporary literature examines enduring American themes and breaks new ground with the inclusion of diverse voices. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

**ENGL 345 Women Writers of the Twentieth Century (4)
GE C4 USCP GWR**

In-depth exploration of works of 20th century women authors within their historical and cultural contexts. Analysis of canonical and non-canonical writing by women of differing classes, races, ethnicities, and sexual preferences. Literary techniques through which texts reflect or challenge such cultural constructs as gender, identity, sexuality, motherhood, etc. The emergence of a female literary tradition. May include such writers as Woolf, Rich, Kingston, Yamamoto, Morrison, Cervantes. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

ENGL 346 Ethnic American Literature (4) GE C4 USCP GWR

Investigation of the primary issues, themes, and tropes of literature written in English by African-American, Asian-American, Native American, Hispanic and Jewish writers. Cultural and historical contexts explored to consider effects of marginalization on this literature, and its subsequent relation to the American canon. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

ENGL 347 African American Literature (4) GE C4 USCP GWR

The writings of African Americans from the end of the eighteenth century to the present. Individual works and literary trends among African Americans of various periods and contexts: intellectual, political, and cultural. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

**ENGL 349 Gender in Twentieth Century
Literature (4) GE C4 USCP GWR**

In-depth study of issues related to male and female identity and the relations between men and women as depicted in twentieth-century fiction, poetry, non-fiction, and/or drama. How gender issues are created and viewed from different perspectives, such as social/economic class, ethnicity, and sexual orientation. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

ENGL 350 The Modern Novel (4) GE C4 GWR

Readings in the modern novel in its historical and cultural context. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 351 Modern Poetry (4) GE C4 GWR

Modern poetry, considered in its historical and cultural context. The rise of experimental styles designed to reflect the disorder of the twentieth century – fragmentation, alienation, dislocation, and the absence of connections. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 352 Modern Drama (4) GE C4 GWR

Reading and analysis of world drama of the last 150 years, thereby enhancing student awareness of modern culture, history, ethics, politics, and the human condition. Design work, multi-media forms, art, music, and cinema as components or informing elements of the works under consideration. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior

standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 353 Drama in London (4) GE C4

Reading in drama of the Twentieth Century and/or earlier periods, exclusive of Shakespeare, with special emphasis on form and ideas. Attendance at play performances required. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors.

ENGL 354 The Bible as Literature and in Literature and the Arts (4) GE C4 GWR

The most important and representative books of the Bible. Exposure to works based on the Bible in literature, painting, sculpture, architecture, music, and film. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 360 Literature for Adolescents (4)

Analysis and evaluation of young adult literature appropriate for classroom instruction in grades 6–12 with special attention to the relationship of young adult literature to popular culture and themes relevant to adolescents. Pedagogical approaches also explored. Twenty hours of fieldwork in secondary schools required. 3 lectures, 1 activity. Prerequisite: ENGL 230, 231, 240, 251, 252, or 253. Recommended: Junior standing.

ENGL 365 Complexities of Literacy in Literature and Non-fiction Text (4)

Cognitive elements of reading and writing processes – decoding and encoding, construction of meaning, recognizing and using text conventions of different genres. Metacognitive strategies for making sense of text. Twenty hours of fieldwork in secondary schools required. 3 lectures, 1 activity. Prerequisite: Completion of GE Area A and junior standing.

ENGL 368 Theory and Practice of Peer-to-Peer Writing Instruction (4)

Discussion and application of theories and practices central to writing center work, such as collaborative learning, the writing process, social dimensions of the peer/tutor relationship, and strategies for working with specific student populations including second-language writers and writers from across the disciplines. Required for those interested in becoming tutors in the University Writing and Rhetoric Center and/or new teaching assistants in English. 3 lectures, 1 activity. Prerequisite: Junior standing; completion of GE C1 with a grade of 'B' or better, or consent of instructor.

ENGL 370 World Cinema (4) GE C4 GWR

Major works of international cinema with emphasis on critical interpretation, on the ways film communicates visually and aurally, and on the historical and cultural contexts in which films are created. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 371 Film Styles and Genres (4) GE C4 GWR

Major films within particular cinematic genres or styles, with emphasis on critical interpretation, aesthetic appreciation, and the films' historical and cultural contexts. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 372 Film Directors (4) GE C4 GWR

Films of one or more major film directors, with emphasis on critical interpretation, aesthetic appreciation, and the films' historical and cultural contexts. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 380 Literary Themes (4) GE C4 GWR

Literature selected according to a particular theme. Emphasis on critical interpretation, aesthetic appreciation, and historical and cultural contexts. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units). *Crosslisted as ENGL/HNRS 380.*

ENGL 381 Diversity in Twentieth-Century American Literature (4) GE C4 USCP GWR

Literature selected according to a particular theme, with a focus on issues of ethnicity and gender. Emphasis on critical interpretation, aesthetic appreciation, and historical and cultural contexts. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

ENGL 382 LGBT Literature and Media (4) GE C4 USCP GWR

Representations of lesbian, gay, bisexual, transgendered (LGBT) individuals and issues, late 19th century to the present. Topics include the closet, homophobia, coming out, AIDS, same-sex marriage, intersections of sexuality, race, class, gender identity. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

ENGL 386 Creative Nonfiction (4) GE C4

Writing creative nonfiction (the memoir, the nature essay, the personal narrative, cultural criticism, literary journalism) by adding composition skills of fictional and poetic techniques. A publication workshop. Total credit limited to 8 units. 4 lectures. Prerequisite: : Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors.

ENGL 387 Fiction Writing (4) GE C4

How to write and read fiction. Exploring and understanding the elements of fiction writing, employing models by established writers. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors.

ENGL 388 Poetry Writing (4) GE C4

How to write and read poetry. Exploring a variety of formal options, employing model poems by established writers and identifying and enhancing what is best in poetry written in class. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors.

ENGL 389 Creative Writing: Drama (4)

Instruction and practice in writing, revising, and evaluating drama. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing.

ENGL 390 The Linguistic Structure of Modern English (4)

Linguistic analysis of the English language, including phonology, morphology, syntax, and style and dialect variation. 4 lectures. Prerequisite: Completion of GE Area A.

ENGL 391 Topics in Applied Linguistics (4)

Topics in applied linguistics including sociolinguistics, first and second language acquisition, literacy, bilingualism, and dialectology. Applications to teaching the English language. 4 lectures. Prerequisite: Completion of GE Area A.

ENGL 392 English Grammar for Writers and Teachers (4)

Linguistics-based study of standard English word categories, sentence parts and types, punctuation, and the role of sentence structure in text style and coherence; consideration of grammar standards in social context. Preparation for professional writing, editing, and teaching standard grammar. 4 lectures. Prerequisite: Completion of GE Area A.

ENGL 395 History of the English Language (4)

Linguistic approach to the history of the English language: evolution of phonology, morphology, lexicon, syntax, and semantics within the changing cultural context of the last 2000 years. 4 lectures. Prerequisite: Completion of GE Area A.

ENGL 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units. Prerequisite: consent of the department chair.

ENGL 408 Internship (2–12) CR/NC

Advanced study and part-time work experience; current innovation, practices, and problems in administration, supervision, and organization. Must be able to do independent work in career field. Weekly reports and evaluation by work supervisor required. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Consent of instructor.

ENGL 411 New Media Arts I (4)

Advanced-level presentation of new media theory, design and practice. Topics covered include, but are not limited to, interactivity theory, user-centered system design, cognitive psychology, media analysis, and basic web design theory. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Area A. Junior standing. *Crosslisted as ENGL/HNRS 411.*

ENGL 412 New Media Arts II (4)

Advanced level of work with the primary technologies and design/critique theories currently at use in the professional creation of new media works. Lectures and readings expand upon material presented in ENGL 411. 4 lectures. Prerequisite: ENGL 411 or consent of instructor. *Crosslisted as ENGL/HNRS 412.*

ENGL 416 New Media Study (4)

Theoretical, critical, or applied study of new electronic communication media. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Completion of GE Area A. Junior standing.

ENGL 418 Technical Communication Practicum (2–4) (CR/NC)

Supervised work experience in government, corporate, or volunteer setting, as approved by department chair. Placement may be student or employer initiated or through Cooperative Education. Proposal, progress reports, and final report. Total credit limited to 8 units, with a maximum of 4 units per quarter. Credit/No Credit grading only. Prerequisite: Senior standing and at least two of the following: ENGL 148 or ENGL 149, ENGL 210, ENGL 310, ENGL 317, ENGL 408, ENGL 411, ENGL 412

ENGL 419 Advanced New Media Projects (2) (CR/NC)

Supervised independent projects creating new media works for academic, professional, or popular audiences. Students are paired with teachers, business people, service organizations, or others who need new media projects designed for specific uses. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Junior standing and consent of instructor.

ENGL 420 Client-Based Technical Communication (4)

Capstone course for the technical communication program. Students work for one or more commercial client(s) to produce a set of professional print and/or electronic documents. 4 lectures. Prerequisite: Junior standing and ENGL 317 or ENGL 319 or consent of instructor.

ENGL 424 Teaching English in Secondary Schools (5)

Research-based methods of teaching English in secondary schools, with emphasis on practical approaches to teaching grammar/mechanics and the writing process in a literature-based classroom. Attention to lesson and unit planning and integration of state standards and technology. 5 lectures. Prerequisite: Completion of GE Area A, senior or graduate standing and admission to the teacher education program, or consent of instructor.

ENGL 430 Chaucer (4)

Selected readings from *Canterbury Tales* and Chaucer's other major poems. 4 seminars. Prerequisite: Junior or graduate standing. Two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. ENGL 203 is strongly recommended.

ENGL 431 Shakespeare (4)

Representative comedies, tragedies, and histories. 4 seminars. Prerequisite: Junior or graduate standing. Two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. ENGL 204 is strongly recommended.

ENGL 432 Milton (4)

Paradise Lost, *Paradise Regained*, and *Samson Agonistes*, with some attention to the minor poems. 4 seminars. Prerequisite: Junior or graduate standing. Two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. ENGL 204 is strongly recommended.

ENGL 439 Significant British Writers (4)

Selected British writers, as individual writers or in groups. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Junior or graduate standing. Two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. English Major CORE class in the relevant period strongly recommended.

ENGL 449 Significant American Writers (4)

Selected American writers, as individual writers or in groups. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Junior or graduate standing. Two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. English Major CORE class in the relevant period strongly recommended.

ENGL 459 Significant World Writers (4)

Selected world writers as individual writers or in groups. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Junior or graduate standing. Two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. English Major CORE class in the relevant period strongly recommended.

ENGL 461 Senior Project (1)

One-unit adjunct course which must be taken concurrently with a department-approved English 400-level course during the last two quarters of the student's undergraduate career. English majors only.

ENGL 468 The Rhetoric of the Image (4)

The complicated and dependent relationship between still and moving images and written texts. How images and print communicate rhetorically with people as readers, viewers, and consumers. 4 lectures. Prerequisite: Completion of GE Areas A and C4. Junior standing.

ENGL 469 Women's Rhetoric(s): Definitions, Contexts, Issues (4)

Theoretical questions about what constitutes women's rhetoric(s), and how women have used and accommodated traditional methods of persuasion to argue for and enact a changed world. 4 lectures. Prerequisite: Completion of GE Areas A and C4. Junior standing.

ENGL 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 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. Major credit limited to 6 units; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ENGL 486 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 8 units; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ENGL 487 Advanced Creative Writing: Fiction (4)

Instruction and practice in advanced writing, revising and evaluating of fiction. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 387.

ENGL 488 Advanced Creative Writing: Poetry (4)

Instruction and practice in advanced writing, revising and evaluating of poetry. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 388.

ENGL 489 Advanced Creative Writing: Drama (4)

Instruction and practice in advanced writing, revising and evaluating of drama. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 389.

ENGL 495 Topics in Applied Language Study (4)

Application of linguistics to human communications, human relations, and language policy and planning, or literature. The Schedule of Classes will

list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: ENGL 290 or ENGL 390.

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: Two of the following: ENGL 290, ENGL 390, ENGL 391, ENGL 395, ENGL 495.

ENGL 498 Approaches to Teaching English as a Second Language/Dialect (4)

Approaches to teaching English as a second language. Attention to materials development and testing. 4 lectures. Prerequisite: ENGL 497.

ENGL 499 Practicum in Teaching English as a Second Language/Dialect (2) (CR/NC)

Practical experience in the English as a second language classroom under supervision of a cooperating teacher. Teaching materials development and curriculum design. Credit/No Credit grading only. 1 seminar and supervised work. Prerequisite: ENGL 498 or consent of instructor.

ENGL 501 Techniques of Literary Research (4)

Purposes and methods of literary research in literature. Acquaintance with printed and on-line materials of research and practical experience in collecting material, weighing evidence, reaching conclusions, and writing scholarly articles. Analysis of dissemination of scholarly information. Discussion of ethics of scholarship. 4 seminars. Prerequisite: Graduate standing in English.

ENGL 502 Seminar in Critical Analysis (4)

Basic approaches used by critics. Multiple points of view. Application to literary works. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing in English.

ENGL 503 Graduate Introduction to Linguistics (4)

Introduction to linguistics for graduate students. Phonology, morphology, lexicon, syntax, and variation within language; application of linguistics to real-world issues. 4 seminars. Prerequisite: Graduate standing in English.

ENGL 504 Seminar in English Linguistics (4)

Examination of varying theoretical approaches to the structure of English, or applications of linguistic methods in the study of literature, dialectology, language acquisition, literacy, bilingualism, or discourse analysis. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in English and one of the following: ENGL 290, ENGL 390, or ENGL 503, or consent of instructor.

ENGL 505 Seminar in Composition Theory (4)

Special problems in composition. Direct application of composition and rhetorical theory to composition instruction. 4 seminars. Prerequisite: Graduate standing in English.

ENGL 506 Pedagogical Approaches to Composition (4)

Practical problems in the teaching of English composition. Application and study of practical approaches. Discussion of classroom organization and management. Discussion of research into the nature and resolution of student writing problems. Required of all new teaching assistants in English. 4 seminars. Prerequisite: Graduate standing in English and ENGL 505, or consent of instructor. Concurrent: Teaching of ENGL 134.

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. The Schedule of Classes will list topic selected. Total credit limited to 16 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

ENGL 511 Seminar in American Literary Periods (4)

American periods. Written and oral reports of individual investigation. The Schedule of Classes will list topic selected. Total credit limited to 20 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

ENGL 512 Seminar in British Literary Periods (4)

British periods. Written and oral reports of individual investigation. The Schedule of Classes will list topic selected. Total credit limited to 20 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

ENGL 513 Seminar in Special Topics (4)

Themes and ideas in language and literature not ordinarily covered in the routine graduate course offerings. Written and oral reports of individual investigation. The Schedule of Classes will list topic selected. Total credit limited to 16 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

ENGL 515 Apprenticeship in Teaching Literature, Composition, or Linguistics at College Level (2) (CR/NC)

Supervised experience in planning, teaching, and evaluating a 100-, 200- or 300-level linguistics, composition, or literature class taught by English faculty member. Planning, selecting texts, conferring with students, discussing and constructing assignments, lecturing, leading small group discussions. Credit/No Credit grading only. Total credit limited to 8 units. Prerequisite: Graduate standing in English and completion of 8 units of ENGL 500 level graduate work.

ENGL 570 Selected Advanced Topics (4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

ENGL 587 Graduate Seminar in Creative Writing: Fiction (4)

Graduate instruction in writing, revising, and evaluating fiction. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing in English and ENGL 487, or consent of instructor.

ENGL 588 Graduate Seminar in Creative Writing: Poetry (4)

Graduate instruction in writing, revising, and evaluating poetry. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing in English and ENGL 488, or consent of instructor.

ENGL 590 Directed Study (1-4)

Supervised independent or group study of special problems in selected areas of language, composition, or literature. Total credit limited to 12 units. Prerequisite: Graduate standing in English and the permission of the graduate advisor.

ENGR—ENGINEERING

ENGR 110 Engineering Science I (3)

Introduction to engineering and computer science. Graphical communication and visualization as well as engineering orientation. Cultural pluralism and gender issues. 3 lectures.

ENGR 111 Engineering Science II (3)

Introduction to engineering and computer science. Computer-aided design (CAD) and manufacturing (CAM), and fabrication, as well as engineering orientation. Cultural pluralism and gender issues. 3 lectures.

ENGR 112 Engineering Science III (3)

Introduction to engineering and computer science. Computer science and engineering orientation. Cultural pluralism and gender issues. 3 lectures.

ENGR 141 Engineering Orientation—Freshman Seminar (2) (CR/NC)

College success skills for the technical student, including group study, time management, technical project, identification of campus resources. Academic, career and personal assessment as it relates to the educational process. Specifically for students enrolled through Student Academic Services and the MESA Engineering Program. Credit/No Credit grading only. 1 lecture, 1 activity.

ENGR 142 Engineering Careers (2) (CR/NC)

Career investigation, resume writing, job search and interview skills, speakers from industry and time management. Specifically for students enrolled through Student Academic Services and the MESA Engineering Program. Credit/No Credit grading only. 1 lecture, 1 activity.

ENGR 210 Technical Group Study Training (2) (CR/NC)

Approaches to facilitated small group study. Practice facilitating under supervision in the MEP Technical Study Center. Review academic and interactive group communication skills. Minimum two hour facilitated group lab. CRLA International Tutor Program Certification. Total credit limited to 6 units. Credit/No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: Grade of B or better at Cal Poly in course student will be facilitating.

ENGR 213 Bioengineering Fundamentals (2)**GE B2**

Treatment of the engineering applications of biology. Genetic engineering and the industrial application of microbiology. Systems physiology with engineering applications. Structure and function relationships in biological systems. The impact of life on its environment. 2 lectures. For engineering students only. Prerequisite: MATH 142. Corequisite: BIO 213. Recommended: CHEM 124. *Crosslisted as BRAE/ENGR 213.* Fulfills GE B2.

ENGR 240 Additional Engineering Laboratory (2)

Special assignments undertaken by students who need or wish to acquire abilities supplementary to their standard pattern of courses. Assignments must be primarily shop or laboratory in nature. Work is done by the student with faculty supervision. Total credit limited to 4 units. 2 laboratories. Prerequisite: Consent of department head.

ENGR 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

ENGR 302 Transportation and Manufacturing in the Twenty-First Century (4)**GE Area F**

Role of transportation and manufacturing technology in the twenty-first century. Effects of technological change upon society, and the principles associated with the advancement of transportation and manufacturing technologies in the automotive industry and the industrial-military complex. Case studies of systems to compare alternative approaches to problem solving. 4 lectures. Prerequisite: Junior standing and completion of GE Area B, or consent of instructor. Fulfills GE Area F.

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 322 The Learn By Doing Lab Teaching Practicum (2) (CR/NC)

Early teaching experience in an informal science/technology/engineering/mathematics (STEM) teaching and learning environment. Principles of inquiry-driven STEM education, lesson design, implementation and assessment. Intended for undergraduates exploring STEM teaching as a career. Total credit limited to 4 units. Credit/No Credit grading only. 1 seminar, 1 laboratory. Prerequisite: Completion of GE Area B and consent of instructor. *Crosslisted as ENGR 322/SCM 302.*

ENGR 350 The Global Environment (4)**GE Area F**

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Areas A and B. *Crosslisted as AG/BUS/EDES/ENGR/HUM/SCM/UNIV 350.* Fulfills GE Area F.

ENGR 400 Special Problems for Advanced Undergraduates (2-4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units. Prerequisite: ME 212 or consent of department head.

ENGR 451 Special Topics in Bioengineering (4)

Current topics in bioengineering, including medical applications and industrial applications. Total credit limited to 16 units, with a maximum of 4 units per quarter. The Schedule of Classes will list topic selected. 4 lectures. Prerequisite: MATH 242, ME 313 or consent of instructor.

ENGR 462 Senior Project (4)

Selection and completion of project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results presented in a formal report. Minimum commitment of 150 hours. Prerequisite: ME 212, junior standing, and consent of instructor.

ENGR 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Consent of instructor.

ENGR 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

ENGR 481, 482 Senior Project Design Laboratory I, II (2) (2)

Selection, development, and completion of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning scheduling and research and may involve students from several disciplines. Formulation of outline, literature review, and project schedule. 2 laboratories. **ENGR 481** prerequisite: MATH 244, IME 314, ME 302 or consent of instructor. **ENGR 482** prerequisite: ENGR 481 or consent of instructor.

ENGR 483 Senior Project Design Laboratory III (2)

Continuation of ENGR 482. Completion of project by individuals or team typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research, and may involve students from several disciplines. Formulation of outline, literature review, and project schedule. 2 laboratories. Prerequisite: ENGR 482 or consent of instructor.

ENGR 493 Cooperative Education Experience (2) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units. Prerequisite: Sophomore standing and consent of instructor.

ENGR 494 Cooperative Education Experience (6) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units. Prerequisite: Sophomore standing and consent of instructor.

ENGR 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

ENGR 500 Individual Study (2-4)

Advanced study planned and completed under the direction of faculty. Open to graduate students who have demonstrated the ability to do independent work. Total credit limited to 8 units. Prerequisite: Graduate standing and consent of Program Director.

ENGR 551 Advanced Topics in Bioengineering (4)

Current topic in bioengineering research/application in detail, including medical applications and industrial applications. Takes advantage of capabilities of resident or visiting faculty. Total credit limited to 16 units. The Schedule of Classes will list topic selected. 4 lectures. Prerequisite: ENGR 451 or consent of instructor.

ENGR 563 Graduate Seminar (2)

Selected topics of interest to engineering and other graduate students. Open to graduate students and selected seniors. A forum to share information about research and research tools; an opportunity to discuss topics of interest with professionals in the field, academics, and other graduate students. The Schedule of Classes will list topic selected. Total credit limited to 4 units. 1 seminar, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

ENGR 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing or consent of instructor.

ENGR 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

ENGR 581 Biochemical Engineering I (4)

Fundamentals of Biotechnology. Types of organisms and their structure. Unstructured and structured models for microbial growth. Theory of microbial competition. Stoichiometric and thermodynamic principles. Material and energy balances for aerobic and anaerobic growth. Kinetics of enzyme catalyzed reactions. 3 seminars, 1 laboratory. Prerequisite: MCRO 221 and CHEM 371, or consent of instructor. *Crosslisted as ENGR/ENVE 581.*

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/ENVE 581 or consent of instructor. *Crosslisted as ENGR/ENVE 582.*

ENGR 583 Biochemical Engineering III (4)

Biochemical separations. Removal of insoluble products by centrifugation and filtration. Cell disruption. Primary product isolation: extraction, ultrafiltration, adsorption, ion exchange, gel electrophoresis, affinity chromatography. Final isolation: drying, crystallization. Molecular tools and biosensors for assay of biological materials. 3 seminars, 1 laboratory. Prerequisite: ENGR/ENVE 582 or consent of instructor. *Crosslisted as ENGR/ENVE 583.*

ENGR 591 Thesis Project Design Laboratory (2)

Selection and development of project, by individuals or team, typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 2 laboratories. Prerequisite: Graduate standing.

ENGR 592 Thesis Project Design Laboratory (2)

Continuation of ENGR 591. Completion of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 2 laboratories. Prerequisite: ENGR 591 or consent of instructor.

ENGR 593 Cooperative Education Experience (2) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ENGR 594 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ENGR 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ENGR 599 Design Project (Thesis) (1-9)

Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the degree requirement. An appropriate experimental or analytical thesis or project may be accepted. Prerequisite: Graduate standing.

ENVE—ENVIRONMENTAL ENGINEERING**ENVE 111 Introduction to the Environmental Engineering Profession (1) (CR/NC)**

Overview of environmental engineering solutions to water pollution, air pollution, solid waste, and hazardous waste problems. Remediation of contaminated soil and groundwater. Environmental regulations. Careers in environmental engineering. Licensing and professional registration, professional code of ethics, professional engineering societies. Credit/No Credit grading only. 1 lecture.

ENVE 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

ENVE 240 Additional Engineering Laboratory (1-2) (CR/NC)

Special assignments undertaken by students who need or wish to acquire abilities supplementary to their standard pattern of courses. Assignments must be primarily of shop or laboratory nature. Work done with minimum faculty supervision. Total credit limited to 6 units. Credit/No Credit grading only. 1-2 laboratories.

ENVE 264 Environmental Fluid Mechanics (4)

Theory and application of fluid statics and fluid dynamics to environmental problems. Compressible and incompressible flow in pipes. Open channel flow. Flow measurement systems. 4 lectures. Prerequisite: MATH 241, PHYS 133, and ME 211.

ENVE 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

ENVE 304 Process Thermodynamics (3)

First and second laws of thermodynamics, properties of gases, liquids and mixtures, vapor-liquid equilibria, solubility and absorption, equilibrium in chemical reactions, thermodynamic applications in environmental engineering. 3 lectures. Prerequisite or concurrent: CHEM 125, ENVE 331. Prerequisite: ME 302.

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: ENGL 149, MATH 241, PHYS 133, and CSC 231.

ENVE 324 Introduction to Air Pollution (4)

Causes and effects of air pollution on the individual, the community and industry. Application of mathematics and chemistry to solve air pollution

GE Area F

problems. For non-majors. 4 lectures. Prerequisite: Junior standing and completion of GE Area B. Fulfills GE Area F.

ENVE 325 Environmental Air Quality (4)

Consideration of ambient air contamination inside and outside. Factors included in establishing, monitoring and maintaining air quality standards. Using engineering principles to understand, model, and predict air quality. 4 lectures. Prerequisite: CHEM 128, ENVE 264, and CSC 231 or consent of instructor.

ENVE 330 Environmental Quality Control (4)

Application of scientific and engineering principles to control the development and use of air, water and land resources. Control of pollution of the environment. Disposal of wastes. Administrative and legal aspects. For non-Engineering majors. 4 lectures. Prerequisite: Completion of GE Area B and junior standing.

ENVE 331 Introduction to Environmental Engineering (4)

Description and quantification of water and air quality characteristics important for water and wastewater treatment and air pollution control. Fundamentals of kinetics, reactor configurations, toxicity and dose-response relationship. Regulations governing ambient pollutant levels and discharges. Introduction to the modeling of pollutant fate and transport. Overview of solid waste management and global environmental issues. 4 lectures. Prerequisite: CHEM 125 or CHEM 128, MATH 242 or MATH 244 (or concurrent).

ENVE 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

ENVE 411 Air Pollution Control (3)

Theory, principles and practices related to the control of particulate emissions. Mechanical separations. Cost and design of control systems. 3 lectures. Prerequisite: ENVE 304, ME 341 or ENVE 264, ENVE 325, and ENVE 331.

ENVE 421 Mass Transfer Operations (4)

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. 4 lectures. Prerequisite: ENVE 304, ENVE 325, ENVE 331, and ME 341 or ENVE 264.

ENVE 426 Air Quality Measurements (3)

Planning and conducting air quality measurements in the atmosphere, indoors, and at the source. Topics include both particulates, gases and meteorological measurements. 2 lectures, 1 laboratory. Prerequisite: ENVE 325, CHEM 212/312, ME 341 or ENVE 264, STAT 312, and ENGL 149.

ENVE 434 Water Chemistry and Water Quality Measurements (4)

Aquatic environmental chemistry and water quality measurements. 3 lectures, 1 laboratory. Prerequisites: CHEM 129, ENVE 330 or ENVE 331, or consent of instructor.

ENVE 436 Introduction to Hazardous Waste Management (4)

Overview of industrial processes that produce hazardous wastes. Principles of toxicology and review of state federal regulations for hazardous wastes, including RCRA, TSCA, and superfund laws. Storage, handling, and transport of hazardous wastes. Unit operations and processes treatment and reduction. Ultimate disposal including incineration and secure landfills. 4 lectures. Prerequisite: ENVE 325 and ENVE 331, and ENVE 421 or consent of instructor.

ENVE 438 Water and Wastewater Treatment Design (3)

Theory and design of facilities for physical and chemical treatment of water and wastewater, biological treatment of wastewater, and treatment and disposal of sludge. 3 lectures. Prerequisite: ENVE 331 and ME 341 or ENVE 264.

ENVE 439 Solid Waste Management (3)

Chemical and physical properties of municipal and industrial refuse. Landfill disposal, incineration, composting. Industrial and commercial solid waste disposal problems and treatment methods. Pyrolysis. Salvage and recycle operations. Economics of disposal methods. Interrelationship

between water quality and landfill operations. 3 lectures. Prerequisite: ENVE 330 or ENVE 331, and senior standing.

ENVE 443 Bioenvironmental Engineering I (4)

State-of-the-art bioremediation technologies for soil, groundwater and contaminated air stream remediation and pollution prevention. Introduction to engineering design combining biogenetics, reactor configuration, and basic biological and engineering principles. Various in-situ and ex-situ technologies. 3 lectures, 1 laboratory. Prerequisite: ENVE 331.

ENVE 450 Industrial Pollution Prevention (4)

Theory and case studies of innovative industrial and hazardous waste treatment and waste minimization through principles of pollution prevention. 3 lectures, 1 laboratory. Prerequisite: ENVE 331.

ENVE 455 Environmental Health and Safety (4)

Physical, chemical and biological hazards associated with industrial processes. Toxicology. Safety analysis and design. Causes and prevention of occupational and environmental hazards. Development and implementation of industrial hygiene programs. 4 lectures. Prerequisite: ENVE 331.

ENVE 461, 462 Senior Project I, II (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum of 120 hours total time. Prerequisite: Senior standing.

ENVE 466 Senior Project Design Laboratory I (2)

Selection and initial work on a project by individuals or team which is typical of problems graduates must solve in their fields of employment. Project involves, but is not limited to, physical modeling, testing and design. The project may include students/elements from other disciplines. Formulation of outline, literature review, project schedule, initial analyses and interim report. 2 laboratories. Prerequisite: Senior standing and consent of instructor. Note: although ENVE 466 substitutes for ENVE 461, students may not use repeat credit for the purpose of increasing GPA.

ENVE 467 Senior Project Design Laboratory II (2)

Continuation of ENVE 466. Continuation of research methodology: problem statement, method, results, analysis, synthesis, project design, construction (when feasible), and evaluation/conclusions. Project results are presented in formal written reports and formal oral reports. 2 laboratories. Prerequisite: ENVE 466.

ENVE 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to under-graduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ENVE 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

ENVE 493 Cooperative Education Experience (2) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units. Prerequisite: Sophomore standing and consent of instructor.

ENVE 494 Cooperative Education Experience (6) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units. Prerequisite: Sophomore standing and consent of instructor.

ENVE 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require

relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

ENVE 500 Individual Study (1–3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department chair.

ENVE 516 Advanced Environmental Modeling (4)

Application, adaptation, and limitations of advanced computer models in environmental engineering. The Schedule of Classes will list topics selected. Total credit limited to 8 units. 4 lectures. Prerequisite: CE 251 or CSC 231, or graduate standing/consent of instructor.

ENVE 535 Physico-Chemical Water and Wastewater Treatment (4)

Physical and chemical processes used in potable water treatment and advanced wastewater treatment. Coagulation, flocculation, sedimentation, filtration, membrane separation, disinfection, and absorption. Wastewater recycling regulations. Integration of treatment processes. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

ENVE 536 Biological Wastewater Treatment Processes Engineering (4)

Fundamentals of biological wastewater treatment. Suspended and attached growth bioreactors. Activated sludge, biotower, and anaerobic process design. Biological nutrient removal. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

ENVE 537 Decentralized Wastewater Management (4)

Design and management of decentralized wastewater treatment systems. Description of wastewater characteristics, process analysis, and wastewater pretreatment. Design of treatment processes for septic tank effluent. Effluent disposal, septage management, and the management of decentralized systems. 4 lectures. Prerequisite: ENVE 438.

ENVE 542 Sustainable Environmental Engineering (4)

Critical analysis of environmental engineering practices such as solid waste management, recycling, and wastewater treatment from the viewpoint of energy efficiency, lifecycle cost, and sustainability. Both laboratory experiments and computer models to assess sustainability. 3 lectures, 1 laboratory. Prerequisite: Graduate or senior standing or consent of instructor.

ENVE 551 Environmental Unit Operations (4)

In-depth laboratory study of unit operations and processes used in environmental engineering. Performance tests on laboratory scale equipment. Computer simulations. 2 lectures, 2 laboratories. Prerequisite: ENVE 421 and graduate standing or consent of instructor.

ENVE 552 Environmental Problems of the Semiconductor Industry (4)

Introduction to the environmental, health, and safety issues of the semiconductor industry. Semiconductor manufacturing processes and their environmental emissions. Engineering and management options for pollution control and prevention. Management of environmental systems in the semiconductor industry. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

ENVE 570 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 seminars. Prerequisite: Graduate standing or consent of instructor.

ENVE 571 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

ENVE 581 Biochemical Engineering I (4)

Fundamentals of Biotechnology. Types of organisms and their structure. Unstructured and structured models for microbial growth. Theory of microbial competition. Stoichiometric and thermodynamic principles.

Material and energy balances for aerobic and anaerobic growth. Kinetics of enzyme catalyzed reactions. 3 seminars, 1 laboratory. Prerequisite: MCRO 221 and CHEM 371, or consent of instructor. *Crosslisted as ENGR/ENVE 581.*

ENVE 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/ENVE 581 or consent of instructor. *Crosslisted as ENGR/ENVE 582.*

ENVE 583 Biochemical Engineering III (4)

Biochemical separations. Removal of insoluble products by centrifugation and filtration. Cell disruption. Primary product isolation: extraction, ultrafiltration, adsorption, ion exchange, gel electrophoresis, affinity chromatography. Final isolation: drying, crystallization. Molecular tools and biosensors for assay of biological materials. 3 seminars, 1 laboratory. Prerequisite: ENGR/ENVE 582 or consent of instructor. *Crosslisted as ENGR/ENVE 583.*

ENVE 593 Cooperative Education Experience (2) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ENVE 594 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ENVE 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ENVE 599 Design Project (Thesis) (1-9)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

ERSC—EARTH SCIENCES

ERSC 110 Orientation in Earth and Soil Sciences (1) (CR/NC)

Understanding the depth and breadth of earth and soil sciences. Examine potential career opportunities. Introduction to both student and professional organizations. Credit/No Credit grading only. 1 activity. *Crosslisted as ERSC/SS 110.*

ERSC 144 Introduction to Earth Systems (4)

Survey of fundamental processes of Earth science. Application of systems thinking to understanding the dynamic interactions among geological, geographic, soils and human factors in shaping the Earth. 3 lectures, 1 activity.

ERSC 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 12 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head. *Crosslisted as ERSC/SS 200.*

ERSC 202 Soil Erosion and Water Conservation (4)

Development of an erosion and sediment control plan using climate, topography, soils and land use in relation to soil and water quality. Evaluation of soil and water conservation plans and best management

practices for agriculture, urban, riparian, and rangelands. 3 lectures, 1 activity. Prerequisite: SS 121 or consent of instructor.

ERSC 223 Rocks and Minerals (4)

Origin, composition, identification and weathering of rocks, minerals, and clays important in the development of soils. Parent materials as related to the nature and properties of soils. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 111 or CHEM 127.

ERSC 250 Physical Geography (4)

Addresses the origins and patterns of the earth's diverse assemblage of climates, landforms, biota and soils. A major focus on relationship between human cultures and these earthly environments. 4 lectures. *Crosslisted as ERSC/GEOG 250.*

ERSC 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor. *Crosslisted as ERSC/SS 270.*

ERSC 301 Earth Sciences/Soils Science Practicum (1-2) (CR/NC)

Supervised practice in technical, educational, professional, and operational applications related to earth sciences or soil science. Students participate in faculty-supervised group or individual activities that support educational and professional goals. Credit/No Credit grading only. Total credit limited to 12 units. 1-2 activities. Prerequisite: SS 110 or SS 121. *Crosslisted as ERSC/SS 301.*

ERSC 323 Geomorphology (4)

Recognizing and identifying major landforms and their components by interpretation of aerial photographs and topographic maps, and observations. Emphasis on analyzing common landforms in the western United States for application in soil science, physical geography, hydrology, and geology. 2 lectures, 1 laboratory, 1 activity. Prerequisite: SS 121 and GEOL 201.

ERSC 325 Climate and Humanity (4)

Geographic perspective on the interrelationships between climate and human cultures. Effects of people on climate and the influence of climate and weather upon human activities and behavior. Focus on global human conditions which are responsible for the alteration of climate and in turn are vulnerable to climate change. 4 lectures. Prerequisite: Junior standing or consent of instructor. *Crosslisted as ERSC/GEOG 325.*

ERSC 333 Human Impact on the Earth (4)

Global assessment of the impact of humans on the earth's vegetation, animals, soil, water and atmosphere. Emphasis on problems stemming from the interactions of human attitudes, technologies, and population with natural resources. 4 lectures. Prerequisite: Junior standing or consent of instructor. *Crosslisted as ERSC/GEOG 333.*

ERSC 339 Earth Sciences/Soil Science Internship (1–12) (CR/NC)

Selected students will spend up to 12 weeks with an approved firm or agency engaged in work and study related to their major. A detailed written proposal and written interim and final reports required. One unit of credit may be allowed for each full week of internship. Credit/No Credit grading. Prerequisite: Consent of internship instructor. *Crosslisted as ERSC/SS 339.*

ERSC 400 Special Problems for Advanced Undergraduates (2–4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 12 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head. *Crosslisted as ERSC/SS 400.*

ERSC 401 Field-Geology Methods (4)

Collecting and interpreting field-geologic data. Description of sedimentary rocks and construction of stratigraphic columns. Mapping geologic structures in the field. Surficial geologic stratigraphy and surficial geologic mapping. Understanding geologic processes through field study. Communicating results of field study. 1 lecture, 3 activities. Prerequisite: GEOL 102 or GEOL 201, GEOL 241, GEOL 415, ERSC 223, ERSC 323. *Crosslisted as ERSC/GEOL 401.*

ERSC 402 Geologic Mapping (4)

Bedrock geologic mapping on topographic maps and aerial photos. Surficial geologic mapping on topographic maps and aerial photos. Correlating and defining surficial geologic map units on the basis of soil development.

Understanding landscape evolution using soil development 4 activities. Prerequisite: ERSC/GEOL 401. *Crosslisted as ERSC/GEOL 402.*

ERSC 414 Global and Regional Climatology (4)

The earth's pattern of climates and the physical processes that account for them. Focus on interrelationships between climate and the physical/biological and cultural environments. Special emphasis on modern climate changes and their consequences. 3 lectures, 1 laboratory. Prerequisite: Junior standing. *Crosslisted as ERSC/GEOG 414.*

ERSC 415 Applied Meteorology and Climatology (4)

Physical processes in the atmosphere that determine regional weather, climate and climate variability. Surface and satellite systems for weather observation, and weather/climate modeling. Dynamics of weather systems, including thunderstorms and hurricanes. Emphases on weather/climate affecting agriculture and other human activities. 3 lectures, 1 activity. Prerequisite: GEOG/ERSC 250 or consent of instructor. *Crosslisted as ERSC/GEOG 415.*

ERSC 461 Senior Project I (1)

Senior project topic selection and contract development with project advisor. Statement of problems, subproblems, assumptions, objectives, hypothesis, methods of analysis and statistical design. Development of literature review and budget of time and finances. Proper format and presentation of tabular and graphic information. 1 activity. Prerequisite: MATH 118 or MATH 141, STAT 218 or CRSC 411.

ERSC 462 Senior Project II (3)

Implementation of materials and methods. Collection, analysis and interpretation of data. Completion of formal written report under advisor supervision. Minimum 90 hours. Prerequisite: ERSC 461.

ERSC 463 Undergraduate Seminar (2)

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. Prerequisite: ERSC 461.

ERSC 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 lectures. Prerequisite: Consent of instructor. *Crosslisted as ERSC/SS 470.*

ERSC 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor. *Crosslisted as ERSC/SS 471.*

ERSC 544 Earth Sciences for Educators (3)

An interdisciplinary earth sciences course which emphasizes the interactions of multiple systems of air, water, land, life, and human society. Designed for teachers and students seeking teaching credential. Incorporates scientific theory, learning resources, and applications in the field. 3 lectures. Prerequisite: Graduate standing and consent of instructor. Not open to students in Soil Science specialization under MS Agriculture.

ERSC 570 Selected Topics in Earth Science (1–4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

ERSC 571 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

ES–ETHNIC STUDIES

ES 112 Race, Culture and Politics in the United States (4) GE D1 USCP

Introductory and interdisciplinary study of the ways that race and ethnicity are created by both historical processes and American institutional formation – specifically social, political, economic, legal and cultural institutions. Special attention paid to the interlocking systems of race, class, gender and sexuality. 4 lectures. *Crosslisted as ES/HNRS 112.* Fulfills GE D1 and USCP.

ES 114 Race in American Culture (4) USCP

The social practices, cultural representations, and public policies that construct race and racism in the development of American institutions, and their effect upon ethnic groups and women. The cultural discourses that reinforce racist ideology and pseudo-scientific conceptions of race. 4 lectures. Fulfills USCP.

ES 200 Special Problems for Undergraduates (1-4)

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 4 units. Prerequisite: Consent of department chair.

ES 212 Global Origins of United States Cultures (4) GE D3 USCP

How the global dispersal of Europeans, Asians, and Africans, the hemispheric dispersal of Latin Americans, and the forced internal migration of Native Americans have contributed to American cultural heritage and the struggles for ethnic, class and gender equality, and justice. 4 lectures. *Crosslisted as ES/HNRS 212*. Fulfills GE D3 and USCP.

ES 215 Planning for and with Multiple Publics (4) USCP

How the social/spatial relationships among racial/ethnic and gender groups are expressed in terms of human settlement patterns, civic involvement and every-day negotiations. Ways in which segregation and marginalization are expressed in western and non-western contexts. 3 lectures, 1 activity. Prerequisite: Completion of GE Area D1. Recommended: ES 112. *Crosslisted as CRP/ES 215*. Fulfills USCP.

ES 241 Survey of Indigenous Studies (4) GE D3 USCP

A survey of the interdisciplinary field of indigenous studies and specifically the social, political, economic, legal, and cultural institutions of American Indian, Native Alaskan, and Native Hawaiian peoples within a transnational and global context. Special attention paid to the interlocking systems of race, class, gender, and sexuality, particularly within but not limited to the United States. 4 lectures. Fulfills GE D3 and USCP.

ES 242 Survey of Africana Studies (4) GE D3 USCP

A survey of the interdisciplinary field of Africana Studies and specifically the social, political, economic, legal, and cultural institutions of African American, Afro-Caribbean, and African diasporic peoples within a transnational and global context. Special attention paid to the interlocking systems of race, class, gender, and sexuality, particularly within but not limited to the United States. 4 lectures. Fulfills GE D3 and USCP.

ES 243 Survey of Latino/a Studies (4) GE D3 USCP

A survey of the interdisciplinary field of Latino/a Studies and specifically the social, political, economic, legal, and cultural institutions of Chicano/a and other Latino/a peoples within a transnational and global context. Special attention paid to the interlocking systems of race, class, gender, and sexuality, particularly within but not limited to the United States. 4 lectures. Fulfills GE D3 and USCP.

ES 244 Survey of Asian American Studies (4) GE D3 USCP

A survey of the interdisciplinary field of Asian American Studies and specifically the social, political, economic, legal, and cultural institutions of West Asian, South Asian, Southeast Asian, and East Asian peoples in the United States within a transnational and global context. Special attention paid to the interlocking systems of race, class, gender, and sexuality, particularly within but not limited to the United States. 4 lectures. Fulfills GE D3 and USCP.

ES 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

ES 300 Chicano/a Non-Fiction Literature (4) GE C4 USCP

Overview of contemporary Chicano/a non-fiction literature since 1848. Thematic concerns, literary criticism, literary techniques, historical and socio-cultural factors influencing non-fiction Chicano/a literary genres. Instructor reserves option to select non-fiction genres to be studied. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 308 Fire and Society (4) GE D5

Prehistorical and historical record of human use of and attitude toward fire. Mythology and religion of fire. Traditional, cultural and ethnic variations and their influence on modern U.S. institutions involved in managing fire. 3 lectures,

1 activity. Prerequisite: Completion of GE Area A3 and one lower division course in GE Area D. *Crosslisted as ES/NR 308*. Fulfills GE D5 except for Comparative Ethnic Studies majors.

ES 310 Hip-Hop, Poetics and Politics (4) GE D5 USCP

Dynamics of hip-hop culture, its historical development, political significance, and social influence. How hip-hop exemplifies cross-cultural hybridization within not only Black communities nationally and internationally, but also amongst indigenous, Latino/a, and Asian peoples in the U.S. and beyond. 4 lectures. Prerequisite: Completion of GE Area A and two lower division courses in Area D. Recommended: ES 112 (D1) and/or ES D3 courses; Junior standing. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 320 African American Cultural Images (4) GE D5 USCP

Comparative study of the cultural representations of, and counter-representations by, American racial/ethnic groups in American popular opinion and consciousness, with particular emphasis on African Americans. 4 lectures. Prerequisite: Completion of GE Area A and two lower division courses in Area D. Recommended: ES 112 (D1) and/or ES D3 courses; Junior standing. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 321 Native American Cultural Images (4) GE D5 USCP

Comparative study of the cultural representations of, and counter-representations by racial/ethnic groups in American popular opinion and consciousness, with particular emphasis on Native Americans. The cultural images of Native peoples in the United States that have characterized relationships. 4 lectures. Prerequisite: Completion of GE Area A and two lower division courses in Area D. Recommended: ES 112 (D1) and/or ES D3 courses; Junior standing. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 322 Asian American Cultural Images (4) GE D5 USCP

Comparative study of the cultural representations of, and counter-representations by, American racial/ethnic groups in American popular opinion and consciousness, with particular emphasis on Asian-Americans. 4 lectures. Prerequisite: Completion of GE Area A and two lower division courses in Area D. Recommended: ES 112 (D1) and/or ES D3 courses; Junior standing. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 323 Mexican American Cultural Images (4) GE D5 USCP

Comparative study of the cultural representations (racializing images and discourses) of, and counter-representations by, American cultural/ethnic groups in American popular opinion and consciousness, with particular emphasis on Mexican Americans/Latinos. 4 lectures. Prerequisite: Completion of GE Area A and two lower division courses in Area D. Recommended: ES 112 (D1) and/or ES D3 courses; Junior standing. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 325 Sex and Gender in African American Communities (4) USCP

Gender and sexuality issues that influence the social, political, economic and cultural development of African-America. Special attention given to how racism affects the realization of standard gender conventions within black communities, as well as to myths of black sexuality, black feminism, and queer politics. 4 lectures. Prerequisite: Completion of a course in GE Area D1 or D3. Recommended: ES 112 or ES 212. Fulfills USCP.

ES 326 Native American Architecture and Place (4) GE C4 USCP

The role of culture and setting in the construction of spatial, material and landscape concepts and artifacts, through the introduction of selected North American cultures, with focus from 1300 AD through contemporary time. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. *Crosslisted as ARCH/ES 326*. Fulfills GE C4 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 330 The Chinese American Experience (4) GE D5 USCP

History and current status of Chinese Americans, with emphasis on the international contexts, organizations and institutions of Chinese America, and on Chinese Americans' demographic compositions, spatial patterns, and cultural, socioeconomic, and political adaptation experiences. 4 lectures. Prerequisite: Completion of GE Area A and two lower division courses in Area D. Recommended: ES 112 (D1) and/or ES D3 courses; Junior standing. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 335 The Filipina/o American Experience (4) GE D5 USCP

An interdisciplinary examination of the historical development of Filipina/o American identities and communities. The social, cultural and political

institutions that have influenced Filipina/o immigration, participatory citizenship, activism and cultural practices. 4 lectures. Prerequisite: Completion of GE Area A and two lower division courses in Area D. Recommended: ES 112 (D1) and/or ES D3 courses; Junior standing. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 340 Cultural Production and Ethnicity (4) GE C4

Culture and ethnicity as key factors in the production, perception, and interpretation of art and the humanities. Critical analysis of cultural attitudes and knowledge in expressive arts and cultural production, and of the contexts of cultural production as reflective of ethnicity. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Area A and one lower division course in Area C. Recommended: Completion of one ES course; Junior standing. Fulfills GE C4 except for Comparative Ethnic Studies majors.

ES 350 Gender, Race, Science and Technology (4) GE Area F USCP

Interdisciplinary examination of the complex relationships between gender, race, science, and technology in educational, work, knowledge production, policy, and ethical contexts. Topics may include reproductive, medical, genetic, and emerging technologies and exploration of efforts to create more socially responsible science/technology. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B2 or B3. Recommended: Junior standing. *Crosslisted as ES/WGS 350.* Fulfills GE Area F and USCP.

ES 360 Ethnicity and the Land (4) GE C4 USCP

Comparative study of how race and culture shape landscapes, and how social hierarchies allocate the use of natural resources and the burdens of environmental pollution. 4 lectures. Prerequisite: Completion of GE Area A and one lower division course in Area C. Recommended: One Ethnic Studies course and an introductory Natural Resources course; junior standing. *Crosslisted as ES/NR 360.* Fulfills GE C4 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 380 Critical Race Theory (4) GE D5 USCP

History and evolution of the critical race theory movement. Defining issues of the field; in particular, the relationship between race, power and the law. 4 lectures. Prerequisite: Completion of GE Area A, ES 112 (D1), or other lower division ES course, or consent of instructor. Recommended: Junior standing. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 381 The Social Construction of Whiteness (4) GE D5 USCP

The investigation of the social construction of race in the United States through historicizing the category of "whiteness." Why "white" was invented as a racial category and how white privilege has been sustained through social, political, economic and legal practices. 4 lectures. Prerequisite: Completion of GE Area A and two lower division courses in Area D. Recommended: ES 112 (D1) and/or ES D3 courses; Junior standing. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 390 Research Methodology in Comparative Ethnic Studies (4)

Theory and practice of research methodology in comparative ethnic studies. Topics include the scientific method, qualitative and quantitative methodologies, and ethical practices. Research report prepared from start to finish, including database searching, collecting pilot data, and proper formatting of a research report. Issues of race in research practice and use foregrounded throughout. 3 lectures, 1 activity. Prerequisite: Completion of Area A, STAT 217, ES 112 and three courses from ES 241, ES 242, ES 243, ES 244. Junior standing.

ES 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Junior standing and consent of department chair.

ES 410 Advanced Topics in Comparative Ethnic Studies (4)

Selected topics and issues in comparative ethnic studies. The Schedule of Classes will list topic selected. Repeatable for a maximum of 8 units. 4 seminars. Prerequisite: ES 390 or consent of instructor.

ES 450 Fieldwork in Comparative Ethnic Studies (4)

Supervised project based on fieldwork in comparative ethnic studies. 4 seminars. Prerequisite: ES 390 or consent of instructor.

ES 461 Senior Project (4)

Completion of a project under faculty supervision. Results presented in a formal paper or project. Prerequisite: ES 390 and departmental approval.

ES 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: At least one course in Ethnic Studies and consent of instructor.

FPE-FIRE PROTECTION ENGINEERING

FPE 501 Fundamental Thermal Sciences (4)

Introduction to the thermal sciences, including thermodynamics, fluid dynamics and heat transfer, as they relate to fire protection engineering. Includes 1st and 2nd laws of thermodynamics, conservation relations, hydrostatics, internal and external flows, and heat transfer by conduction, convection and radiation. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

FPE 502 Fire Dynamics (4)

First exposure to fire dynamics phenomena. Includes fundamental fire and combustion topics such as thermodynamics of combustion, fire chemistry, premixed and diffusion flames, ignition, burning of liquids and solids, heat release rates, flame spread and fire plumes. 4 lectures. Prerequisite: FPE 501 or consent of instructor.

FPE 503 Flammability Assessment Methods (4)

Characterization of flammability properties of gaseous, liquid and solid materials. Fire test methods for evaluating flammability properties of materials and burning characteristics of products. Overview of regulatory requirements for restricting the flammability of products and materials used in buildings. 4 lectures. Prerequisite: FPE 502.

FPE 504 Fire Modeling (4)

Fire modeling techniques for fire safety assessment. Application of various engineering correlations and computer-based fire models, including zone models and computational fluid dynamics models, to representative fire problems. 4 lectures. Prerequisite: FPE 502, FPE 503.

FPE 521 Egress Analysis and Design (4)

Regulatory requirements for egress systems in buildings, including occupancy classifications, occupant loads, means of egress components and exit capacities. Introduction to human behavior in fire and to methods for calculating people movement under emergency conditions, including computer-based evacuation models. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

FPE 522 Fire Detection, Alarm and Communication Systems (4)

Analysis of the operating characteristics of fire detection devices and alarm notification appliances. Introduction to modern fire alarm systems and components. Introduction to mass communication systems. Current installation and approval standards. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

FPE 523 Water-based Fire Suppression (4)

Analysis and design of water-based fire suppression systems, including water supply analysis and hydraulic calculations. Overview and design considerations for automatic sprinkler, water spray, water mist and foam suppression systems. Typical contemporary installations and current installation and approval standards. 4 lectures. Prerequisite: FPE 501 or consent of instructor.

FPE 524 Structural Fire Protection (4)

Regulation and analysis procedures for structural components of wood, steel, concrete, composites. Structural capabilities, modifications under fire induced exposures. Calculation methods for predicting fire resistance of structural components. Definition of types of building construction. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

FPE 551 Fire Safety Regulation and Management (4)

Use of model building and fire codes, administrative regulation, retrospective codes, performance-based codes, and risk-based regulation to manage fire safety. Identification and application of different fire risk

management tools and techniques. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

FPE 552 Smoke Management and Special Hazards (4)

Analysis and design of smoke management systems. Assessment of smoke hazards. Identification of special hazards. Analysis and design of fire suppression systems used for fire control of special hazards, including gaseous and chemical agents and systems. 4 lectures. Prerequisite: FPE 502 and FPE 504.

FPE 596 Culminating Experience in Fire Protection Engineering (2-5)

Performance of comprehensive fire and life safety evaluations of buildings and other structures. Communication of the results and findings of such evaluations in written report and by oral presentation. Conducted under supervision of faculty. Total credit limited to 5 units. Prerequisite: FPE 504, advanced graduate standing, completion of, or concurrent enrollment in, engineering courses in program, and consent of instructor.

FR–FRENCH

FR 101, 102, 103 Elementary French I, II, III (4) (4) (4)

For beginners. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. Language taught in its cultural context. To be taken in numerical sequence. 3 lectures, 1 activity. **FR 102** prerequisite: FR 101 or consent of instructor. **FR 103** prerequisite: FR 102 or consent of instructor.

FR 121, 122 Intermediate French I, II (4) (4)

Review of French grammar and practice in writing and oral expression within a cultural context. To be taken in numerical sequence. 3 lectures, 1 activity. **FR 121** prerequisite: FR 103 or consent of instructor. **FR 122** prerequisite: FR 121 or consent of instructor.

FR 233 Critical Reading in French Literature (4) **GE C1**

Selected readings in French from major Francophone authors that illustrate the French literary tradition from the Middle Ages to the present in both France and other French-speaking countries. 4 lectures. Prerequisite: Completion of GE Area A, and FR 122. Fulfills GE C1.

FR 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

FR 301 Advanced French Composition and Grammar (4)

Oral and written development of structural grammar, syntax and complex components of French. Expansion of vocabulary and idiomatic expressions through text study. Translation from English to French and written composition. 4 lectures. Prerequisite: Consent of instructor.

FR 302 Advanced French Conversation and Grammar (4)

Topics focus on culture and selected grammar points. Outlines and/or abstracts constitute written assignments. Individual presentations to elicit spontaneous response. Group presentations to allow cooperative research and preparation. 4 lectures. Prerequisite: Consent of instructor.

FR 305 Significant Writers in French (4) **GE C4**

Critical analysis and oral discussion of poetry, essays, novels, and plays by selected French and Francophone writers. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Area A, and FR 233. Fulfills GE C4 except for Modern Languages and Literatures majors.

FR 322 French Food in French (4)

Blend of French language, culture, food preparation techniques, and basic food chemistry and nutrition. Total immersion in language and cooking: preparation of French food while interacting in French with classmates and instructors, in lectures, discussion, and laboratory. 3 lectures, 1 laboratory. Prerequisite: FR 103 or consent of instructor. *Crosslisted as FR/FSN 322.*

FR 350 French Literature in English Translation (4) **GE C4**

Selected works to be read by students in English translation. Critical analysis, interpretation, and comparison of works by significant French and/or Francophone writers. Lecture in English. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

Prerequisite: Completion of GE Area A and one course in Area C1. Fulfills GE C4 except for Modern Languages and Literatures majors.

FR 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

FRSC–FRUIT SCIENCE

FRSC 123 Beekeeping (3)

Studies and exercises in the handling of European honey bees with special reference to pollination of commercial crops. Honey processing and marketing. Hive inspection and disease detection. 2 lectures, 1 laboratory.

FRSC 132 Pomology I (4)

Orchard design and development, cultural practices, physiological responses of trees to cultural practices, propagation and strategies to maximize orchard profitability and sustainability. Not open to students with credit in FRSC 230. 3 lectures, 1 laboratory. Prerequisite: HCS 120.

FRSC 133 Pomology II (4)

Analysis of production and management strategies for major fruit and nut crops in California. 3 lectures, 1 laboratory. Prerequisite: FRSC 132.

FRSC 202 Enterprise Project (2–4) (CR/NC)

Beginning field experience in management of orchards and vineyards or honeybees, under faculty supervision. Project participation is subject to approval by the department head and the Cal Poly Corporation. Degree credit limited to 4 units. Credit/No Credit grading only. 1 lecture, variable practicum.

FRSC 210 Viticultural Practices (2)

Propagation, layout and planting of a new vineyard, including irrigation and trellis system installations and management practices of established vineyards. Total credit limited to 4 units. 2 activities.

FRSC 230 California Fruit Growing (4)

Interrelationship of climate and cultural techniques on orchard productivity. California's place in the international production-marketing scheme. Field trip required. Not open to AEPS or FRSC majors, or students with credit in FRSC 132. 3 lectures, 1 laboratory.

FRSC 231 Viticulture I (4)

Understanding of internal and external factors affecting vine productivity. Historical and international perspectives on grape growing. Vineyard production strategies. 3 lectures, 1 laboratory.

FRSC 311 Survey of Viticulture (4)

Introduction to winegrowing including the life cycle of the vine, site selection and the concept of "terroir", canopy management and cultural practices influencing wine quality. Decision making processes in pest management, irrigation strategies, and organic and sustainable vineyard practices. Current issues in mechanization and its impact on labor management, in the concept of business decisions. Not open to students with credit in FRSC 231. 4 lectures. Prerequisite: FRSC 210. *Formerly FRSC 211.*

FRSC 331 Viticulture II (4)

Factors influencing vine physiology and winegrape quality. Recent advances in irrigation strategies, canopy management, and pest control. Budgets for profitable operation and mechanized viticulture. Field trip required. 3 lectures, 1 laboratory. Prerequisite: FRSC 231.

FRSC 342 Citrus and Avocado Fruit Production (4)

World citrus and avocado production and marketing. Orchard management techniques. Relationship of environment to species, cultivar, and rootstock selection. Field trip to a major California production area required. 3 lectures, 1 laboratory. Prerequisite: FRSC 230 or HCS 120.

FRSC 402 Enterprise Project Management (2–4) (CR/NC)

Advanced experience in production of orchards and vineyards. Development of a plan for field operations, a marketing plan, and a budget. Management decision-making. Degree credit limited to 2 units. Credit/No

Credit grading only. 1 lecture, variable practicum. Prerequisite: FRSC 202 and consent of instructor.

FRSC 415 Grapevine Physiology (4)

Understanding of grapevine physiology, including anatomy, taxonomy, physiological growth processes, growth cycle phenology, bud break, flowering, fruit set, berry ripening. 3 lectures, 1 laboratory. Prerequisite: FRSC 231 and FRSC 331.

FRSC 599 Thesis in Fruit Science (1-9)

Systematic research of a significant problem in Fruit Science. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.

FSN-FOOD SCIENCE AND NUTRITION

FSN 101 Orientation to the Food Science and Nutrition Majors (1) (CR/NC)

Understanding the depth and breadth of the Food Science and Nutrition programs. Emphasis on academic and career planning. Students are required to complete this course within their first year in the major. Separate sections will be offered for each major. Credit/No Credit grading only. 1 lecture.

FSN 121 Fundamentals of Food (4)

Theoretical aspects and practical applications of the principles of culinary science and food preparation. 3 lectures, 1 laboratory.

FSN 125 Introduction to Food Science (4)

Basic principles of food science. Chemical, physical, and microbiological properties of foods. Ingredient properties, preservation, and processing. Overview of the commercial food processing industry at state and national levels. 3 lectures, 1 laboratory.

FSN 200 Special Problems for Undergraduates (1-4)

Individual investigation, research studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 4 units per quarter. Prerequisite: Consent of instructor.

FSN 201 Enterprise Project (1-4) (CR/NC)

Post-harvest processing of a high quality food product. Project participation is voluntary and subject to approval by the department head and the Cal Poly Corporation. Total degree credit for FSN 201 and FSN 401 combined limited to 12 units. Credit/No Credit grading only. Prerequisite: FSN 125 or FSN 230 or FSN 121 and consent of instructor.

FSN 204 Food Processing Operations (4)

Applied food manufacturing and processing technology emphasizing unit operations. Water removal in foods (dehydration, spray drying, vacuum concentration), heat removal (refrigeration, freezing), and osmotic preservation. Students produce processed foods in a pilot plant. 3 lectures, 1 laboratory. Prerequisite: FSN 125 or FSN 230.

FSN 210 Nutrition (4)

Introduction to the science of human nutrition. Nutrient structure, metabolism, and function in body systems. Application of nutrition science principles to promote optimal health. 4 lectures. Fulfills GE B5.

GE B5

FSN 230 Elements of Food Processing (4)

Principles of food processing operations covering thermal processing, freezing, dehydration, fermentation and raw material handling. Overview of food technology, food quality, spoilage, packaging and label requirements. For non-Food Science majors only. Field trip may be required. 3 lectures, 1 laboratory.

FSN 244 Cereal and Bakery Science (4)

Applied science of cereal-based products. Theory and practice underlying preparation of doughs, batters, fillings, and glazes. Chemistry of baking doughs and batters and storage of finished products. Marketing and product development of breads, cakes, cookies, and pastries. Comparative nutritional evaluation of flours, grains, and finished products. 3 lectures, 1 laboratory. Prerequisite: FSN 125 or FSN 230.

FSN 250 Food and Nutrition: Customs and Culture (4) GE D4 USCP

Anthropological perspective of traditional and contemporary food customs and culture. Major emphasis on U.S. cultures including Native American, Hispanic American, African American, and Asian American. Past and future developments in organic foods, junk foods and industrial foods. 4 lectures. Fulfills GE D4 and USCP.

FSN 264 Survey of Food Chemistry (4)

Basic application of chemistry to food products. Role of chemical components of food and beverage formulations with focus on grape, wine, fermented and distilled products as well as fruit, vegetable and cereal products. 4 lectures. Prerequisite: CHEM 111 or equivalent.

FSN 270 Food and Wine Plant Sanitation (4)

Operational management of a food and wine plant sanitation program. Chemical and physical control of insects, rodents, and birds. Microbial sanitation operations. Government and legal issues affecting operations. Chemistry of detergents, surfactants and sanitizers. Design and construction of plants. Certified organic USDA requirements. 4 lectures. Prerequisite: FSN 125 or FSN 230.

FSN 275 Principles of Food Safety and Hazard Analysis (4)

Chemical, microbiological, and physical aspects of food safety are addressed especially with regard to establishment of safety programs for the food industry. In-depth coverage of hazard analysis and critical control points (HACCP). 3 lectures, 1 activity. Prerequisite: FSN 125 or FSN 230, and MCRO 221 or MCRO 224; or consent of instructor.

FSN 285 Certified Organic Food Processing Operations (4)

Certification and legal requirements for the processing of fruit, vegetable, wine, cereal, beer, distilled spirits and muscle foods according to USDA, EU and JAS requirements. Basic principles of certified organic handling, process operations, ingredient sourcing and product development. 4 lectures. Prerequisite: FSN 125, FSN 230 or consent of instructor.

FSN 290 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

FSN 304 Advanced Culinary Principles and Practice (4)

Chemistry of starch, fat and proteins and its impact on texture, taste, flavor and appearance of food. Effects of microorganisms on changes of food during preparation and storage. Strong emphasis on baking technology. 3 lectures, 1 laboratory. Prerequisite: FSN 121 and CHEM 127.

FSN 310 Maternal and Child Nutrition (4)

Nutritional needs and issues of women and children, including fertility, pregnancy and lactation; physical, nutritional, social growth and development from infancy through adolescence. Current nutrition issues in maternal and child nutrition. 4 lectures. Prerequisite: FSN 210; junior standing.

FSN 311 Sensory Evaluation of Food (4)

Designed to help the food scientist solve typical sensory problems occurring in the food industry by using simple difference and scaling test designs; select appropriate panelists for specific sensory tests; and conduct such tests, analyze, interpret the results and write a report. 3 lectures, 1 laboratory. Prerequisite: STAT 218; FSN 125 or FSN 230.

FSN 315 Nutrition in Aging (4)

Nutrition issues in the middle and later years. Changes in organ systems, nutrient needs, functional status, and food preferences as adults age. Nutrition and chronic disease. Nutritional assessment and screening. Nutrition-related health care and social services. 4 lectures. Prerequisite: FSN 210; junior standing.

FSN 319 Food Technology for the Consumer (4) GE Area F

Overview of the science and technology used to produce the foods consumed on a daily basis. Food science, biotechnology, food law, processing, preservation, ingredient functionality, package label information, and food safety information. 4 lectures. Prerequisite: Junior standing and completion of GE Area B. Fulfills GE Area F.

FSN 321 Culinary Management: Principles and Practice (4)

Principles involved in the choice, purchase, and preparation of foods in a variety of settings. Application of culinary management principles in the use of time, energy and money. Planning, preparing, and serving meals with emphasis on nutritional, aesthetic, economic and cultural aspects of food. 3 lectures, 1 laboratory. Prerequisite: FSN 121, FSN 210, sophomore standing.

FSN 322 French Food in French (4)

Blend of French language, culture, food preparation techniques, and basic food chemistry and nutrition. Total immersion in language and cooking: preparation of French food while interacting in French with classmates and instructors in lectures, discussion, and laboratory. 3 lectures, 1 laboratory. Prerequisite: FR 103 or consent of instructor. *Crosslisted as FR/FSN 322.*

FSN 328 Nutrient Metabolism I (4)

Metabolism of carbohydrates, fats and proteins as it applies to human nutrition. Integration of metabolic pathways. 4 lectures. Prerequisite: FSN 210, CHEM 313/371, BIO 111/161, junior standing.

FSN 329 Nutrient Metabolism II (4)

Continuation of FSN 328. Biochemical, molecular, and physiological functions of vitamins and minerals and their interaction with other nutrients. 3 lectures, 1 laboratory. Prerequisite: FSN 328.

FSN 330 Introduction to Principles of Food Engineering (4)

Introduction to principles of food engineering and basic calculations needed for food plant operations. Unit conversions, material balance, heat balance, steam heating, psychrometry, vacuum and pressure. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: FSN 125; MATH 118 or equivalent; and PHYS 121.

FSN 334 Food Packaging (3)

Function of food packaging in food processing and preservation. Packaging materials and forms. Regulations and testing of food packaging material. Oral presentation required. 3 lectures. Prerequisite: FSN 125 and FSN 204.

FSN 335 Food Quality Assurance (4)

Chemical, microbiological, and physical methods of analyses of foods used in food quality assurance and product development laboratories. Organization and management of quality assurance programs utilizing basic statistical control. Development of food production standards and interpretation of specifications. Packaging and container evaluation. 3 lectures, 1 laboratory. Prerequisite: FSN 125 or FSN 230; junior standing.

FSN 341 Wines and Fermented Foods (4)

Processing, manufacturing, historical and bio-technical applications of fermentation technology for the production of food products focusing on wine. Wines of the world, distilled beverages, beers, fermented dairy, vegetable and meat products important to the post-harvest economy of California. 4 lectures. Prerequisite: Junior standing and completion of GE Area B.

FSN 343 Institutional Foodservice I (3)

Principles of equipment selection and floor planning with emphasis on sanitation and safety. 2 lectures, 1 laboratory. Prerequisite: FSN 121 and junior standing.

FSN 344 Institutional Foodservice II (4)

Economic principles and problems involved in planning and preparing food using institutional equipment to meet specific product standards for large groups. 3 lectures, 1 laboratory. Prerequisite: FSN 321, FSN 343.

FSN 354 Packaging Function in Food Processing (3)

Basic food spoilage and preservation mechanisms. The role of food packaging in food processing. Package and food compatibility. For non-Food Science majors. 3 lectures. Prerequisite: Junior standing.

FSN 364 Food Chemistry (4)

Chemical and biochemical properties of food components. Basic principles of food enzymology and the chemical and biochemical changes occurring in food systems as a function of different food processing conditions. Mechanisms of reactions affecting food quality and nutritional value. Laboratory focus on assessment of food chemical systems. 3 lectures, 1 laboratory. Prerequisite: FSN 125 or FSN 230, CHEM 313.

FSN 368 Food Analysis (4)

Principles of chemical and biochemical methods and techniques for measuring food protein, carbohydrates, lipids, water, vitamins, minerals and other components of foods, wine analysis. Application of AOAC approved methods for determining nutrients as they relate to nutritional labeling legal requirements. 3 lectures, 1 laboratory. Prerequisite: FSN 364.

FSN 374 Food Laws and Regulations (4)

Federal, state, and local laws and regulations affecting the production, processing, packaging, marketing, and distribution of food. Emphasis on FDA, USDA and California codes. 4 lectures. Prerequisite: FSN 125 or FSN 230 or WVIT 102; and junior standing.

FSN 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 4 units per quarter. Prerequisite: Consent of instructor.

FSN 401 Advanced Enterprise Project (1-4)

Leadership responsibility on enterprise projects. Lead students, under the supervision of instructor, will be accountable for all phases of the project: scheduling times, securing raw product, record keeping, and marketing of the product. Total degree credit for FSN 201 and FSN 401 combined limited to 12 units. Prerequisite: FSN 201 and junior standing and consent of instructor.

FSN 408 Food Composition Science and Product Development (4)

Chemical and physical properties of food ingredients. Functionality of water, carbohydrates, proteins, lipids, additives and other food ingredients used in the formulation, development, and processing of foods. Product development processes from idea generation to marketing. 3 lectures, 1 laboratory. Prerequisite: FSN 311; FSN 364; CHEM 313; and senior standing.

FSN 410 Nutritional Implications of Food Industry Practices (4)

Methods for assessing nutritional quality of foods/diets. Nutrient databases for raw and processed foods. Effects of food industry practices (e.g., processing, fortification, new product development, biotechnology) on nutritional quality of foods/diets. Evolution of public policy. 4 seminars. Prerequisite: FSN 210; FSN 125 or FSN 230; and senior standing.

FSN 415 Nutrition Education and Communications (4)

Application of appropriate behavior and learning theories in nutrition education and communications across diverse population groups. Effective use of techniques, materials, and computer-based technology to enhance communications. Includes community-based learning projects. 4 lectures. Prerequisite: FSN 329 and senior standing.

FSN 416 Community Nutrition (4)

Federal, state and local nutrition assessment activities and program services for at-risk populations. Emphasis on health promotion and disease prevention concepts. Develop skills in assessing community nutrition problems and planning service interventions. 4 lectures. Prerequisite: FSN 328; senior standing. Recommended: FSN 310, FSN 315 and FSN 415.

FSN 417 Nutrition Counseling (4)

Communication, behavioral, and counseling theories as they relate to nutrition counseling. Emphasis on development of skills to promote healthy eating behaviors. Examination of eating disorders and obesity, including preventative and therapeutic interventions. 4 lectures. Prerequisite: Senior standing, PSY 201/202. Corequisite: FSN 415.

FSN 420 Critical Evaluation of Nutrition Research (4)

Nutrition research terminology and methods, including the strengths and weaknesses of *in vitro*, animal, human observational, and human intervention studies. Critical evaluation and interpretation of nutrition research. Case studies of research supporting or refuting diet/health links. 4 seminars. Prerequisite: FSN 329; STAT 218; and senior standing.

FSN 426 Food Systems Management (4)

Principles of successful organization and management with their application to the effective operation of food service. Administrative responsibilities of the food service manager. Management theories and

practice. Labor relations. Discipline and performance appraisal. 4 lectures. Prerequisite: FSN 344.

FSN 429 Clinical Nutrition I (4)

Application of the nutritional care process to physiological disorders which may alter nutritional requirements or require dietary modifications. Anthropometric, biochemical, clinical, and dietary assessment. GI disorders, diabetes mellitus, electrolytes, acid-base balance, hydration and enteral and parenteral nutrition. 3 lectures, 1 laboratory. Prerequisite: ZOO 331, 332 (*transfer equivalent ZOO 231, 232*) and senior standing. Prerequisite or concurrent: FSN 329.

FSN 430 Clinical Nutrition II (4)

Application of the nutritional care process to physiological and metabolic disorders which may alter nutritional requirements or require dietary modifications. Respiratory diseases, burns, cancer, inborn errors of metabolism, pregnancy, cardiovascular disease, liver disease, AIDS, renal disease, and bariatric surgery. 3 lectures, 1 laboratory. Prerequisite: FSN 429.

FSN 440 Internship in Food Science or Nutrition (1–12)

Career experience with private or public agencies. Total credit limited to 12 units. Maximum of 6 units may be applied toward degree requirements. Prerequisite: Junior standing and consent of instructor.

FSN 444 Engineering Concepts in Food Processing (4)

Engineering concepts relevant to food processing. Heat transfer, evaporation, dehydration and refrigeration calculation principles. 4 lectures. Prerequisite: FSN 330, FSN 204; FSN 230 for non-Food Science majors.

FSN 461, 462 Senior Project I, II (3) (3)

Selection of scientific research topic in major area. Development of literature review, research questions in Senior Project I. Research design, data collection, and analysis in Senior Project II. Project requires a formal report which must follow departmental guidelines. Minimum of 90 hours per quarter. **FSN 461** prerequisite: For FDSC and NUTR majors: Completion of GE A3, STAT 218, and senior standing. Also corequisite for NUTR majors: FSN 329; recommended: FSN 420. Prerequisite for WVIT majors (enology concentration): Junior standing and consent of instructor. **FSN 462** prerequisite: FSN 461.

FSN 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to under-graduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Senior standing.

FSN 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Senior standing.

FSN 474 Advanced Food Processing (4)

Advanced topics in processing operations with emphasis on thermal processing. Non-traditional processing technology such as microwave, ionizing radiation, and Pascalization. Oral presentation required. 3 lectures, 1 laboratory. Prerequisite: FSN 444 and senior standing.

FSN 480 Policy Arguments in Food and Nutrition (2)

Analysis and evaluation of law and policy in foods, nutrition, and related healthcare issues. Planning and presentation of successful arguments supporting or refuting key food and health policies. Critical assessment of advocacy processes and determination of best approaches to achieving legislative and policy goals. 2 seminars. Prerequisite: FSN 374, junior standing.

FSN 485 Cooperative Education Experience in Food Science and Nutrition (6) (CR/NC)

Part-time work experience with an approved Food Science or Nutrition firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 12 units. Degree credit limited to

6 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

FSN 495 Cooperative Education Experience in Food Science and Nutrition (12) (CR/NC)

Full time work experience with an approved Food Science or Nutrition firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 12 units. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

FSN 500 Individual Study (1–6)

Advanced independent study planned and completed under the direction of a member of the department faculty. Total credit limited to 6 units. Prerequisite: Graduate standing, consent of supervising faculty member and graduate advisor.

FSN 501 Lipid Metabolism and Nutrition (3)

Digestion, absorption and metabolism of lipids with emphasis on lipoprotein metabolism, regulation of lipid metabolism, essential fatty acid requirements and functions. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

FSN 540 Dietetic Internship Supervised Practice (10) (CR/NC)

Supervised practice at various nutrition therapy, foodservice management, and community nutrition sites. Total credit limited to 30 units, with a maximum of 10 units per quarter. Credit/No Credit grading only. Prerequisite: Acceptance into the Cal Poly, San Luis Obispo Dietetic Internship, a special session program in Continuing Education.

FSN 541 Dietetic Internship Seminar (2) (CR/NC)

A forum for dietetic interns to make presentations and share their experiences in their supervised practice; guest presentations on current issues in nutrition and health. Total credit limited to 6 units. Credit/No Credit grading only. 2 seminars. Prerequisite: Acceptance into the Cal Poly, San Luis Obispo Dietetic Internship, a special session program in Continuing Education.

FSN 542 Dietetic Internship: Current and Emerging Issues (2) (CR/NC)

Presentation of various hot topics and emerging issues in nutrition therapy, foodservice management and community nutrition for enrichment of the internship experience. Credit/No Credit grading only. 2 lectures. Total credit limited to 6 units, with a maximum of 2 units per quarter. Prerequisite: Acceptance into the Cal Poly, San Luis Obispo Dietetic Internship, a special session program in Continuing Education.

FSN 570 Selected Topics in Food Science and Nutrition (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

FSN 571 Selected Advanced Laboratory in Food Science and Nutrition (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

FSN 581 Graduate Seminar in Food Science and Nutrition (3)

Current findings and research problems in the field and their application to food science and nutrition. The Schedule of Classes will list topic selected. Total credit limited to 6 units with approval of advisor. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

FSN 599 Thesis (1–6)

Individual research in food science and nutrition under faculty supervision leading to a graduate thesis of suitable quality. Total credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.

GEOG–GEOGRAPHY

GEOG 150 Introduction to Cultural Geography (4) **GE D3**

The interplay of cultures, places, and environments, with emphasis on the diversity, interrelationships, and spatial features of global cultures. Topics include characteristics and patterns of population, ethnicity, agriculture, geopolitics, language, religion, urbanization, industry, and folk and popular culture. 4 lectures. Fulfills GE D3.

GEOG 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.

GEOG 250 Physical Geography (4)

Addresses the origins and patterns of the earth's diverse assemblage of climates, landforms, biota and soils. A major focus on relationship between human cultures and these earthly environments. 4 lectures. *Crosslisted as ERSC/GEOG 250.*

GEOG 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

GEOG 300 Geography of the United States (4) **GE D5**

The population (including origin, ethnicity, migration, and distribution), land utilization, and economic development viewed against the background of the physical environment. Topically and regionally organized. Pervading themes include landscape evolution and alteration, regional cultural distinctiveness, and current problems. 4 lectures. Prerequisite: Completion of GE Areas A, D3. Recommended: Junior standing. Fulfills GE D5 except for Social Sciences majors.

GEOG 301 Geography of Resource Utilization (4) **GE D5**

A multicultural, world view of the interconnections of the following resource systems: food, energy, water, and non-fuel minerals. A pervading theme is the sustainability of these systems. 4 lectures. Prerequisite: Completion of GE Areas A, D3. Recommended: Junior standing. Fulfills GE D5 except for Social Sciences majors.

GEOG 308 Global Geography (4) **GE D5**

Examination of the major world regions such as Europe, the Middle East, Africa, Asia and Latin America. Focus on the origins and content of contemporary cultural landscapes and on their utility for understanding international differences, interactions, and current events. Particular attention to the relationship between humans and the environment. 4 lectures. Prerequisite: Completion of GE Areas A and D1. Recommended: Junior standing. Fulfills GE D5 except for Social Sciences majors.

GEOG 317 The World of Spatial Data and Geographic Information Technology (4) **GE Area F**

Basic foundation for understanding the world through geographic information and the tools available to utilize spatial data. Application of Geographic Information Systems (GIS) and related technologies, including their scientific basis of operation. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B2. *Crosslisted as GEOG/LA/NR 317.* Fulfills GE Area F.

GEOG 318 Applications in GIS (4)

ArcGIS Desktop Geographic Information System (GIS) computer software to explore environmental, natural resource, social and economic issues using spatial data. Principles of cartography and map interpretation. Development of data base and software management competencies. 2 lectures, 2 laboratories. Prerequisite: Junior standing and computer literacy, or consent of instructor.

GEOG 325 Climate and Humanity (4)

Geographic perspective on the interrelationships between climate and human cultures. Effects of people on climate and the influence of climate and weather upon human activities and behavior. Focus on global human conditions which are responsible for the alteration of climate and in turn are vulnerable to climate change. 4 lectures. Prerequisite: Junior standing or consent of instructor. *Crosslisted as ERSC/GEOG 325.*

GEOG 328 Applications in Remote Sensing (4)

Introduction to the use of satellite imagery to analyze natural and human features on the earth. Applications in geology, water, climate, vegetation, agriculture, and urban land use. Fundamentals of processing digital satellite images. Emphasis on bridging the earth and social sciences. 3 lectures, 1 activity. Prerequisite: GEOG 250 or consent of instructor.

GEOG 333 Human Impact on the Earth (4)

Global assessment of the impact of humans on the earth's vegetation, animals, soil, water and atmosphere. Emphasis on problems stemming from the interactions of human attitudes, technologies, and population with natural resources. 4 lectures. Prerequisite: Junior standing or consent of instructor. *Crosslisted as ERSC/GEOG 333.*

GEOG 340 Geography of California (4)

Geographic analysis of the land and people of California. Patterns of physical environment, natural resources, history, settlement, ethnicity, economy, politics, and urban growth. Current issues in a national and global context. 4 lectures. Prerequisite: Junior standing.

GEOG 360 Geography of Europe (4)

The population, land utilization, and economic development viewed against the background of the physical environment. Topically and regionally organized. Pervading themes include landscape evolution and alteration, regional cultural distinctiveness, and current problems. Emphasis on Western Europe. 4 lectures. Prerequisite: Junior standing.

GEOG 370 Geography of Latin America (4) **GE D5**

Geographic analysis of Mexico, Central America, and South America. The patterns of physical environment, culture, economy, and development. The issues (local, regional, and global) that shape Latin America. 4 lectures. Prerequisite: Completion of GE Areas A, D3. Recommended: Junior standing. Fulfills GE D5 except for Social Sciences majors.

GEOG 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.

GEOG 408 Geography of Development (4)

Detailed analysis of international development from a geographical perspective. Survey of various theories of development and their cultural and ecological components at multiple geographic scales, including institutions and actors involved. Applicable skills for development research and practice, emphasizing sustainability. 4 lectures. Prerequisite: GEOG 308 or consent of instructor.

GEOG 414 Global and Regional Climatology (4)

The earth's pattern of climates and the physical processes that account for them. Focus on interrelationships between climate and the physical/biological and cultural environments. Special emphasis on modern climate changes and their consequences. 3 lectures, 1 laboratory. Prerequisite: Junior standing. *Crosslisted as ERSC/GEOG 414.*

GEOG 415 Applied Meteorology and Climatology (4)

Physical processes in the atmosphere that determine regional weather, climate and climate variability. Surface and satellite systems for weather observation, and weather/climate modeling. Dynamics of weather systems, including thunderstorms and hurricanes. Emphases on weather/climate affecting agriculture and other human activities. 3 lectures, 1 activity. Prerequisite: GEOG/ERSC 250 or consent of instructor. *Crosslisted as ERSC/GEOG 415.*

GEOG 440 Advanced Applications in GIS (4)

Applications in Geographic Information Systems (GIS) emphasizing research, methodologies, and career fields to geography, earth sciences, and the social sciences. 2 lectures, 2 laboratories. Prerequisite: GEOG 318 or consent of instructor.

GEOG 455 Anthropology-Geography Research Design and Methods (4)

Development of knowledge and skills needed to conduct original scientific anthropology-geography research and prepares students for senior projects. Various empirical methodologies highlighted, with a focus on quantitative design and measurement of human culture, biology, behavior, environment

and ecology. 3 lectures, 1 laboratory. Prerequisite: Completion of one GE B2 and two upper division ANT or GEOG classes. *Crosslisted as ANT/GEOG 455.*

GEOG 461, 462 Senior Project I, II (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing or consent of instructor.

GEOG 464 Professional Preparation for Anthropologists/Geographers (1) (CR/NC)

Preparation for professional advancement in the fields of anthropology and geography. Supervised career planning emphasizing resume development, selection of an internship or international experience, exploration of career options and graduate programs. Lectures from outside, practicing professionals. Credit/No Credit grading only. 1 seminar. Prerequisite: Junior standing, ANT 201, GEOG 150.

GEOG 465 Internship (3–8) (CR/NC)

Supervised training, research, and work in public and private organizations. Credit/No Credit grading only. Total credit limited to 18 units. Prerequisite: GEOG 464, senior standing and/or consent of instructor.

GEOG 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1–4 lectures. Prerequisite: Consent of instructor.

GEOL–GEOLOGY

GEOL 102 Introduction to Geology (4) GE B3
Processes responsible for the Earth's minerals, rocks, and structure surface features. Volcanism; mountain building; plate tectonics; weathering. Erosion and deposition by streams, glaciers, wind and waves. Geological resources, earth hazards, and interaction of man with global processes. 4 lectures. Fulfills GE B3.

GEOL 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisites: Consent of department chair.

GEOL 201 Physical Geology (3)
Processes responsible for the Earth's rocks, structural surface features, geologic hazards, and natural resources, with emphasis on interactions with human activities. 3 lectures. Prerequisite: MATH 119.

GEOL 203 Fossils and the History of Life (4) GE B5
Fossil record. Geologic time scale. Evolution and the fossil record. Evolution – creation controversy. Early earth and early life. Features, lifestyles, origins, and histories of major invertebrate, vertebrate, and plant groups. Mass extinctions. 3 lectures, 1 discussion. Fulfills GE B5.

GEOL 204 Geologic History of California (3)
Development of California through geologic time. Where and why the rocks appeared. Movement on faults, and mountain building. Geologic processes at work today and yesterday. Relationship of California geology to the rest of the world. 3 lectures.

GEOL 205 Earthquakes (4) GE B3
World-wide seismicity and plate tectonics. Seismic waves and their recording. Earth structure and composition. Intensity, magnitude, and energy. Major California faults and earthquakes. Paleoseismology, forecasting and prediction. Acceleration, resonance, and effects of ground shaking on structures. Earthquake safety. Tsunamis. 3 lectures, 1 discussion. Fulfills GE B3.

GEOL 206 Geologic Excursions (1) (CR/NC)
Field trips to places of geologic interest. The Schedule of Classes 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.

GEOL 241 Physical Geology Laboratory (1)
Properties and identification of minerals and rocks. Topographic maps and landform analysis. Geologic maps and interpretation of rock structure. 1 laboratory. Prerequisite or concurrent: GEOL 102 or GEOL 201.

GEOL 270 Selected Topics (1–4)
Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

GEOL 305 Fundamentals of Seismology (4) GE B6
Theory of plate tectonics. Elastic waves in layered media. Principle of the seismometer. Seismic properties, structure and composition throughout the Earth. Intensity, magnitude, and seismic moment and energy calculations. Major California faults and earthquakes. Paleoseismology, forecasting and prediction. Analysis of ground motion. Resonance. Effects of ground shaking on structures and bodies of water. Earthquake safety. 3 lectures, 1 discussion. Prerequisite: PHYS 132. Fulfills GE B6.

GEOL 310 Igneous and Metamorphic Petrology (4)
Processes associated with melting, igneous crystallization, and metamorphism of igneous and sedimentary rocks. Special attention to relationships with tectonic setting. Required field trip. 3 lectures, 1 laboratory. Prerequisite: GEOL 102 or GEOL 201, and ERSC 223.

GEOL 330 Principles of Stratigraphy (4)
Description and analysis of stratified rock and sediment. Sedimentology, diagenesis, transgressive/regressive sequences, bedform interpretation, marine and terrestrial sediment and sedimentary-rock sequence interpretation, and sequence stratigraphy. Required field trips. 3 lectures, 1 laboratory. Prerequisite: GEOL 102 or GEOL 201, and GEOL 241.

GEOL 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigations, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

GEOL 401 Field-Geology Methods (4)
Collecting and interpreting field-geologic data. Description of sedimentary rocks and construction of stratigraphic columns. Mapping geologic structures in the field. Surficial geologic stratigraphy and surficial geologic mapping. Understanding geologic processes through field study. Communicating results of field study. 1 lecture, 3 activities. Prerequisite: GEOL 102 or GEOL 201, GEOL 241, GEOL 415, ERSC 223, ERSC 323. *Crosslisted as ERSC/GEOL 401.*

GEOL 402 Geologic Mapping (4)
Bedrock geologic mapping on topographic maps and aerial photos. Surficial geologic mapping on topographic maps and aerial photos. Correlating and defining surficial geologic map units on the basis of soil development. Understanding landscape evolution using soil development 4 activities. Prerequisite: ERSC/GEOL 401. *Crosslisted as ERSC/GEOL 402.*

GEOL 415 Structural Geology (4)
Recognition, interpretation, and depiction of geological structures. Understanding rock deformation through the study of faults and folds. 3 lectures, 1 laboratory. Required weekend field trips. Prerequisite: GEOL 241 and ERSC 223.

GEOL 420 Applied Geophysics (3)
Introduction to geophysical exploration of the shallow subsurface: seismic refraction, seismic reflection, electrical resistivity, magnetic and gravity methods. Application to determination of subsurface structure, groundwater and mineral resources. 2 lectures, 1 laboratory. Prerequisite: PHYS 132, GEOL 201. Recommended: STAT 218 or equivalent.

GEOL 470 Selected Advanced Topics (1–4)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

GEOL 471 Selected Advanced Laboratory (1–4)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

GER–GERMAN

GER 101, 102, 103 Elementary German I, II, III (4) (4)
For beginners. Class practice in pronunciation, sentence structure, reading, writing and basic conversation using the communicative approach. Laboratory drill required. Language taught in its cultural context. To be taken in numerical sequence. 3 lectures, 1 activity. **GER 102** prerequisite: GER 101 or consent of instructor. **GER 103** prerequisite: GER 102 or consent of instructor.

GER 121, 122 Intermediate German I, II (4) (4)
Review of German grammar and practice in writing and oral expression within a cultural context. To be taken in numerical sequence. 3 lectures, 1 activity. **GER**

121 prerequisite: GER 103 or consent of instructor. GER 122 prerequisite: **GER 121** or consent of instructor.

GER 233 Critical Reading in German Literature (4) GE C1

Selected readings from major German authors that show the German literary tradition from the Middle Ages to the present in Germany, Austria, Switzerland, and or foreign writers in Germany. 4 lectures. Prerequisite: Completion of GE Area A, and GER 122. Fulfills GE C1.

GER 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

GER 301 Advanced German Composition and Grammar (4)

Oral and written development of structural grammar, syntax and complex components of German. Vocabulary expansion and idiomatic construction. Written compositions. Translations to examine linguistic and semantic differences. 4 lectures. Prerequisite: Consent of instructor.

GER 302 Advanced German Conversation and Grammar (4)

Topics focus on culture and selected grammar points. Individual and group presentations and interaction using videos. 4 lectures. Prerequisite: Consent of instructor.

GER 305 Significant Writers in German (4) GE C4

Critical analysis and oral discussion of poetry, essays, novels, and plays. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Area A, and GER 233. Fulfills GE C4 except for Modern Languages and Literatures majors.

GER 350 German Literature in English Translation (4) GE C4

Selected works to be read by students in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding German, Austrian and Swiss writers. Lecture in English. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Area A, and one course in Area C1. Fulfills GE C4 except for Modern Languages and Literatures majors.

GER 470 Selected Advanced Topics (4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Consent of instructor.

GRC–GRAPHIC COMMUNICATION

GRC 101 Introduction to Graphic Communication (3)

Graphic communication history, theory, processes, applications, and practices. New technologies that affect day-to-day communication including traditional and digital printing and publishing, and non-print imaging including Internet applications. Overview of design technology, web and digital media, printing and imaging management, graphics for packaging, industry segments. 3 lectures.

GRC 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Graphic Communication majors only. Prerequisite: Consent of instructor.

GRC 201 Digital Publishing Systems (3)

Introduction to web and print publishing systems including hardware, software, design considerations, and file formats. Overview of output technologies, networking, and digital publishing standards. 2 lectures, 1 laboratory. Graphic Communication majors only.

GRC 202 Digital Photography (3)

Digital photography for print and web, including lighting, exposure, composition, photo-retouching, equipment, color management, and output. 2 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 101 and either GRC 201 or GRC 377.

GRC 203 Digital File Preparation and Workflow (3)

Terminology and techniques used in digital workflow systems for print and web. Workflow options, including automation, proofing, and output systems. Digital file delivery and transfer. 2 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 202 or ART 184.

GRC 204 Introduction to Contemporary Print Management and Manufacturing (4)

Survey of management fundamentals and components relevant to graphic communication manufacturing, production, operations, and quality. Introduction to management theory and contemporary management trends and practices in the graphic communication industry. 4 lectures. Graphic Communication majors only. Prerequisite: GRC 101.

GRC 211 Substrates, Inks and Toners (4)

Technical aspects of paper, other substrates, inks, toners, and other printable materials used in the printing and packaging industries. Manufacture, application and interaction of these materials in relation to particular processes and end use requirements. Hands-on testing of materials in relation to quality, properties, and performance. 3 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 101.

GRC 212 Substrates, Inks and Toners: Theory (3)

Technical aspects of paper, other substrates, inks, toners and other printable materials used in the printing and packaging industries. Manufacture, application, and interaction of these materials in relation to particular processes and end use requirements. Credit not allowed for GRC majors. 3 lectures. Prerequisite: GRC 101 and GRC minors only.

GRC 218 Digital Typography (4)

Application of typography using current software tools for print and web. In-depth study of communication principles and visual organization. Font technology and management for the creative, print and web publishing industries. Graphic Communication majors only. 3 lectures, 1 laboratory. Prerequisite: GRC 202 and GRC 203.

GRC 260 Introduction to Research Methods in Graphic Communication (3)

Introduction to research methods for preparing scholarly and defensible papers and projects, and in conducting qualitative and quantitative evaluations, testing and research in graphic communication. Methods covered include the Scientific Method, historical and descriptive research, questionnaires, Elite and Specialized Interviewing, content analysis, and sampling. Design of research projects for each method taught. 2 lectures, 1 activity. Graphic Communication majors only. Prerequisite: GRC 101.

GRC 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Graphic Communication majors only. Prerequisite: Open to undergraduate students and consent of instructor.

GRC 316 Flexographic Printing Technology (3)

Analysis of flexographic printing technology for flexible packaging, label printing, folding and corrugated cartons. Applications of computers to the management and technical function of flexographic printing technology. 2 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 211.

GRC 320 Managing Quality in Graphic Communication (4)

Theory and practices of quality systems in the graphic communication industry. Emphasis on Deming Systems Thinking, Lean Manufacturing, Six Sigma, ISO, and Malcolm Baldrige. Quantifying customer expectations, specifications, standard operating procedures, SPC tools, and employee empowerment in the graphic arts. 3 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 328 and STAT 217.

GRC 322 Advanced Digital Typography (3)

Advanced typographic principles relating to print and electronic media. Page layout and font management with consideration for electronic media. Applied problems focusing on typographic design, typographic application and file preparation. 2 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 218 and GRC 338.

GRC 324 Binding, Finishing, and Distribution Processes (3)

Imposition techniques, cutting, and folding. Stitch, case and perfect binding techniques and applications. Operational and aesthetic uses of die cutting, scoring, creasing, foil stamping and embossing techniques. Fulfillment and mailing operations. Applications of computers to the management and technical function of binding; finishing and distribution. 2 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 101.

GRC 325 Binding and Finishing Processes: Theory (2)

Imposition techniques, cutting and folding. Stitch, case and perfect binding techniques and applications. Operational and aesthetic uses of die cutting, scoring, creasing, foil stamping and embossing techniques. Fulfillment and mailing operations. Applications of computers to the management and technical function of binding; finishing and distribution. Credit not allowed for GRC majors. 2 lectures. Prerequisite: GRC 101 and GRC minors only.

GRC 328 Sheetfed Printing Technology (4)

Theory, practice and application of sheetfed printing and plate technology for commercial, book, advertising, catalog, packaging and reprographic segments of the printing industry. Press configurations, materials, computerized press controls, workflow, pressroom management, coating and quality control. Plate types, quality and new technologies for sheetfed printing. 3 lectures, 1 laboratory. Prerequisite: GRC 211 or GRC 212 and Graphic Communication majors only.

GRC 329 Web Offset and Gravure Printing Technologies (3)

Introduction to web offset and gravure printing for newspapers, packaging, magazines, books, catalogs and commercial products. Application of technology to the management and production of web offset and gravure printing. Preparation and use of gravure cylinders. 2 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 328.

GRC 331 Color Management and Quality Analysis (4)

The physics, psychology, measurement, analysis and management of color for print and electronic documents. Practical application of color correction, color proofing, and production workflows that ensure the best possible color reproduction. 3 lectures, 1 activity. Graphic Communication majors only. Prerequisite: Completion of GE B3 and either GRC 202 or ART 182.

GRC 337 Consumer Packaging (3)

Problem-solving strategies for package printing that integrate concepts from marketing, design and technology. Package manufacturing, function, quality, visual appeal, sustainability, and economics are addressed. 2 lectures, 1 laboratory. Prerequisite: GRC 202.

GRC 338 Digital Content Management and Variable Data Publishing (4)

Digital content management strategies for print and web including file management, database principles, archiving, document formats, variable data publishing, workflow analysis, groupware, and repurposing. Technical and creative problem-solving for content production and management in print and web publishing. 3 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 202, GRC 203 and GRC 218.

GRC 339 Web Design and Production (4)

Advanced design and production techniques for web development. Current software applications and technologies for user interface design, site structure and information architecture. 3 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 338.

GRC 357 Specialty Printing Technologies (3)

Specialty printing and imaging technologies used in fabric decorating, decals for marketing, industrial, and functional printing, security printing and various forms of packaging. Printing on various materials using special processes including screen printing, pad printing, sublimation printing, digital imaging, and post print finishing. 2 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 202.

GRC 361 Marketing and Sales Management for Print and Digital Media (4)

Identification and development of target markets for products and services in the graphic communication industry. Deployment of strategies in pricing, promotion and distribution management. Application of customer relationship management techniques for personal selling, forecasting and planning. 3 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 101 and GRC 204.

GRC 377 Web and Print Publishing (4)

Web and print publishing technology and its impact on society. The technologies of digital photography, typography, graphics, layout, and design for print and web publishing including decision-making considerations. The application of scientific and mathematical principles to web and print publishing technologies. 3 lectures, 1 laboratory. Prerequisite: Junior standing and completion of Area B. Fulfills GE Area F except for Graphic Communication majors.

GE Area F**GRC 388 Sustainable Communication Media (4)**

Sustainable communication media and its impact on society, including advertising, printing, publishing and packaging. Production, procurement, and supply-chain perspectives. Scientific and quantitative approaches to continuously improving media for businesses, products or services. Media's environmental, social and economic performance. 4 lectures. Graphic Communication majors only. Prerequisite: Junior standing and completion of Area B.

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. Graphic Communication majors only. Prerequisite: Consent of instructor.

GRC 402 Digital Printing and Emerging Technologies in Graphic Communication (3)

Application of digital printing including the study of digital presses, front-end systems, and related technologies. Integration and automation of database and publishing software. Emerging graphic communication technologies that are affecting the methods and procedures of producing and distributing print and electronic media. Managing technological change in graphic communication establishments. 2 lectures, 1 activity. Graphic Communication majors only. Prerequisite: GRC 338.

GRC 403 Estimating for Print and Digital Media (4)

Estimating the cost of various kinds of print and digital products and services. Development of budgeted hour costs and production standards. Cost estimating methods for Print on Demand, VDP, sheetfed lithography, web site development, and wide-format output. Analysis of material, labor and other cost factors. 3 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 328.

GRC 411 Strategic Trends and Costing Issues in Print and Digital Media (4)

Graphic communication industry market trends. Strategies for profitably positioning graphic communication companies. Costing methodology and practices for graphic communication companies. Company profitability using ratio analysis. Innovative management practices in the graphic communication industry. 3 lectures, 1 activity. Graphic Communication majors only. Prerequisite: GRC 403 and senior standing.

GRC 421 Production Management for Print and Digital Media (4)

Application of management principles and production control methodologies for print and digitally-imaged products. Organization and financial analysis, decision-making, equipment and inventory planning, resource optimization, and the application of practiced and newly innovative contemporary world-class techniques for improving profitability in the graphic communication industry. 3 lectures, 1 activity. Graphic Communication majors only. Prerequisite: GRC 320.

GRC 422 Human Resource Management Issues for Print and Digital Media (4)

Human resource management integrated into the success of graphic communication companies. A comprehensive management approach is utilized emphasizing policy development, training, safety, motivation, facilitation skills, team building and empowerment, ethical and legal issues in the printing industry. 3 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 403 and senior standing.

GRC 429 Digital Media (3)

Current digital media technology and production including audio, video, e-books, and animation. Industry standards, digital rights management, file formats, and publishing options for digital media. Legal, ethical, and business issues surrounding digital media. 2 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: GRC 338.

GRC 431 Printing Plant Layout Analysis (3)

Elements of printing plant site selections, equipment planning, inventory planning, and workflow optimization. Design and layout of printing plants for effective space utilization. Organization of plant services. 2 lectures, 1 activity. Graphic Communication majors only. Prerequisite: GRC 421.

GRC 432 Imaging Systems Management (4)

Management issues associated with the introduction and use of computerized electronic prepress systems. Strategic, technical, marketing, financial, production, operational, and personnel aspects of color prepress work in a capital-intensive environment. 4 lectures. Prerequisite: GRC 338.

GRC 439 Book Design Technology (4)

Advanced creative problem-solving strategies associated with the technologies used in book design and production. Advanced techniques in page layout, design, typography, type specification and image manipulation as they relate to output technology. Content, format and distribution of print and electronic books. 3 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: Senior standing, GRC 338.

GRC 440 Magazine and Newspaper Design Technology (4)

Concept development of magazine and publication design technology. Design and technical considerations as they relate to output technology. Application of organizational structures such as grids, formatting and sequential design. Advanced techniques in typography and image manipulation. Content, format and distribution of print and electronic magazines. 3 lectures, 1 laboratory. Graphic Communication majors only. Prerequisite: Senior standing, GRC 338.

GRC 451 Management Topics in Graphic Communication (3)

Current trends and practices in select graphic communication management topics. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures. Graphic Communication majors only. Prerequisite: GRC 101 and GRC 201.

GRC 452 Emerging Technologies in Graphic Communication (3)

Current trends and practices in select graphic communication emerging digital topics. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures. Graphic Communication majors only. Prerequisite: GRC 101 and GRC 201.

GRC 453 Design Reproduction Topics in Graphic Communication (3)

Current trends and practices in select graphic communication design reproduction topics. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures. Graphic Communication majors only. Prerequisite: GRC 101 and GRC 201.

GRC 460 Research Methods in Graphic Communication (2)

Research methods for preparing scholarly and defensible papers and senior projects, and in conducting qualitative and quantitative evaluations, testing, and research in graphic communication. Methods covered include statistical, historical, descriptive, questionnaires, interviewing, and sampling. 1 lecture, 1 activity. Graphic Communication majors only. Prerequisite: Senior standing and STAT 217.

GRC 461 Senior Project (3)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in formal report. Minimum 90 hours total time. Graphic Communication majors only. Prerequisite: GRC 460.

GRC 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: GRC 101 and GRC 201 and Graphic Communication majors only.

GRC 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Graphic Communication majors only. Prerequisite: Consent of instructor.

GRC 472 Applied Graphic Communication Practices (2)

Application of theories and practices to University Graphic Systems as they apply to commercial printing, publication printing, digital media and graphic communication industries. Major credit limited to 4 units; total credit limited to 18 units. 2 lectures. Graphic Communication majors only. Prerequisite: GRC 101.

GRC 473 Applied Graphic Communication Management Practices (2)

Management theories and practices in the graphic communication industry. Application of theories and practices to University Graphic Systems as they apply to commercial printing, publication printing, digital media, marketing, sales, customer service, and production cost centers. Major credit limited to 6 units; total credit limited to 18 units. 2 lectures. Graphic Communication majors only. Prerequisite: GRC 472 and consent of instructor.

GRC 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and

registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 12 units. Credit/No Credit grading only. Graphic Communication majors 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. Major credit limited to 12 units; total credit limited to 12 units. Credit/No Credit grading only. Graphic Communication majors only. Prerequisite: Sophomore standing and consent of instructor.

GRC 500 Special Problems in Document Systems Management for Graduate Students (2)

Investigation, research, studies of problems in document systems management. Repeated course over four quarters working with University Graphic Systems, the Graphic Communication Institute at Cal Poly, and with individual faculty. Total credit limited to 8 units. Prerequisite: Second year MBA student, GRC 101 and GRC 201 or advisor approval.

GRC 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

GS–GRADUATE STUDIES**GS 597 Continued Graduate Study (1-15) (CR/NC)**

Activities other than regular coursework that are needed to complete the requirements for the degree. Analysis of data, thesis and project report writing, oral defense of the thesis/project, preparation for the comprehensive exam, and other activities related to the culminating experience for the student's program. Can be used to fulfill the continuous enrollment requirement for graduate students. Units earned in this course may not be used toward degree completion. Credit/No Credit grading only. Total credit limited to 15 units; repeatable in same term. Prerequisite: Must be in good standing in a graduate program at Cal Poly.

GSA–GRADUATE STUDIES–ACCOUNTING**GSA 535 Legal Aspects of Commercial Transactions (4)**

Relation of the legal, regulatory, and ethical environment to commercial transactions. Examination of the law of competitive torts and unfair competition, property, sales, commercial paper, secured transactions, bankruptcy, securities regulation, and environmental regulation, with an emphasis on the Uniform Commercial Code. Case studies. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 536 Taxation of Trusts, Estates, and Transfer Taxes (4)

Income taxation of trusts and estates as flow-through entities; transfer taxation of gifts and estates, including generation-skipping transfers. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 537 State and Local Taxation (4)

Multi-state income and franchise taxation; property taxes; sales and use taxes; and the constitutional authority for the imposition of state taxes. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 538 Current Developments in Taxation (4)

Current developments in income taxation of individuals, trusts and estates and business entities; transfer taxation of gifts and estates; and ethics and professional responsibility in taxation. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 539 Clinical Tax Education Internship (9) (CR/NC)

Accounting internship that allows graduate level accounting students the opportunity to apply skills and competencies to an employment opportunity. Placement in a full-time supervised work experience at a public accounting firm or in an accounting or internal audit department of a private enterprise or government agency. Credit/No Credit grading only. Prerequisite: OCOB graduate standing in Specialization in Tax, MS Accounting program.

GSA 540 Taxation of Corporations and Partnerships (4)

Comparative study of the taxation of C corporations and flow-through tax entities, including S corporations, partnerships and limited liability companies.

Not open to students with credit in BUS 417. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 541 Advanced Financial Reporting Issues I (4)

Comprehensive coverage of selected advanced financial accounting and reporting topics. Topics include accounting changes and errors, leases, pensions and other post-employment benefits, income taxes, and consolidated financial statements. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 542 Auditing (4)

Survey of the ethical, regulatory and legal environment in which audits occur. An appreciation of how audit risk is assessed, how auditors evaluate clients' internal control structures, the role of evidence in an audit, and the audit reporting requirements. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 543 Advanced Financial Reporting Issues II (5)

Comprehensive coverage of selected advanced financial accounting and reporting topics. Topics include financial statement footnote and MD&A disclosures and coverage of SEC statutes, regulations and filing forms. 5 seminars. Prerequisite: GSA 541 and OCOB graduate standing or approval from the Associate Dean.

GSA 544 Advanced Enterprise Wide Business Processes (4)

Study of various transactions in order to understand the underlying business processes and information flows between various business units, in order for a transaction to occur and be properly reported, and the information determined that is critical for the information system to capture. Emphasis of role of information systems in controlling the authorization of transactions, access to information, access to assets, preparation of accounting records and reports. 3 seminars, 1 activity. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 545 Applied Research and Communications (4)

Advanced use of authoritative accounting and auditing data bases and actual filings by public companies. Frequent writing and speaking exercises. Real world accounting and auditing issues facing public and private enterprises. In-depth coverage of federal and state regulation of securities transactions. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 546 Tax Research and Administrative Procedures (4)

Research techniques applicable to tax issues including the communication of research results. Administrative procedures necessary for tax compliance with the various tax jurisdictions with primary emphasis on IRS practices. 2 seminars, 2 activities. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 547 Corporate Taxation (4)

Income tax treatment of regular C corporations and their shareholders. The creation, operation, and liquidation of such organizations. 4 seminars. Prerequisite: GSA 546 and OCOB graduate standing or approval from the Associate Dean.

GSA 548 Advanced Individual Taxation and Tax Planning (4)

Advanced concepts concerning the impact of taxes on individuals. Introduction to transfer taxes imposed on individuals. Financial, estate and compensation tax planning issues. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 549 Advanced Taxation of Flow-Through Entities (4)

Advanced and special topics related to the income tax treatment of partnerships, limited liability companies, trusts and S corporations and their owners and beneficiaries. Creation, operation, liquidation and sale of such organizations. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 550 Advanced Corporate Taxation (4)

Advanced and special topics related to the income tax treatment of regular corporations and their shareholders. Mergers and acquisitions, tax accounting methods and periods, cross-boundary topics, and current issues. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 551 International Taxation (4)

Fundamental tax concepts of inbound and outbound investments of U.S. taxpayers, controlled foreign corporations, Subpart F, the foreign tax credit, transfer pricing and contracting country treaties. 4 lectures. Corequisite: BUS 417, or BUS 414 and BUS 415, and OCOB graduate standing or approval from the Associate Dean.

GSA 552 Fraud Auditing and Examination (4)

Occupational and financial statement fraud; particular emphasis on the breakdown of corporate governance and ethics systems and developing internal control systems to prevent and detect fraudulent activities. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 553 International Accounting (4)

International accounting, auditing, and corporate governance standards including international financial reporting standards (IFRS). 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 554 Advanced Spreadsheet Modeling for Accounting (4)

Advanced topics in electronic spreadsheets and their use in accounting and financial applications. Developing spreadsheet models for data analysis and decision making. Integrating automation tools and external data sources into spreadsheets. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 555 Accounting Database Modeling and Analysis (4)

Fundamental concepts in database analysis, design, implementation, administration, and audit including issues such as requirements specification, REA modeling, ER modeling, normalization, SQL, transaction control, database security, and query optimization. May also include topics such as data warehouses, XBRL and ebXML. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 556 Financial Statement Analysis and Valuation (4)

Comprehensive coverage of selected topics on financial statement analysis and valuation. Topics include: security valuation, financial accounting analysis, financial ratio analysis, cash flow analysis, structured forecasting, credit analysis, the cost of capital, valuation models, valuation ratios, real option valuation, earnings quality. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSA 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB—GRADUATE STUDIES—BUSINESS

GSB 500 Independent Study (1-4)

Advanced study planned and completed under the direction of the Director of Graduate Programs. Open only to graduate students who have demonstrated ability to do independent work. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. Prerequisite: OCOB graduate standing and formal petition with approval from the Associate Dean.

GSB 501 Individual Research (1-4)

Advanced individual research planned and completed under the direction of a member of the college faculty. Designed to meet the needs of qualified students who wish to pursue investigations which cannot be followed effectively in regularly offered elective courses. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. Prerequisite: OCOB graduate standing and formal petition with approval from the Associate Dean.

GSB 503 Collaborative Industry Project (1-8)

Collaborative business project with a client organization that allows graduate level students the opportunity to apply knowledge, skills and competencies to address a business problem. Small teams work in collaboration with a client organization and a faculty advisor. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. The project may last up to one year. Prerequisite: OCOB graduate standing and formal petition with approval from the Associate Dean.

GSB 511 Accounting for Managers (4)

Emphasis on development of the ability to read and interpret public and internal financial reports. Public reporting responsibilities of companies and management's responsibilities for developing and maintaining effective internal control systems. 3 lectures, 1 activity. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 512 Quantitative Analysis (4)

Focus on a variety of statistical techniques that help to transform data into useful information that can be used to make informed business predictions and

decisions. 3 seminars, 1 laboratory. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 513 Organizational Behavior (4)

Application of behavioral, social and organizational science concepts to management. Individual, team and organizational levels of analysis, including such topics as expectations, perception, motivation, communications, creativity, leadership, cultural and ethical behavior, group dynamics, team effectiveness, work design, organization change and development. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 514 The Legal and Regulatory Environment of Business (4)

Legal and regulatory environment in which business operates. Consideration of historical, societal, and global perspectives reflecting political, social and/or economic beliefs and values. Strong emphasis on fundamental concepts of law and analytical tools to understand interaction between law, ethics and management decisions. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 522 Advanced Management Information Systems (4)

Analysis of the challenges, successes, and failures managers face when planning for and implementing information system initiatives, particularly enterprise systems such as supply chain management, customer relationship management and enterprise resource planning systems. Focus on the strategic and operational impact of emerging information technologies in modern day business management. Design and development of knowledge worker applications including database and decision support systems. 3 lectures, 1 activity. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 523 Managerial Economics (4)

Managerial economics, or microeconomics, focuses on private markets. Choices made by firms and consumers within topics that include demand, supply, efficiency, marketing structure, and government intervention. Development of an analytical framework for analyzing how these topics are important for managers. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 524 Marketing Management (4)

Introduction to marketing management. Concepts and principles necessary to plan, direct and control the product, promotion, distribution and pricing strategies of the firm. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 525 Project Management (4)

Focus on project management tools and processes required to establish priorities for and management of projects within normal and abnormal scope, money and time constraints. Planning, organizational and resource challenges common to a variety of project types. Product life cycle, normal operational, new product introduction and profit oriented product family projects reviewed in service and production environments. 3 lectures, 1 laboratory. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 526 Knowledge Management and Business Intelligence (4)

Relationships among knowledge management (KM), knowledge organizations and knowledge workers. Mapping of the field of knowledge management and exploration of the nature and key features of KM. Discussion of knowledge management and business intelligence central themes using case studies; alternative ways to design, implement and improve KM systems in organizations; business intelligence, decision support systems and data warehousing. Integration of querying, reporting, OLAP, data mining and data warehousing functions. 3 lectures, 1 activity. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 527 Management of Information Security (4)

Topics of information security and the need for security from a managerial perspective. Legal, ethical and professional information security issues. Planning for security and contingency considerations. Business policies and programs for organizational security. Risk management and control as mechanisms for protection. Examples of information security issues and practices implemented in today's business environment. 3 lectures, 1 activity. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 528 Commercial Development of Innovative Technologies (4)

Conceptual business frameworks for commercialization of new and innovative products and technologies. Business aspects of innovative technologies as they relate to core functional areas such as finance, accounting, marketing, operations, and business and intellectual property law. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 529 Effective Communication Skills for Managers (4)

Enhancement of business writing and oral presentation skills, organized around two areas: 1) preparing written business documents and reports, and 2) professional oral presentation skills. Preparation of a variety of business reports and documents. Multiple business presentations. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 531 Managerial Finance (4)

Theories, practices and tools of corporate financial decision making. Topics include valuation of fixed income securities and stocks, capital budgeting, capital structure, dividends, and an overview of financial markets and institutions. Introduction to valuation of derivative securities, market efficiency, and agency costs. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 533 Aggregate Economics Analysis and Policy (4)

Development of the theoretical and empirical framework of the macroeconomy in which businesses must operate. Topics include GDP, inflation, unemployment, interest rates and monetary and fiscal policies. The dynamics of the macroeconomic environment over time. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 534 Production and Operations Management (4)

Introduction to the operations function and its interaction with other areas in an organization. Emphasis on strategic and tactical decisions to achieve competitive advantage in cost, delivery speed and reliability, quality, flexibility, and product innovation through manufacturing and services. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 537 Corporate Governance in Ethical Organizations (4)

Coverage of mechanisms, at the firm level, that contribute to more effective corporate governance and ethical climate at publicly traded corporations. Topics include role of boards of directors, audit committees, structures and systems that affect ethical climate in organizations. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 538 Emerging Issues in Business (4)

Focus on one or more developing, cutting-edge issues facing contemporary managers within a specific business discipline. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 539 Graduate Internship in Business (2-8) (CR/NC)

Correlation of experience and academic knowledge. Placement in a supervised business or public organization. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. Credit/No Credit grading only. Prerequisite: OCOB graduate standing and formal petition with approval from the Associate Dean.

GSB 541 Federal Income Tax for Business (4)

An introduction to the principles of business taxation. Emphasis of the role taxes play in financial and managerial decision making and how taxes motivate people and institutions to engage in certain transactions and activities. 4 lectures. Prerequisite: GSB 511 and OCOB graduate standing or approval from the Associate Dean.

GSB 555 Negotiation for Managers (4)

Negotiation concepts and practice in two-party and multiple-party situations faced by practicing managers. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 556 Entrepreneurship and New Venture Management (4)

Exploration of entrepreneurship with emphasis on the formation and management of new business ventures. Analysis of typical operating problems of these firms and application of appropriate techniques for their solution. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 560 Derivative Markets and Instruments (4)

Introduction to derivative markets and their key instruments. Application of financial theory to the problems of valuing derivative securities and the management of business risks with derivative instruments. Principal securities considered include forwards, futures, options, and swaps. 4 lectures. Prerequisite: GSB 531 and OCOB graduate standing or approval from the Associate Dean.

GSB 562 Seminar in General Management and Strategy (4)

Application of interdisciplinary skills to business and corporate strategy formulation and implementation. Analysis of interdependence between external

environments and internal systems. Focus on responsibilities, tasks, and skills of general managers. Case studies, group problem solving. Integrating course of MBA core curriculum. Course satisfies comprehensive examination requirement. 4 seminars. Corequisite: OCOB graduate standing and GSB 511, GSB 513, GSB 523, GSB 524, GSB 531, GSB 533 and either GSB 512 or IME 503 and either GSB 534 or IME 580 or approval from the Associate Dean.

GSB 563 International Business Tour (4)

Business tour exposure to different management systems and their operating environments. Pre-trip and on-the-road meetings, readings, case studies and discussions. Tours of firms, government offices, ministries, etc; interviews of managers and government officials. Conducted in English. Passport required. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 2 seminars, 2 activities. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 564 Entrepreneurial Finance (4)

The process of financing new and fast-growing firms. Preparation of pro forma financial statements for a new venture. Readings on the venture capital process, from seed capital through the initial public offering (IPO). Valuation of firms seeking venture capital, and those planning their IPO. Valuing convertible securities. Real options valuation. 4 lectures. Prerequisite: GSB 531 and OCOB graduate standing or approval from the Associate Dean.

GSB 567 Advanced Seminar in International Business Management (4)

Integration of management concepts within complex multinational organizations. Interdisciplinary approach to identifying and assessing multinational and global competitive environments and strategies; structuring and managing interdependent multinational operations; addressing conflicts between domestic and international policies and practices in multinational enterprises. Case studies, simulations, group analysis and problem solving. Course satisfies the culminating experience through the comprehensive examination option. 4 seminars. Corequisite: OCOB graduate standing and GSB 511, GSB 513, GSB 523, GSB 524, GSB 531, GSB 533 and either GSB 512 or IME 503 and either GSB 534 or IME 580 or approval from the Associate Dean.

GSB 569 Managing Technology in the International Legal Environment (4)

Practical legal decisions required to conduct business for or with high technology companies. Methods to protect high technology developments in international markets, including copyrights, patents, trade secrets, trademarks and contracts. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Total credit limited to 8 units. The Schedule of Classes will list title selected. 1-4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 573 Marketing Research (4)

Preparation to become competent users and creators of marketing research information. Focus on collecting customer information as well as analyzing, interpreting and presenting information to be used in executive decision making. 4 lectures. Prerequisite: OCOB graduate standing and GSB 524 and either GSB 512 or IME 503 or approval from the Associate Dean.

GSB 574 Seminar in Labor-Management Relations (4)

The impact of unionized labor on management practice. Three challenges to management; namely, the organizing challenge, the negotiation challenge, and the grievance/arbitration challenge. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 576 Seminar in Quality and Performance Management (4)

Principles and techniques of quality and performance management as applied to organizations in the private and public sector. Emphasis on competitive implications, integration of fundamental management techniques, quality management tools, and new management technologies focused on continuous organizational improvement. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 577 Advanced Quantitative Business Analysis (4)

The necessary conceptual framework of operations research techniques for solving key problems encountered while managing an enterprise. Concepts of linear programming, simulations, network models, inventory models, PERT/CPM, and forecasting techniques. 3 seminars, 1 laboratory. Prerequisite: GSB 512 and OCOB graduate standing or approval from the Associate Dean.

GSB 578 International Business Management (4)

Managerial concepts and techniques appropriate for analysis and decision making within international businesses. Environmental and organizational factors influencing multinational operations. Assessing international market opportunities and entry modes. Complexities of multinational management strategy, structure and systems. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 579 Manufacturing Strategy (4)

Strategic role of manufacturing in the overall corporate competitive strategy. Matching manufacturing capabilities and marketing needs, capacity planning, matching process technology with product requirements. Developing flexible capabilities, central to developing and implementing an effective manufacturing strategy. 4 seminars. Prerequisite: GSB 534 and OCOB graduate standing or approval from the Associate Dean.

GSB 583 Management of Human Resources (4)

An overview of the major functional and support activities in the personnel/human resource field, including strategic human resource planning, job analysis, recruitment, selection, performance appraisal, compensation, employee rights, and employee safety and health. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 584 Corporate Financial Policy (4)

An overview of the factors that affect corporate financial decisions, including firms' financing, investment and hedging policies. Factors included: taxes, transaction costs, contracting (between managers and shareholders, and between shareholders and other claimholders such as bondholders), and asymmetric information. 3 seminars, 1 activity. Prerequisite: GSB 531 and OCOB graduate standing or approval from the Associate Dean.

GSB 585 Investments and Portfolio Management (4)

The application of financial theory to the problems of investment management. Topics cover the valuation of basic financial instruments, portfolio optimization, risk management, asset allocation, the CAPM, and market efficiency. Required use of optimization software and writing spreadsheet programs. 4 seminars. Prerequisite: GSB 531 and OCOB graduate standing or approval from the Associate Dean.

GSB 586 Financial Markets and Instruments (4)

The form and function of major types of financial institutions and markets. Exposure of financial institutions to a wide variety of risks, the successful management of which is important for the growth and survival of these institutions (liquidity risk, interest rate risk, market risk, credit risk, off-balance-sheet risk, and operating risk). In-depth exploration of the measurement and management of these risks. 4 seminars. Prerequisite: GSB 531 and OCOB graduate standing or approval from the Associate Dean.

GSB 587 International Financial Management (4)

The international aspects of corporate finance and investing. Balance of payments, foreign exchange with emphasis on exchange rate determination, exchange risk, hedging, and interest arbitrage, international money and capital markets, international financing, and international banking. 4 seminars. Prerequisite: GSB 531 and OCOB graduate standing or approval from the Associate Dean.

GSB 589 Accounting Policy (4)

Role of management in establishing and directing accounting policy. Coverage includes the impact of management decisions on external reporting and taxes and the impact of financial reporting requirements on management decisions. 4 seminars. Prerequisite: GSB 511 and OCOB graduate standing or approval from the Associate Dean.

GSB 595 Managing Change (4)

The knowledge and the elementary skills/competencies needed to intervene in an organization in order to improve its effectiveness. Design and use of action to improve organizational effectiveness. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

GSB 596 Economic Forecasting (4)

Applications to business planning of selected economic forecasting techniques. Classical time series analysis, Box-Jenkins (ARIMA) models, leading indicators and input-output analysis. 3 seminars, 1 laboratory. Prerequisite: GSB 512, GSB 523 and OCOB graduate standing or approval from the Associate Dean.

GSB 597 Seminar in Selected Economic Problems (4)

Selected economic problems analyzed at an advanced level in a particular field, such as international trade, public finance, urban, industrial organization or

transportation. 4 seminars. Prerequisite: GSB 523 and OCOB graduate standing or approval from the Associate Dean.

HCS—HORTICULTURE AND CROP SCIENCE

HCS 110 Orientation to Horticulture and Crop Science (2) (CR/NC)

Understand depth and breadth of horticulture, field crops, and plant protection careers. Examination of curricula within the department. Introduction to both student and professional organizations. Emphasis on curriculum and career planning. Required of all Horticulture and Crop Science students. Credit/No Credit grading only. 1 lecture, 1 activity.

HCS 120 Principles of Horticulture and Crop Science (4)

Introduction to horticulture and crop science. Basic plant processes, classification, anatomy, physiology, and biotechnology. Effect of environment on plants and how we control it. Introduction to plant growth including propagation, media, irrigation, nutrition, management, harvest, and post harvest handling. People's use of plants. Field trip required. 3 lectures, 1 laboratory.

HCS 124 Plant Propagation (4)

Plant propagation practices with emphasis on understanding why practices are used, how they work, and how they are applied in commercial horticulture. Field trip required. 3 lectures, 1 laboratory. Prerequisite: BOT 121 and HCS 120.

HCS 200 Special Problems for Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total graduation credit limited to 4 units, with a maximum of 4 units per quarter. Report required. Prerequisite: Consent of instructor.

HCS 231 Commercial Seed Production (4)

Production of field and vegetable seed. Seed technology, germination, quality control, seed enhancement, storage and handling of seed, and seed laws. Field trip to a seed conditioning/seed enhancement facility required. 3 lectures, 1 laboratory. Prerequisite: HCS 120 or VGSC 230.

HCS 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

HCS 304 Plant Breeding (4)

Principles and techniques used to develop new plant varieties. Sexual reproduction, inheritance, selection and biotechnology methods useful in breeding of plants. Field trip required. 3 lectures, 1 laboratory. Prerequisite: CRSC 132, HCS 120 or BOT 121.

HCS 327 Abiotic Plant Problems (3)

Diagnosis of physiological disorders associated with environmental and nutritional factors. Particular emphasis on the systematic inquiry process. Case histories, multimedia use. 2 lectures, 1 laboratory. Prerequisite: HCS 124, CHEM 111, SS 121.

HCS 329 Plants, Food and Biotechnology (4)

Agriculture as applied biology and its impact on civilization. Application of technology to increase the efficiency of food production. Genetics and biotechnology; culminating in an assessment of genetically engineered foods, the myths, the controversy, the science. Not open to CRSC or FRSC majors. 3 lectures, 1 laboratory. Prerequisite: Completion of one of the following: BIO 111, BIO 114, BIO 161, BOT 121, or HCS 120. Recommended: Junior standing. *Crosslisted as BOT/HCS 329.* Fulfills GE Area F.

GE Area F

HCS 339 Internship in Horticulture and Crop Science (1–12) (CR/NC)

Selected Horticulture and Crop Science students will spend up to 12 weeks with an approved agricultural/horticultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of instructor.

HCS 340 Principles of Greenhouse Environment (4)

Analysis of problems and practices affecting the contemporary commercial horticulturist. Analysis and operation of greenhouses and related equipment stressing the effect of environment on plant growth. Field trip required. 3 lectures, 1 laboratory. Prerequisite: EHS 245.

HCS 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total degree credit limited to 4 units, with a maximum of 4 units per quarter. Report required. Prerequisite: Consent of instructor.

HCS 410 Crop Physiology (4)

Ecological and physiological interactions associated with the production of crop plants. Physiological and biochemical processes that elucidate the mechanism of whole plant performance and responses to the environment. 3 lectures, 1 laboratory. Prerequisite: BIO 263 or HCS 120; BOT 121 or BIO 162; and CHEM 312 or CHEM 316.

HCS 421 Postharvest Technology of Horticultural Crops (4)

Respiration, ethylene, ripening and senescence; modified atmosphere packaging, controlled atmosphere storage, packinghouses and transportation; survey of postharvest techniques to maximize commodity shelf-life. Field trip required. 3 lectures, 1 laboratory. Prerequisite: Junior standing.

HCS 450 Plant Biotechnology Laboratory (2)

Application of genetic engineering technology to plants; methods of plant tissue culture and transformation. 2 laboratories. Prerequisite: BIO 303 or BIO 351 or CHEM 373 or HCS 304. *Crosslisted as BOT/HCS 450.*

HCS 461 Senior Project I (2)

Selection of a project under faculty advisor approval. Initial research and data gathering period for project information. Projects typical of problems which graduates must solve in their fields of study or employment. Project results are presented in a formal written report completed in HCS 462. Contract drawn up with approval of advisor. Minimum 60 hours. Prerequisite: Junior standing and completion of GE Area A1 and consent of instructor.

HCS 462 Senior Project II (2)

Continuation of Senior Project development. Write-up of rough draft and formal draft of project. Completion of formal written report under advisor supervision. Minimum 60 hours. Prerequisite: Consent of instructor.

HCS 463 Senior Seminar (1)

Oral presentations by students on their senior projects, critical thinking assignment. Preparation for entry into the business world. Guest speakers. 1 activity. Prerequisite: Senior standing.

HCS 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

HCS 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

HCS 500 Individual Study in Horticulture and Crop Science (1–6)

Advanced independent study planned and completed under the direction of a member of the Horticulture and Crop Science faculty. Total credit limited to 6 units; may be repeated in same term. Prerequisite: Consent of instructor.

HCS 511 Ecological Biometrics (4)

General survey of current analytical methodology available to ecological researchers to evaluate effects and assess the underlying mechanisms that drive natural and cultivated ecosystems. Methodology includes general linear models, ordination, survival analysis, multivariate analyses, and computer simulations. Student research used as a basis for instruction. Total credit limited to 8 units. 3 seminars, 1 activity. Prerequisite: STAT 218 or STAT 512, or consent of instructor. *Crosslisted as HCS/PPSC 511.*

HCS 539 Graduate Internship in Horticulture and Crop Science (1–9)

Application of theory to the solution of problems of agricultural production or related business in the fields of horticulture and crop science. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of instructor.

HCS 570 Selected Topics in Horticulture and Crop Science (1–4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 12 units; may be repeated in same term. 1–4 seminars. Prerequisite: Consent of instructor.

HCS 571 Selected Topics Laboratory in Horticulture and Crop Science (1–4)

Directed group laboratory of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 12 units; may be repeated in same term. 1–4 laboratories. Prerequisite: Consent of instructor.

HCS 575 Postharvest Instrumentation and Experimentation (3)

Hands-on instruction in the instrumentation available to conduct postharvest research, including discussions of the scientific methods and typical postharvest studies. Implementation and dissemination of a personalized postharvest experiment required, both as a slide presentation and a poster. Independent research. 3 laboratories Prerequisite: STAT 218 and senior or graduate standing.

HIST-HISTORY**HIST 100 Introduction to the Study of History (2)**

Introduction to the study of history, focusing on methods, topics, skills in the History major at Cal Poly, and internship and career opportunities. To be taken in the first year of study at Cal Poly. 2 seminars.

HIST 110 Western Civilization: Ancient to Renaissance (4)

Beginnings of western civilization from the river valley societies of the Middle East, circa 3,000 BCE to the Renaissance in Western Europe to 1550 CE. Political, economic, social, intellectual, and artistic development of that period. 4 lectures.

HIST 111 Western Civilization: Reformation to the Present (4)

Development of western civilization from 1550 CE to the present. Comparison of liberal modernization of the West with the conservative modernization in Central, East and Southeast Europe. Political, economic, social, intellectual, and artistic developments of that period. Particular attention to understanding dynamics that produce pluralistic mass societies such as Great Britain and France, and authoritarian mass societies such as Nazi Germany and the Soviet Union. 4 lectures.

HIST 200 Special Problems for Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department chair.

HIST 206 American Cultures (4) GE D1 USCP

The social, cultural, constitutional, and political history of African American, Asian American, Native American, European American, and Latino/a men and women. 4 lectures. Fulfills GE D1 and USCP.

HIST 207 Freedom and Equality in American History (4) GE D1 USCP

The multiple and conflicting ways in which various Americans (defined in terms of race, class and gender) have struggled to formulate and promote their own understandings of freedom and equality, from the pre-conquest era to the present. 4 lectures. *Crosslisted as HIST/HNRS 207.* Fulfills GE D1 and USCP.

HIST 208 Survey of California History (4) USCP

Survey of California history from the pre-Columbian period to the present. Native American culture, Spanish imperialism, the Mexican War, gold rush, immigration, dominance of the Southern Pacific Railroad, progressivism, growth of Los Angeles, and California's impact on national and world economy and politics. 4 lectures. Fulfills USCP.

HIST 210 World History I (4) GE D3

Global history from the beginnings of organized agriculture to the Industrial Revolution. Focus on causation, using geography and cultural creation to highlight economic, political, social, and intellectual developments of the major civilizations of earth. 4 lectures. Open to Liberal Studies majors only. Fulfills GE D3.

HIST 213 Modern Political Economy (4) GE D2

The relationship between states and economies in the modern period. Themes of modernization, industrialization, and colonial expansion. The major theories of political economy, especially liberalism and socialism. 4 lectures. Fulfills GE D2.

HIST 214 Political Economy of Latin America and the Middle East (4) GE D2

Comparative examination of socio-economic structures of the Middle East and Latin America in the framework of global economy. Analysis of the historical context of integration of these two regions in the international economic system and the local reactions to the effects of global forces on national structures. 4 lectures. Fulfills GE D2.

HIST 216 Comparative Social Movements (4) GE D3

History of global social movements from the late nineteenth century to the present. May include, but not limited to: socialism, nationalism, feminism, fascism and communism, pacifism, life reform, gay liberation, indigenous peoples' movements, and environmentalism. Includes a service learning component. 4 lectures. *Crosslisted as HIST/HNRS 216.* Fulfills GE D3.

HIST 221 World History, Beginnings to 1000 (4) GE D3

History of world societies in comparative global perspective. Cross-cultural exchange, interaction, and conflict in the making of the world to 1000, concentrating on the rise of earliest human communities, growth of states, economic, political, and cultural transformations. 4 lectures. Fulfills GE D3.

HIST 222 World History, 1000-1800 (4) GE D3

History of world societies in comparative global perspective. Cross-cultural exchange, interaction, and conflict in the making of the world to 1800, concentrating on the global interaction and integration, cultural and ecological exchange, economic, political, and cultural transformations. 4 lectures. Fulfills GE D3.

HIST 223 World History, 1800 to Present (4) GE D3

Comparative history of Western and non-Western societies in global perspective. Cross-cultural exchange, interaction, and conflict in the making of the modern world, with focus on the economic, political, and cultural transformations that facilitated and emerged from imperialism. 4 lectures. *Crosslisted as HIST/HNRS 223. Formerly HIST/HNRS 215.* Fulfills GE D3.

HIST 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

HIST 300 Junior Seminar (4)

Historical analysis of selected problems and topics for undergraduates. Seminar format, intense discussion of readings and issues. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Completion of GE Area A and one course from Area D2 or D3. Recommended: Junior standing.

HIST 303 Research and Writing Seminar in History (5)

Designed to develop student's ability to research and write an interpretive paper on a specific topic. Seminar participants practice the skills of library research, historical and historiographical analysis, and writing and revising. Paper in lieu of final examination. The Schedule of Classes will list topic selected. 4 lectures and research project. Prerequisite: History major or minor, completion of GE Areas A1 and A3, or consent of instructor.

HIST 304 Historiography (4)

Theoretical approaches used to study the past, including scholarship on history and memory, the influence of interdisciplinary studies, the significance of race and gender as categories of analysis, and the place of history and the historian in contemporary society. 3 seminar meetings and research project. Prerequisite: HIST 303, History major.

HIST 306 The Witch-Hunt in Europe, 1400-1800 (4) GE D5

A history of the development of witchcraft ideas, persecutions, and skepticism in the western world from 1400 to 1800, focusing on the legal, economic, social, and intellectual currents that produced, fired, and eventually ended the phenomenon. 4 lectures. Prerequisite: Completion of GE Areas A and D3. Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 307 European Thought, 1800-2000 (4) GE D5

Intellectual and cultural history of Europe from the nineteenth century to the present. Liberalism, radical thought, feminism, evolutionary theory, psychoanalysis, structuralism, existentialism, and postmodernism. 4 lectures. Prerequisite: Completion of GE Area A and one course from D1, D2 or D3. Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 308 The Trans-Atlantic Slave Trade (4) GE D5

The African, Islam and Euro-American dimensions of the trans-Atlantic slave trade, with focus on its varying roots, organization and impact on cross-cultural and global levels. 4 lectures. Prerequisite: Completion of GE Area A and one course from D2 or D3. Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 309 Cultures of West Africa and the African Diaspora (4) GE D5

The cultures of West African and the African Diaspora, with special attention to the intersection of Animist, Islamic and Western cultures, and the survival of African cultures in the Americas as manifested in the artistic, religious, literary, and other humanistic legacies of the African Diaspora. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area D2 or D3. Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 310 East Asian Culture and Civilization (4) GE D5

The pre-modern and modern histories of China and Japan. Focus on the traditional era, the transition to modernity, cultural uniqueness within East Asian civilization, and western images of Asia. 4 lectures. Prerequisite: Completion of GE Area A and one course from GE Area D2 or D3. Recommended: Junior

standing. *Crosslisted as HIST 310/HNRS 312.* Fulfills GE D5 except for History majors.

HIST 314 The Middle East (4)

Political, social, and economic development of the Middle Eastern countries in the context of regional history and international politics since the birth of Islam. Particular attention to the resurgence of religious movements and their connection with nationalism and anti-colonialism in the region. 3 lectures and research project. Prerequisite: Junior standing.

HIST 316 Modern East Asia (4) GE D5

Modern histories of China, Japan and Korea: great disruptions of modernity that have transformed these societies, common characteristics of modernity in East Asia, great differences between Chinese, Japanese and Korean histories, and the mutually constitutive nature of these East Asian histories. 4 lectures.

Prerequisite: Completion of GE Area A and one course from Area D2 or D3. Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 317 The Lure of the Sea (4) GE D5

The history of the sea, people who travel across it, live alongside or in the midst of it, or simply seek it out. Topics include imperialism, maritime commerce, port cities, littoral societies, piracy, tourism, popular culture. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area D1, D2 or D3.

Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 318 The City in the Modern World, c. 1800-2000 (4) GE D5

Comparative history of social, economic, political, and cultural changes in urban life during the nineteenth and twentieth centuries. Topics may include but are not limited to: commerce and labor; disease and death; conservation and preservation; gender and sexuality; race and ethnicity. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area D1, D2 or D3.

Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 319 Modern South and Southeast Asia (4) GE D5

Modern histories of South and Southeast Asia: traditional empires and cultures, spread of modern capitalism, Western and Japanese colonialism, decolonization and independence, ethnic and religious tensions, roles in contemporary economy and geopolitics. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area D2 or D3. Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 320 Colonial and Revolutionary America (4) GE D5

Settlement and evolution of British America, background to the imperial dispute, events leading to the Revolution, Articles of Confederation, Constitution, the national economy, roles of and impact on African-Americans, women, Native Americans and Loyalists. 4 lectures. Prerequisite: Completion of GE Areas A and D1. Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 321 Civil War America (4) GE D5

The experiences of nineteenth-century Americans. Focus on industrialization, antebellum reform, slavery, the Civil War battlefield and homefront, Reconstruction, and the creation of a New South. 4 lectures. Prerequisite: Completion of GE Areas A and D1. Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 322 Modern America (4) GE D5

American history since 1900. Focus on domestic and foreign policy interactions, struggle of disenfranchised groups for social and political equality, and changes in culture and identity. 4 lectures. Prerequisite: Completion of GE Areas A and D1. Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 323 Versions of the Past: Novels, Comics and Movies (4) GE D5

An introduction to historical novels, comics, movies, memoirs and autobiographies as forms of historical representation in the contemporary U.S. Exploration of the vision of American history that each work presents and the truth-claims made for that particular vision. 4 lectures. Prerequisite: Completion of GE Areas A and D1. Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 324 The Historical Novel in the United States, 1960s to the Present (4) GE D5

An introduction to the historical novel as it has developed in the United States since the 1960s. Exploration of how historical novels typically represent the past and the ways in which they change our notion of what counts as "history." 4 lectures. Prerequisite: Completion of GE Areas A and D1. Recommended: Junior standing. *Crosslisted as HIST/HNRS 324.* Fulfills GE D5 except for History majors.

HIST 336 Britain at War: The British, the Americans and the Struggle for Freedom, 1939-1945 (4) GE D5

Historical examination of Great Britain's challenge to its sovereignty and freedom by the regime of Nazi Germany from 1939-1945. An account of how Britain formed an alliance with the United States, and how that partnership forged a successful campaign that culminated in the survival of Britain and destruction of the Nazi regime. 3 lectures, 1 activity. Prerequisite: Limited to London Study students. Completion of GE Area A and one course from D1, D2 or D3. Recommended: Junior standing. Fulfills GE D5 except for History majors.

HIST 339 History of Colonial Latin America (4)

Survey of Latin American history in the colonial period from 1492 to the early nineteenth century. Special attention to the indigenous cultures, the Iberian civilization, and the evolving relationship between them. 3 lectures and research project. Prerequisite: Junior standing.

HIST 340 History of Modern Latin America (4)

Social and political history of South America, Mexico, and Cuba during the nineteenth and twentieth centuries. Historical development of economic structure and socio-political and cultural institutions in the region. 3 lectures and research project. Prerequisite: Junior standing.

HIST 341 History of Modern Central America (4)

Political, social, and economic development of Central American countries in the context of regional history and international politics during the nineteenth and twentieth Centuries. 3 lectures and research project. Prerequisite: Junior standing.

HIST 354 History of Network Technology (4) GE Area F

History of computer network technology from the Cold War to the present. Origins of the Internet, development of TCP/IP, growth of network democracy, encryption, race and gender in cyberspace, Usenet and hypertext. 4 lectures. Prerequisite: Completion of one course from GE Area B. Recommended: Junior standing. Fulfills GE Area F.

HIST 359 Living in a Material World (4) GE Area F

Evolution of materials (ceramics, metals, polymers, composites, semiconductors) in the context of history. Traces the link between historical and technological developments enabled by materials from the Stone Age to the Electronic Age. 4 lectures. Prerequisite: Completion of one course from GE Area B. Recommended: Junior standing. *Crosslisted as HIST/MATE 359.* Fulfills GE Area F.

HIST 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department chair.

HIST 401 Early America (4)

Age of exploration. European powers in eastern North America. English settlements, development of the English colonies, with emphasis on Virginia and Massachusetts. Proprietary interests, growth of internal control, and colonial conflicts. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 402 American Revolution and the New Nation (4)

Background to the imperial dispute, events leading to the Revolution, Articles of Confederation, Constitution, impact on the national economy, women, African-Americans, Loyalists, Native Americans. The Schedule of Classes will list topic selected. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 404 The Era of Civil War and Reconstruction (4)

Exploration of the different patterns of life in the United States, in order to comprehend the emergence of sectionalism, the violent struggle of the Civil War, and the readjustments of the Reconstruction years. Emphasis on the experiences of ordinary Americans. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 405 African-American History to 1865 (4)

History of African Americans from the colonial period to the Civil War, roughly 1619-1865. The slave trade, slavery in the colonies, plantation slavery, the Black West, and free Black culture and institutions. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 406 African-American History from 1865 (4) USCP

History of African-Americans from the Civil War to the present. Reconstruction, racial segregation, the Harlem Renaissance, the Great Migration, the Civil Rights

Movement, Black Feminism and Black Power. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor. Fulfills USCP.

HIST 408 The Age of Roosevelt: Depression and World War, 1929-50 (4)

Principle forces affecting the nation's political, social and economic life during the Age of Franklin Roosevelt. Included are the politics of the New Deal, government regulation of the economy and response to the Depression, the rise of the modern presidency, racial and ethnic conflict, the politics of class and gender, the home front at war and post-war tension. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 409 Vietnam War at Home and Abroad (4)

Interaction of revolutionary Vietnamese nationalism with U.S. foreign policy. Analysis of the conduct of the war. Assessment of the impact of the war on U.S. society. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 410 Recent America Since 1950: Shattering of the American Consensus (4)

Political, social and economic forces that have shaped American life since 1950. Subjects included are the Red Scare, suburbanization, the civil rights movement, the Great Society, the politics and culture of protest, recasting the welfare state, and de-industrialization. Emphasis on racial, ethnic and gender issues in the collapse of the American Consensus. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 411 History of United States Foreign Relations (4)

History of American foreign policy from 1900 to the present. Emergence of the United States as a world power early in the century, the retreat following the Great War, Franklin Roosevelt's diplomacy leading to and through the Second World War, atomic diplomacy and the Cold War, four decades of Containment and the search for a new post-Cold War strategy. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 412 American Presidency (4)

Examination of the American presidency with emphasis on its role in American society since the beginning of the twentieth century. From the era of congressional government through the Imperial Presidency of the post-World War II period, and beyond, using presidential biography as a historical source. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 414 The Fall of Imperial China (4)

History of China's last dynasty, the Qing (1644-1912). Origins of Manchu, High Qing era of expansion and prosperity, creation of uniquely Manchu dynasty, new contact with Western imperialism, internal rebellions, modern reform policies, and revolution. 3 lectures and research project. Prerequisite: HIST 303 or completion of GE Area D5, junior standing or consent of instructor.

HIST 416 Modern Japan (4)

Japan's development as a modern state (1800-2000 CE). Themes include Japan's engagement with modernity and nationalism, the emperor system, Japanese imperialist expansion, and postwar reconstruction of Japanese society. 3 lectures and research project. Prerequisite: HIST 303 or completion of GE Area D5, junior standing or consent of instructor.

HIST 417 20th Century China (4)

Chinese history in the twentieth century: the fall of the Qing Dynasty and founding of Republic of China in 1912, problems of imperialism and modernity, Chinese Communist Party and People's Republic of China since 1949. 3 lectures and research project. Prerequisite: HIST 303 or completion of GE Area D5, junior standing or consent of instructor.

HIST 418 Chinese Film and History (4)

Examination of 20th century Chinese history through the use of Chinese feature films. Films (with English subtitles) serve as main texts for understanding the tremendous changes in modern Chinese history, and the evolving relationships between film and Chinese society. 4 lectures. Prerequisite: HIST 303 or completion of GE Area D5, junior standing or consent of instructor.

HIST 419 Modern Southeast Asia (4)

Modern history of mainland and maritime Southeast Asia, focusing on the development of political institutions and changing political and cultural identities. Early empires, expansion of capitalism, colonial rule and wars through era of independence. 3 lectures and research project. Prerequisite: HIST 303 or completion of GE Area D5, junior standing or consent of instructor.

HIST 420 History of Modern South Asia (4)

History of modern South Asia from the beginnings of British colonization to independence. Themes include relations between religious groups, the economic impact of British colonialism, political development, the role of indigenous

nationalist movements, and the shape of independence. 3 lectures and research project. Prerequisite: HIST 303 or completion of GE Area D5, junior standing or consent of instructor.

HIST 421 The History of Prostitution (4)

Comparative history of prostitution from antiquity to present. Analysis of prostitution from social, cultural, political, gendered and economic perspectives. 4 lectures. Prerequisite: HIST 303 or completion of GE Area D5, junior standing or consent of instructor.

HIST 422 Japanese Postwar Film and History (4)

Relationships between film and postwar Japanese society; recurring themes and images that link the diverse body of postwar Japanese film. Films (with English subtitles) serve as main texts for understanding of the tremendous changes in recent Japanese history. 3 lectures, 1 activity. Prerequisite: HIST 303 or completion of GE Area D5, junior standing or consent of instructor. Recommended GE D5: HIST 316, HUM 310.

HIST 423 The History of Vietnam (4)

The history of Vietnam and the influences on its national identities, including migration, cultural adaptations, temporality and territoriality, foreign influences, and racial formations within and outside of the borders of today's Vietnam. 3 lectures and research project. Prerequisite: HIST 303 or completion of GE Area D5, junior standing or consent of instructor.

HIST 424 Organizing and Teaching History (4)

Organization, selection, presentation, application, and interpretation of subject matter in history in secondary schools. 4 seminars. Prerequisite: Admission to teacher education program or valid teaching credential, or consent of instructor.

HIST 425 Social Sciences Teaching Practicum (1) (CR/NC)

Supervised practicum for part-time and full-time student teachers in the Social Science Credential Program. Teaching techniques and strategies useful for addressing a wide range of issues that arise in grades 6-12 social science classrooms. Credit/No Credit grading only. Total credit limited to 4 units. Prerequisite: HIST 424; concurrent: EDUC 469 or EDUC 479.

HIST 426 Imperial Russia (4)

Political, social, intellectual and economic roots of Russian Absolutism. Emergence of Russia as an imperial power, reform, reaction and revolution - 1689-1914. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 427 Soviet Russia (4)

Transformation of Russian autocracy from tsarist to Bolshevik under the impact of World War I and the Revolution of 1917. The formative force of Marxism-Leninism; Civil War; the "experimental" 20s; forced collectivization and industrialization; the Purges; "engineering" a new Soviet Woman and Man for a new communist world; War: Second and Cold. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 429 Precolonial African History (4)

Survey of African history from earliest times. Ancient African civilizations, Moslem penetration, the rise of indigenous kingdoms and the continuous impact of Atlantic slave trade. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 430 Modern African History (4)

Survey of African in the 19th and 20th centuries including European colonialism, African resistance, the rise of African nationalism and problems since independence. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 434 American Women's History to 1870 (4)

Female ideology and experience from the colonial period through the American Civil War. Use of a variety of sources, including women's own writing, in order to understand the history of women as it both reflects and shapes American culture and society. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor. *Crosslisted as HIST/WGS 434.*

HIST 435 American Women's History from 1870 (4)

The female past in the modern period of U.S. history. Considers how transformations in gender roles are reflective of other significant changes in American culture and society. Emphasis on class, race, and ethnic variations in women's experience. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor. *Crosslisted as HIST/WGS 435.* Fulfills USCP.

HIST 436 History of American Thought (4)

Thought and culture in America since the Puritans. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 437 Nazi Germany (4)

Background of German Romantic Nationalism; national unification and defeat in World War I; the failure of Weimar Democracy and political radicalization; the Nazi political, economic, and social revolution 1933-1939. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 438 History of American Agriculture (4)

Agricultural development with emphasis upon economic, political and social implications. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 439 Topics in California History (4)

In-depth analysis of selected political, economic, and social issues involved in the development of California from the earliest times to the present. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 440 Topics and Issues in the History of the United States (4)

Selected topics and issues in United States history. Descriptive subtitles assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and a research project. Prerequisite: HIST 303 or consent of instructor.

HIST 441 Topics and Issues in European History (4)

Selected topics and issues in European history. Descriptive subtitles assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 442 Topics and Issues in Latin American History (4)

Selected topics and issues in Latin American history. Descriptive subtitles will be assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 443 Topics and Issues in Asian History (4)

Selected topics and issues in Asian history. Descriptive subtitles will be assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 444 Topics and Issues in African History (4)

Selected topics and issues in African history. Descriptive subtitles will be assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 445 Topics and Issues in Comparative History (4)

Selected topics and issues in comparative history. Descriptive subtitles will be assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 446 Early Britain (4)

History of the British Isles from the reconstruction of Celtic history to the end of the Medieval epoch. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 447 Early Modern Britain (4)

History of the British Isles from the end of the Medieval epoch to the era of the American revolution, from Richard III to George III. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 448 Modern Britain: Industry, Empire and War (4)

History of the British Isles from the loss of the American colonies through the era of the World Wars and the dissolution of the British Empire. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 451 Medieval Europe (4)

Medieval Europe from the fall of Rome to the plague (400-1350 CE), with topics including the Barbarian Kingdoms, the early Church, Charlemagne, medieval art and Gothic architecture, Church fathers and Scholasticism, medieval philosophy, agricultural and commercial revolutions, and the Great Plague. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 452 Renaissance and Reformation Europe (4)

Europe from 1348 to 1620 CE, with topics including the urban milieu, Renaissance philosophy and artistic expression, the new prince, the educational revolution, the Renaissance Church, Martin Luther, Jean Calvin, and the monumental economic, social, and political changes of the sixteenth century. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 453 Religious Wars and Absolutism (4)

Europe from 1559 to 1715 CE, focusing on the Catholic-Protestant conflict, the rise of the Absolutist state (especially Louis XIV), the "Crisis of the Seventeenth Century," the Thirty Years War, the English Civil War and Cromwell, and the Newtonian Paradigm. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 454 The Age of Revolution and Napoleon (4)

Europe from the death of Louis XIV (1715) to the settlements of the Congress of Vienna (1815). International politics, continental and global warfare, the Enlightenment, "Enlightened Absolutism," the French and Industrial Revolutions, and Napoleon. Political, intellectual, economic, and social developments in the eighteenth century. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 455 Europe in the Age of Reaction and Revolution, 1815-1871 (4)

Reaction to the French Revolution. Industrialization. Liberal socialist and nationalist revolts against the conservative order of 1815. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 456 Europe in the Age of Imperialism and War, 1871-1919 (4)

Maturation of industrialization, socialism and nationalism. Imperialist competition of nation states for world hegemony. Explosion of the First World War. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 457 Europe in the Age of Fascism (4)

Democracy in crisis and the fascist alternatives. Second World War and the recovery of Europe in a bipolar world to the fall of the Berlin Wall, German reunification and the disintegration of Yugoslavia. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor.

HIST 458 Gender and Sexuality in Modern Europe (4)

Social, economic, political, and cultural effects of changing gender systems in modern Europe, particularly but not exclusively with regard to sex and sexuality. 3 lectures and research project. Prerequisite: HIST 303 or completion of GE Area D5, junior standing or consent of instructor.

HIST 459 Imperialism and Postcolonial Studies (4)

The history of imperialism and postcolonial studies and the influences of social, economic, and political impact of the empire system on indigenous people, cultures, economy, and politics. 3 lectures and research project. Prerequisite: HIST 303 or completion of GE Area D5, junior standing or consent of instructor.

HIST 460 Senior Project I (2)

Completion of paper or creative project under faculty supervision. Must be historical in nature, investigate a question of significance, include an historiographical analysis, and make an argument based on primary and secondary sources. Take HIST 461 during a subsequent quarter. Prerequisite: HIST 303; HIST 304; senior standing or consent of instructor; and History major.

HIST 461 Senior Project II (2)

Completion of paper or creative project begun in HIST 460 under faculty supervision. Prerequisite: HIST 303; HIST 304; HIST 460; senior standing or consent of instructor; and History major.

HIST 467 History Internship (4-12) (CR/NC)

Supervised work experience using skills of the discipline of history in a public agency ranging from 12 to 36 hours per week. Interns work directly under the supervision of an employee of the agency and are subject to the professional responsibilities typical of the state. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Junior standing. Completion of HIST 303 with grade of B or better and consent of internship coordinator.

HIST 468 Internship in State and National Park History (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. Total credit limited to 6 units. Recommended preparation: Western Civilization Survey, U.S. and California History, History of Art.

HIST 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 12 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. No major credit allowed; total credit limited to 24 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

HIST 500 Special Problems for Graduate Students (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units. Prerequisite: Graduate standing in History.

HIST 504 Graduate Study in History (4)

Weekly reading and discussion course on practical methods and theoretical approaches to the study and writing of history. 4 seminars. Prerequisite: Graduate standing in History.

HIST 505 Graduate Seminar in United States History (4)

Intensive study of selected topics in United States history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in History.

HIST 506 Graduate Seminar in European History (4)

Intensive study of selected topics in modern European history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in History.

HIST 507 Graduate Seminar in East Asian History (4)

Intensive study of selected topics in East Asian history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in History.

HIST 508 Graduate Seminar in Latin American History (4)

Intensive study of selected topics in Latin American history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in History.

HIST 509 Graduate Seminar in African History (4)

Intensive study of selected topics in African history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in History.

HIST 510 Graduate Seminar in Comparative History (4)

Intensive study of selective topics in comparative history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in History.

HIST 512 Supervised Reading for Comprehensive Exams (2)

Directed supervision of reading for MA comprehensive exams. Regular consultation between advisor and student. Total credit limited to 4 units. Prerequisite: HIST 504 and 12 units of graduate study.

HIST 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing.

HIST 599 Thesis (3)

Directed supervision of MA thesis. Regular consultation between advisor and student. Course to be taken three times over three separate quarters; total credit limited to 9 units. Prerequisite: Graduate standing in History.

HNRC—HONORS CONTRACT**HNRC 199 Honors Contract (CR/NC)**

Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. In these cases and with the permission of the Director of the Honors Program, the student may enter into a "Contract" to engage in honors-level work in a class on an individual basis. Credit/No Credit grading only. Prerequisite: Student must be in good standing in the Honors Program, and have permission of the Director.

HNRC 200 Honors Leadership Experience (CR/NC)

The Honors Program encourages its students to develop leadership skills through serving on the Honors Board, chairing Honors Committees, participating as International Student mentors and/or Preface discussion leaders. To receive Honors credit for these activities, students must also participate in a number of formal leadership-training seminars/workshops, and contribute their insights to the Honors and greater Cal Poly communities. Credit/No Credit grading only. Total credit limited to two courses. Prerequisite: Student must be in good standing in the Honors Program, and have permission of the Director.

HNRC 399 Honors Contract (CR/NC)

Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. In these cases and with the permission of the Director of the Honors Program, the student may enter into a "Contract" to engage in honors-level work in a class on an individual basis. Credit/No Credit grading only. Prerequisite: Student must be in good standing in the Honors Program, and have permission of the Director.

HNRC 400 Honors Professional, Social and Global Experience (CR/NC)

The Honors Program encourages its students to enhance their academic coursework by broadening their professional, social and global perspectives through professional internships/co-ops, participation in community projects and study abroad experience. To receive Honors credit, students must also reflect on these experiences and contribute their insights through presentations (oral and/or written) to the Honors and greater Cal Poly communities. Credit/No Credit grading only. Prerequisite: Student must be in good standing in the Honors Program, and have permission of the Director.

HNRS—HONORS**HNRS 100 Orientation to the University Honors Program (2) (CR/NC)**

Introduction to the Honors Program and overview of the University. Topics include the role of higher education, development of leadership skills, career advising, and guest speakers from the Cal Poly community. For University Honors Program students only. Credit/No Credit grading only. 1 lecture, 1 activity.

HNRS 101 Public Speaking (4)**GE A2**

Introduction to the principles of public speaking. Practical experience in the development, presentation, and critical analysis of speeches to inform, to persuade, and to actuate. Not open to students with credit in COMS 102. 4 lectures. *Crosslisted as COMS/HNRS 101.* Fulfills GE A2.

HNRS 112 Race, Culture and Politics in the United States (4)**GE D1 USCP**

Introductory and interdisciplinary study of the ways that race and ethnicity are created by both historical processes and American institutional formation – specifically social, political, economic, legal and cultural institutions. Special attention paid to the interlocking systems of race, class, gender and sexuality. 4 lectures. *Crosslisted as ES/HNRS 112.* Fulfills GE D1 and USCP.

HNRS 131 General Physics I (4)**GE B3 & B4**

Fundamental principles of mechanics. Vectors, particle kinematics. Equilibrium of a rigid body. Work and energy, linear momentum, rotational kinematics and dynamics. Primarily for engineering students, and for students majoring in the physical sciences. Not open to students with credit in PHYS 141. 3 lectures, 1 laboratory. Prerequisite: MATH 141 with grade C- or better, or consent of instructor, and MATH 142 or MATH 182 (or concurrent enrollment). Recommended: high school physics. For ME and AERO students only. *Crosslisted as HNRS/PHYS 131.* Fulfills GE B3 & B4.

HNRS 132 General Physics II (4)**GE B3 & B4**

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 141 or HNRS 131. *Crosslisted as HNRS/PHYS 132.* Fulfills GE B3 & B4.

- HNRS 134 General Physics IA (4)** **GE B3**
Fundamental principles of mechanics. Vectors, particle kinematics. Equilibrium of a rigid body. Work and energy, linear momentum, rotational kinematics and dynamics. Primarily for engineering and science students. Not open to students with credit in HNRS/PHYS 131. 4 lectures. Prerequisite: MATH 141 with grade C- or better, or consent of instructor, and MATH 142 or MATH 182 (or concurrent enrollment). Recommended: High school physics. *Crosslisted as HNRS 134/PHYS 141*. Fulfills GE B3.
- HNRS 141, 142, 143 Calculus I, II, III (4) (4) (4)** **GE B1**
Limits, continuity, differentiation, integration. Techniques of integration, applications to physics, transcendental functions. Infinite sequences and series, vector algebra, curves. 4 lectures. **141** prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 118 and high school trigonometry, or MATH 119. **142** prerequisite: HNRS/MATH 141 with a grade of C- or better or consent of instructor. **143** prerequisite: HNRS/MATH 142 with a grade of C- or better or consent of instructor. *Cross-listed as HNRS/MATH 141, 142, 143*. Fulfills GE B1.
- HNRS 145 Reasoning, Argumentation, and Writing (4)** **GE A3**
The principles of reasoning in argumentation. Examination of rhetorical principles and responsible rhetorical behavior. Application of these principles to written and oral communications. Effective use of research methods and sources. 4 lectures. Prerequisite: Completion of GE Area A1 with a C- or better, or consent of instructor. Recommended: Completion of GE Area A2. *Crosslisted as COMS/ENGL/HNRS 145*. Fulfills GE A3.
- HNRS 148 Reasoning, Argumentation and Professional Writing (4)** **GE A3**
The principles of reasoning in technical writing. Discussion and application of rhetorical principles, both oral and written, in technical environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Prerequisite: Completion of GE Area A1 with a C- or better, or consent of instructor. Recommended: Completion of GE Area A2. *Crosslisted as ENGL/HNRS 148*. Fulfills GE A3.
- HNRS 149 Technical Writing for Engineers (4)** **GE A3**
The principles of technical writing. Discussion and application of rhetorical principles in technical environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Prerequisite: Completion of GE Area A1 with a C- or better, or consent of instructor. Recommended: Completion of GE Area A2. For Engineering students only. *Crosslisted as ENGL/HNRS 149*. Fulfills GE A3.
- HNRS 200 Special Problems for Undergraduates (1–2) (CR/NC)**
Individual investigation, research, projects, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of instructor and Honors Program.
- HNRS 201 Survey of Economics (4)** **GE D2**
Basic principles of microeconomics and macroeconomics. Emphasis on applications to current national and global economic issues. For majors requiring one quarter of economics. Not open to students having previous credit in ECON 222 or equivalent. 4 lectures. *Crosslisted as ECON/HNRS 201*. Fulfills GE D2.
- HNRS 207 Freedom and Equality in American History (4)** **GE D1 USCP**
The multiple and conflicting ways in which various Americans (defined in terms of race, class and gender) have struggled to formulate and promote their own understandings of freedom and equality, from the pre-conquest era to the present. 4 lectures. *Crosslisted as HIST/HNRS 207*. Fulfills GE D1 and USCP.
- HNRS 212 Global Origins of United States Cultures (4)** **GE D3 USCP**
How the global dispersal of Europeans, Asians, and Africans, the hemispheric dispersal of Latin Americans, and the forced internal migration of Native Americans have contributed to American cultural heritage and the struggles for ethnic, class and gender equality, and justice. 4 lectures. *Crosslisted as ES/HNRS 212*. Fulfills GE D3 and USCP.
- HNRS 216 Comparative Social Movements (4)** **GE D3**
History of global social movements from the late nineteenth century to the present. May include, but not limited to: socialism, nationalism, feminism, fascism and communism, pacifism, life reform, gay liberation, indigenous peoples' movements, and environmentalism. Includes a service learning component. 4 lectures. *Crosslisted as HIST/HNRS 216*. Fulfills GE D3.
- HNRS 223 World History, 1800 to Present (4)** **GE D3**
Comparative history of Western and non-Western societies in global perspective. History of cross-cultural exchange, interaction, and conflict in the making of the modern world, with focus on the economic, political, and cultural transforma-
- tions that facilitated and emerged from imperialism. 4 lectures. *Crosslisted as HIST/HNRS 223*. Formerly *HIST/HNRS 215*. Fulfills GE D3.
- HNRS 230 Philosophical Classics: Knowledge and Reality (4)** **GE C2**
Critical examination of primary philosophical texts, from the ancient and modern periods, with focus on the nature of reality, and the sources and limits of human knowledge. 4 lectures. Prerequisite: Completion of GE Area A. *Crosslisted as HNRS/PHIL 230*. Fulfills GE C2.
- HNRS 231 Philosophical Classics: Ethics and Political Philosophy (4)** **GE C2**
Readings from primary philosophical texts, from the ancient and modern periods, with focus on the identification, evaluation and contemporary relevance of the central ethical and political themes and arguments presented in them. 4 lectures. Prerequisite: Completion of GE Area A. *Crosslisted as HNRS/PHIL 231*. Fulfills GE C2.
- HNRS 232 Masterworks of British Literature from the Late 18th Century to the Present (4)** **GE C1**
Broadly surveys Romantic, Victorian, Modern, and Contemporary British literature in an historical-cultural context. Investigates works from several genres and a variety of national and cultural voices. May include such writers as Wordsworth, Wollstonecraft, Dickens, G. Eliot, Wilde, Woolf, Yeats, and Gordiner. 4 lectures. Prerequisite: Completion of GE Area A. *Crosslisted as ENGL 231/HNRS 232*. Fulfills GE C1.
- HNRS 241 Calculus IV (4)**
Partial derivatives, multiple integrals, introduction to vector analysis. 4 lectures. Prerequisite: MATH 143. *Crosslisted as HNRS/MATH 241*.
- HNRS 244 Linear Analysis I (4)**
Separable and linear ordinary differential equations with selected applications; numerical and analytical solutions. Linear algebra: vectors in n-space, matrices, linear transformations, eigenvalues, eigenvectors, diagonalization; applications to the study of systems of linear differential equations. 4 lectures. Prerequisite: MATH/HNRS 143. *Crosslisted as HNRS/MATH 244*.
- HNRS 251 Great Books I: The Ancient and Classical World—From Myth to Reason (4)** **GE C1**
Examination of the ancient epics and classical literature of Mesopotamia, Greece, and Rome. Representative readings include "The Epic of Gilgamesh," "The Illiad," "The Odyssey," "Genesis," "Exodus," "Antigone," "The Symposium," "The Aeneid," and Marcus Aurelius's "Meditations." 4 lectures. Prerequisite: Completion of GE Area A. *Crosslisted as ENGL/HNRS 151*. Fulfills GE C1.
- HNRS 270 Selected Topics (1–4)**
Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.
- HNRS 299 Honors Group Seminar (1) (CR/NC)**
Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. This course allows students to engage in honors-level work in a standard, non-honors course on a group basis. Credit/No Credit grading only. Total credit limited to 4 units; repeatable in same term. Must achieve a B or better in the related standard course. 1 seminar.
- HNRS 303 Economics of Poverty, Discrimination and Immigration (4)** **GE D5 USCP**
Economic analysis of the cause, extent and impact of poverty, discrimination and immigration and of the policies designed to address these socioeconomic issues. Emphasis on the experience of African-Americans, Latinos, and women in the United States. 4 lectures. Prerequisite: Junior standing; completion of GE Areas A, D1, and either ECON 221 and ECON 222, or ECON 201. *Crosslisted as ECON/HNRS 303*. Fulfills GE D5 except for Economics majors. Fulfills USCP.
- HNRS 304 Values and Technology (4)** **GE C4**
Humanistic investigation into the theoretical and practical applications of technology with specific reference to the social effects of technological change. For all majors. Non-technical. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C. Recommended: Junior standing. *Crosslisted as HNRS 304/HUM 303*. Fulfills GE C4.
- HNRS 310 Air and Space (4)** **GE Area F**
Technological innovations that have led to modern aircraft and spacecraft as viewed from an historical perspective. Development of aerodynamics, propulsion systems, light-weight structures, and control systems. How aviation has affected, and been affected by, history. Impact of aviation on society, including civil and

military aircraft/spacecraft. Federal regulation of aviation, including air traffic control and airlines. Future developments in air and space technology. 4 lectures. Prerequisite: Junior standing and Completion of GE Area B. *Crosslisted as AERO/HNRS 310*. Fulfills GE Area F.

HNRS 311 Computers for Poets (4) GE Area F

How computers and computer devices work. Introduction to software systems and applications. How computers connect with various media including images, speech and data. How information is encoded and transmitted across networks. Relationship between the computer and human information processing. 4 lectures. Prerequisite: Junior standing and completion of GE Area B. *Crosslisted as CSC 310/HNRS 311*. Fulfills GE Area F.

HNRS 312 East Asian Culture and Civilization (4) GE D5

The pre-modern and modern histories of China and Japan. Focus on the traditional era, the transition to modernity, cultural uniqueness within East Asian civilization, and western images of Asia. 4 lectures. Prerequisite: Completion of GE Area A and one course from GE Area D2 or D3. Recommended: Junior standing. *Crosslisted as HIST 310/HNRS 312*. Fulfills GE D5 except for History majors.

HNRS 319 Natural Resource Ecology, Theories and Applications (4) GE B5

Scope and nature of "ecology" in modern society, including resource terminology and classifications systems; dynamics of natural systems (energy exchange and cycles); man's role as a principle agent of change; environmental impacts; historical perspective including people (ethnicity); and the future environment. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Area B2. *Crosslisted as HNRS/NR 319*. Fulfills GE B5.

HNRS 320 Values, Media, and Culture (4) GE C4

Contemporary popular culture and its relationship to the great art and literature of the past. Discussion of television, films, advertising, best sellers, popular magazines, children's stories, comics, and the great tradition of literature. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C. Recommended: Junior standing. *Crosslisted as HNRS/HUM 320*. Fulfills GE C4.

HNRS 321 Undergraduate Research Methods and Practice (4)

Research methods and tools for sciences and humanities, including formulating a research question, designing a study, using the scientific method to conduct and analyze surveys, and analyzing data. Emphasis on working in interdisciplinary research teams. Total credit limited to 8 units. 2 lectures, 2 activities. Prerequisite: Completion of GE Areas A and B1, and consent of instructor. *Crosslisted as HNRS/UNIV 321*.

HNRS 322 Leadership and Project Management (2)

Theory and practice in leadership and project management skills for engineering design teams. Basic issues related to, and tools used for, managing projects and concepts comprising project management. Emphasis on situations requiring resolutions and management decisions by groups representing various elements of an enterprise. 2 lectures. Prerequisite: Prerequisite: Junior standing in an engineering program or consent of instructor. *Crosslisted as HNRS/IME/MATE 322*.

HNRS 324 The Historical Novel in the United States, 1960s to the Present (4) GE D5

An introduction to the historical novel as it has developed in the United States since the 1960s. Exploration of how historical novels typically represent the past and the ways in which they change our notion of what counts as "history." 4 lectures. Prerequisite: Junior standing; completion of GE Areas A, D1 and any other lower-division Area D course. History majors will not receive GE Area D5 credit. *Crosslisted as HIST/HNRS 324*. Fulfills GE D5.

HNRS 332 British Literature in the Age of Enlightenment: 1660-1798 (4) GE C4 GWR

In-depth exploration of the dominant themes and preoccupations of the Age of Enlightenment. Historical and cultural contexts of canonical and non-canonical literature emphasized to illustrate 18th century Britons' views of themselves and their changing world. May include such writers as Dryden, Behn, Defoe, Swift, Pope, and Johnson. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. *Crosslisted as ENGL/HNRS 332*. Fulfills GWR for students with junior standing (90 units).

HNRS 333 British Literature in the Age of Romanticism: 1798-1832 (4) GE C4 GWR

In-depth exploration of the literature of the British Romantic period. Cultural, historical, and philosophic contexts will also be examined in both canonical and non-canonical works. May include such writers as Blake, Wordsworth, Keats, and Wollstonecraft. 4 lectures. Prerequisite: Completion of GE Areas A and C1.

Recommended: Junior standing. Fulfills GE C4 except for English majors. *Crosslisted as ENGL/HNRS 333*. Fulfills GWR for students with junior standing (90 units).

HNRS 375 Technology and the Environment: A Seminar on Contemporary Issues (4)

Interdisciplinary exploration of significant environmental issues (local, regional, national, or global) where technology is a major cause and/or offers a possible solution. 4 seminars. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3. Honors Program membership or nomination by CRP department head. *Crosslisted as CRP/HNRS 375*.

HNRS 380 Literary Themes (4) GE C4 GWR

Literature selected according to a particular theme. Emphasis on critical interpretation, aesthetic appreciation, and historical and cultural contexts. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Areas A and C1. Recommended: Junior standing. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units). *Crosslisted as ENGL/HNRS 380*.

HNRS 391 Appropriate Technology for the World's People: Development (4) GE D5

A broad overview of international development and appropriate design for sustainability. Besides traditional classroom work, students work in teams to address problems with technical solutions. Collaboration with mentors from the university, private sector, and nonprofits serves to provide diverse background and project mentorship. 4 lectures. Prerequisite: Junior standing; completion of GE Area A, two courses from GE D1-D4 and consent of instructor. *Crosslisted as HNRS/UNIV 391*. Fulfills GE D5.

HNRS 392 Appropriate Technology for the World's People: Design (4) GE Area F

Addresses the needs of international impoverished communities with technological solutions, which are inexpensive, ecologically sustainable, and socially appropriate. Group study of target communities, and design and construction of an appropriate technology prototype. Not open to students with credit in UNIV 492. 3 lectures, 1 laboratory. Prerequisite: Junior standing and completion of GE Area B, or graduate standing. Recommended: UNIV 391, GE Area D2, and GE Area D3. *Crosslisted as HNRS/UNIV 392*. Fulfills GE Area F.

HNRS 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 Honors Program Director.

HNRS 411 New Media Arts I (4)

Advanced-level presentation of new media theory, design and practice. Topics covered include, but are not limited to, interactivity theory, user-centered system design, cognitive psychology, media analysis, and basic web design theory. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Area A. Junior standing. *Crosslisted as ENGL/HNRS 411*.

HNRS 412 New Media Arts II (4)

Advanced level of work with the primary technologies and design/critique theories currently at use in the professional creation of new media works. Lectures and readings expand upon material presented in HNRS/ENGL 411. 4 lectures. Prerequisite: HNRS/ENGL 411 or consent of instructor. *Crosslisted as ENGL/HNRS 412*.

HNRS 424 Design of Museum Displays on Science, Engineering, and Technology (4)

The design and creation of educational museum displays that highlight science, engineering, and technology. Projects done by multidisciplinary teams and for clients in the community. Emphasis on design, teamwork, service learning and project management. 3 lectures, 1 laboratory. Prerequisite: GE Area B or Area F. *Crosslisted as HNRS/UNIV 424*.

HNRS 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

HNRS 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

HNRS 475 Sustainable Forest and Environmental Practices (15)

Typical modules related to sustainable resource management: ecosystem sampling and inventory methods, photo interpretation, hydrologic resources, road condition, project impact analysis, best management practices. Topics covered vary from term to term depending on the priority for learning modules. Residency at Swanton Pacific and extended field trips required. 10 lectures, 5 activities. Prerequisite: Consent of instructor. *Crosslisted as HNRS/NR 475.*

HNRS 490 President's Seminar: Science, Society and the University (1-4) (CR/NC)

Development of higher education in the United States; the role of science and research in the University; and the response of higher education to changing economic, political and social demands. Credit/No Credit grading only. 1-4 seminars. Prerequisite: Senior standing, GPA of at least 3.0, or consent of instructor. *Crosslisted as HNRS/HUM 490.*

HNRS 499 Honors Group Seminar (1) (CR/NC)

Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. This course allows students to engage in honors-level work in a standard, non-honors course on a group basis. Credit/No Credit grading only. Total credit limited to 4 units, repeatable in same term. Must achieve a B or better in the related standard course. 1 seminar.

HUM–HUMANITIES**HUM 240 Introduction to Media Arts and Technologies (4)**

The intimate connection between the desire for artistic expression and current technologies that can assist that expression. Examination of technologies for theater, sound, cinema, gaming, and embodied media. Guest speakers with expertise. 4 lectures. Prerequisite: Completion of GE C3; recommended: TH 210.

HUM 302 Human Values in Agriculture (4) GE Area F

Technical aspects of controversial agricultural issues. Identification of value conflicts, comparison of potential impacts, and use of relevant ethical principles. Weighing risks and benefits to resolve the issue. Extensive participation and interaction making oral presentations, role playing, and arguing in public forums. 3 lectures, 1 activity. Prerequisite: Completion of one course from GE Area B. Recommended: Junior standing. Fulfills GE Area F.

HUM 303 Values and Technology (4) GE C4

Humanistic investigation into the theoretical and practical applications of technology with specific reference to the social effects of technological change. For all majors. Non-technical. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C. Recommended: Junior standing. *Crosslisted as HNRS 304/HUM 303.* Fulfills GE C4.

HUM 310 Humanities in World Cultures (4) GE C4

Interdisciplinary examination of the humanities in a selected culture. Special focus on the arts, literature, philosophy and language in that culture. The Schedule of Classes will list topic selected. Repeatable to 12 units with different course titles. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C. Recommended: Junior standing. Fulfills GE C4.

HUM 312 Humanities in Chicano/a Culture (4) GE C4 USCP

Interdisciplinary examination of humanities in Chicano culture. Special focus on the arts, literature, social situations, and the monolingual and bilingual language aspects in Chicano culture. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C. Recommended: Junior standing. Fulfills GE C4 and USCP.

HUM 315 Critical Issues in Latin American Studies (4) GE D5

An interdisciplinary approach to selected topics and issues that address how social, economic, political, and cultural forces have shaped the challenges that face contemporary Latin America. Descriptive subtitles assigned to each course. The Schedule of Classes will list topic selected. Total credit limited to 12 units; repeatable in same term. 4 lectures. Prerequisite: Completion of GE Area A and two courses in lower division Area D (D2 and D3 recommended). Recommended: Junior standing. Fulfills GE D5.

HUM 316 London: From Roman Colony to World Capital (4) GE D5

Selective examination of the historical and cultural legacy of London within the development of Western civilization as well as its influence on the submission and eventual emergence of the non-Western world in the twentieth century. An analytical and interpretive study of how London shaped the social, economic, political and legal institutions of Western society. 4 lectures. Prerequisite: Enrollment in London Study; completion of GE Area A; completion of two

courses in GE Area D or consent of instructor. Corequisite: Enrollment in HUM 319. Recommended: Junior standing. Fulfills GE D5.

HUM 317 Latin American Studies: Activities (2) (CR/NC)

Examination and/or experience of Latin American culture, politics, and socioeconomic development via participant observation in Latin America. A field exploration of archeological sites, ecosystems, historic and contemporary public places, and venues of popular culture in Latin America. Credit/No Credit grading only. 2 activities. Prerequisite: Limited to Study Abroad Programs in Latin America. Corequisite: Enrollment in a 300-level course offered as part of a Study Abroad Program in Latin America.

HUM 318 Culture of Spain: Activities (2) (CR/NC)

Examination and experience of Spanish culture via participant observation in Spain. An introductory exploration of the development of Spanish architecture, art, literature, music, theatre and popular culture as experienced in Valladolid, Spain. Credit/No Credit grading only. 2 activities. Prerequisite: Limited to Valladolid, Spain Fall program. Co-requisite: HUM 310.

HUM 319 London Activities (2) (CR/NC)

Analytical and interpretive survey of the principal center of the English speaking world. The development of London from Roman administrative capital to modern cultural, financial and political colossus. Credit/No Credit grading only. 2 activities. Prerequisite: Limited to London Study students.

HUM 320 Values, Media, and Culture (4) GE C4

Contemporary popular culture and its relationship to the great art and literature of the past. Discussion of television, films, advertising, best sellers, popular magazines, children's stories, comics, and the great tradition of literature. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C. Recommended: Junior standing. *Crosslisted as HNRS/HUM 320.* Fulfills GE C4.

HUM 330 Cal Poly Land: Nature, Technology and Society (4) GE Area F

Scientific investigation of the natural features of the Cal Poly landscape and their transformations by land management technology. Analysis of the environmental, economic, social, and political effects of agricultural, resource extraction and construction technology on that landscape. Emphasis on the educational, land-use and long term planning issues of technology presented by this case study. 4 lectures. Prerequisite: Junior standing and completion of GE Areas A and B. *Crosslisted as AG/HUM/UNIV 330.* Fulfills GE Area F.

HUM 340 Media Arts and Technologies: Storytelling (4)

Creation of expressive technology-based pre-production works for standard television and film presentation to interactive technological environments. Pre-production script work, storyboarding, flow chart design, collaborative story creation, audience testing, and basic animatic construction. Visiting professionals work with students directly in collaborative workshops. 3 lectures, 1 activity. Prerequisite: HUM 240 and permission of Media Arts and Technologies minor coordinator.

HUM 341 Media Arts and Technologies: Cinematic Process (4)

Cinematic production including adapting a narrative for different presentation formats, storyboarding, lighting, sound recording, cinematography and editing. Production of short works designed as foundational pieces that can be built upon individually or in teams in independent study. Visiting professionals run collaborative production workshops. 2 lectures, 2 activities. Prerequisite: HUM 340 and permission of Media Arts and Technologies minor coordinator.

HUM 350 The Global Environment (4) GE Area F

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Areas A and B. *Crosslisted as AG/BUS/EDES/ENGR/HUM/SCM/UNIV 350.* Fulfills GE Area F.

HUM 361 Modernism (4) GE C4

Interdisciplinary survey of the eighteenth, nineteenth and twentieth-century concepts and cultural movements known as modernism throughout Europe, North America and Latin America. Disciplines may include architecture, art, drama, literature, music, philosophy, and photography. 4 lectures. Prerequisite: Completion of GE Area A and one class from Area C. Recommended: Junior standing. *Crosslisted as HUM/UNIV 361.* Fulfills GE C4.

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 standing and consent of instructor.

HUM 450 Summer Internship in London (12) (CR/NC)

Extensive work experience in London. Administration, orientation, and supervision of independent work by the service provider. Intensive two-week orientation, eight-week full-time work assignment. Evaluation by instructor, internship supervisor, and employer. Credit/No Credit grading only. 4 lectures, 8 units of independent study. Prerequisite: Junior standing and consent of the Director of London Study.

HUM 451 Latin American Studies Internship (4-12) (CR/NC)

Supervised work experience in a private, governmental, or non-governmental organization working in Latin America or on a critical issue related to Latin America. Student engagement in all duties and responsibilities of employees and interns engaged in comparable work. 30 hours of work experience per unit of credit. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Junior standing or consent of instructor.

HUM 470 Selected Advanced Topics (2–4)

Focused interdisciplinary study of a problem in the Humanities combining the insight and expertise of more than one discipline, such as history, literature, religious studies, philosophy, fine arts and the sciences. The Schedule of Classes will list title selected. 2–4 lectures. Prerequisite: Completion of GE Area A and junior standing.

HUM 480 Latin American Studies Field Work (4-12) (CR/NC)

Supervised field work on a faculty-led research project in Latin America or on a domestic project addressing a critical issue related to Latin America. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Junior standing and consent of instructor.

HUM 490 President's Seminar: Science, Society and the University (1-4) (CR/NC)

Development of higher education in the United States; the role of science and research in the University; and the response of higher education to changing economic, political and social demands. Credit/No Credit grading only. 1–4 seminars. Prerequisite: Senior standing, GPA of at least 3.0, or consent of instructor. *Crosslisted as HNRS/HUM 490.*

IME–INDUSTRIAL and MANUFACTURING ENGINEERING

IME 101 Introduction to Industrial and Manufacturing Engineering (1)

Introduction of major topics in industrial and manufacturing engineering. Time management, study skills and class scheduling necessary for academic success. University services. Professional ethics. Career opportunities review. 1 laboratory.

IME 130 Technical Foundations (2) (CR/NC)

Introduction to visualization, sketching, and drafting. Basic hand-tools, shop practices, and materials. Clearances and fits, threads and fasteners. Safety. Open to all majors. Credit/No Credit grading only. 1 lecture, 1 laboratory.

IME 140 Graphics Communication and Modeling (2)

Introduction to computer-aided drafting and modeling of solid objects. Visualization and sketching for engineers. Communication of design information to manufacturing using pictorials, orthographic projection, section views, and auxiliary views. Manufacturing tolerances. 1 lecture, 1 laboratory.

IME 141 Manufacturing Processes: Net Shape (1)

Metal casting as a net shape process in manufacturing. Properties of molding materials and methods of casting. Introduction to rapid prototyping. Pattern and casting design principles. 1 laboratory.

IME 142 Manufacturing Processes: Materials Joining (2)

Theory and application of metal cutting and welding processes. Includes shielded metal arc, flux cored arc, submerged arc, gas metal arc, gas tungsten arc, brazing, resistance, and oxy-acetylene processes. Bonding theory, joint design, codes and testing. Introduction to adhesive bonding. Open to all majors. 1 lecture, 1 laboratory.

IME 143 Manufacturing Processes: Material Removal (2)

Uses, capabilities, and theoretical and operational characteristics of lathe and milling machine tools, including conventional, automatic and numerical control. Cutting tool characteristics, machining parameters, quality control, and production methods. Design considerations for manufacturing. Introduction to robotics and automation. Open to all majors. 1 lecture, 1 laboratory.

IME 144 Introduction to Design and Manufacturing (4)

Computer-aided solid modeling of parts and assemblies. Introduction to conventional machining processes on lathes and mills, computer numerical control, quality control, production methods, and design for manufacturing. Open to all majors. 2 lectures, 2 laboratories. Prerequisite: IME 130 or IME 140 or consent of instructor.

IME 156 Basic Electronics Manufacturing (2)

Practical electronics manufacturing knowledge expanded through concepts such as CAD/CAM design, Design for Manufacture (DFM), documentation requirements, prototyping and production planning. Hands-on techniques learned for project planning, soldering, automation, hand tool usage and production methods. 1 lecture, 1 laboratory.

IME 157 Electronics Manufacturing (4)

Printed circuit board assembly; printed circuit board fabrication process; electronics packaging; overview of semiconductor manufacturing; design, documentation and fabrication of electronic units with emphasis on CAD/CAM. Open to all majors. 2 lectures, 2 laboratories.

IME 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

IME 223 Process Improvement Fundamentals (4)

Principles of work simplification and motion analysis. Recording of work flow and methods. Process improvement through work measurement and standards, time study, synthetic data, predetermined time systems and work sampling. Allowances and performance rating, productivity measures. Introduction to lean manufacturing principles. Client based project. 3 lectures, 1 laboratory. Prerequisite: MATH 141. Recommended: IME 101.

IME 239 Industrial Costs and Controls (3)

Estimation of manufacturing costs for production planning, cost analysis, and cost control. Planning, budgeting and control processes. Costs, accounting data and analysis of variances for managerial control, inventory valuation and decision making. Techniques of forecasting, pricing, cost estimating and cost reduction. 3 lectures. Prerequisite: IME 223.

IME 240 Additional Engineering Laboratory (1–2)

Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

IME 241 Manufacturing Process Design I (4)

Economic and engineering analysis of manufacturing processes. Cost estimation for production planning, analysis, and control. Analysis of machining process inputs and mechanisms as an example process. Test report writing, documentation, and inspection methods. Field trips to manufacturing centers. 3 lectures, 1 laboratory. Prerequisite: IME 143 or IME 144, PHYS 141.

IME 251 Introduction to Manufacturing Engineering Analysis (4)

State of the art methods and processes in mechanical and electronic manufacturing. Selection of materials for manufacturing. Product design and manufacturability. Specifications and metrology in manufacturing. Continuous improvement strategies, such as automation, group technology, value analysis, and flexible system design. 2 lectures, 2 laboratories. Prerequisite: IME 143 or IME 144, PHYS 131, CHEM 124.

IME 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

IME 301 Operations Research I (4)

Systems modeling methodology, mathematical model formulations, linear programming, graphical and simplex methods. Duality and sensitivity analysis. Transportation, transshipment and assignment models. Introduction to goal programming and elastic constraints. Computer applications. 3 lectures, 1 activity. Prerequisite: MATH 244.

IME 303 Project Organization and Management (4)

Design and implementation of a major industrial/business systems project. Project planning considerations. Motivational and influence techniques used in project management. Scheduling techniques with risk assessment. Resource leveling and management under constraints. Reducing project duration. Monitoring progress with earned value analysis. Project audit and closure. Planning and implementation of a project. Application of project management

software. 3 lectures, 1 laboratory. Prerequisite: Junior standing, IME 314 or equivalent.

IME 312 Data Management and System Design (4)

Design and management of industrial databases and reporting systems. Relationships of financial accounting databases and production systems. Efficient data entry and reports, queries, macro function, and Internet based database applications. 3 lectures, 1 laboratory. Prerequisite: CSC 232.

IME 313 Introduction to Information Systems Engineering (4)

Practical approach to use of modern information technologies related to industrial and manufacturing engineering. Use of networking and application software, including theory and practice. 3 lectures, 1 laboratory. Prerequisite: CSC 232.

IME 314 Engineering Economics (3)

Economic analysis of engineering decisions. Determining rates of return on investments. Effects of inflation, depreciation and income taxes. Sensitivity, uncertainty, and risk analysis. Application of basic principles and tools of analysis using case studies. 3 lectures. Prerequisite: MATH 241.

IME 319 Human Factors Engineering (3)

Analysis of factors influencing the efficiency of human work. Data on the physical and mental capacities of persons, the physical environment, work organization, and the problem of aging. Design of machines, operations, human computer interface and work environment to match human capacities and limitations, including the handicapped. Multidisciplinary team project. 3 lectures. Prerequisite: PSY 201 or PSY 202 or consent of instructor, and junior standing.

IME 320 Human Factors and Technology (4)

Analysis of cognitive, sensory and physical limitations and capabilities of operators and users of technology, both hardware and software, in working and living environments. Analysis of pertinent databases for a proactive approach to designing user-centered industrial products /systems, consumer products, and work environment. 4 lectures. Prerequisite: Junior standing and completion of GE Area B requirements. Fulfills GE Area F.

GE Area F

IME 322 Leadership and Project Management (2)

Theory and practice in leadership and project management skills for engineering design teams. Basic issues related to, and tools used for, managing projects and concepts comprising project management. Emphasis on situations requiring resolutions and management decisions by groups representing various elements of an enterprise. 2 lectures. Prerequisite: Junior standing in an engineering program or consent of instructor. *Crosslisted as HNRS/IME/MATE 322.*

IME 326 Engineering Test Design and Analysis (4)

Data gathering and statistical testing applied to industrial engineering and manufacturing fields. Experimental methods for product and process evaluation and comparisons; interpretation of engineering data. Engineering experimental design, linear and nonlinear regression, ANOVA, and multifactor ANOVA. Utilization of existing computer software. 4 lectures. Prerequisite: STAT 321 with a grade of C- or better, or consent of instructor.

IME 334 CAD/CAM (3)

Identification and study of the individual techniques of CAD/CAM as being practiced in modern industry. Total credit limited to 6 units. 2 lectures, 1 laboratory. Prerequisite: IME 144 or consent of instructor.

IME 335 Computer-Aided Manufacturing I (4)

Use of the computer to communicate design information to manufacturing. Computer Numerical Control (CNC) programming. Use of CAD/CAM software. Overview of manufacturing systems in an automated environment, including cellular manufacturing and computer-aided process planning. 3 lectures, 1 laboratory. Prerequisite: IME 144, CSC 232, or consent of instructor.

IME 336 Computer-Aided Manufacturing II (4)

Advanced Computer Numerical Control (CNC) programming and machine tool control. Machining center operation. Parametric representation of curves and surfaces. Computation of tool paths. Product and process design for CNC machining. CNC machine tool dynamics. Introduction to flexible manufacturing systems and robotics. Design and fabrication projects. 3 lectures, 1 laboratory. Prerequisite: IME 335, ME 212, MATH 244, or consent of instructor.

IME 341 Tool Engineering (4)

Engineering design of fixtures and tools for manufacturing processes. Interpretation of engineering design specifications. Material selection. Analysis of cost, quality, productivity, and safety in tool design. The role of tooling in manufacturing competitiveness. Design projects. 3 lectures, 1 laboratory.

Prerequisite: IME 241, CE 204, MATH 244, MATE 210, or consent of instructor.

IME 342 Manufacturing Systems Integration (4)

Analysis and design tools for production planning, control, and simulation of manufacturing systems. Use of systems modeling software. Overview of ergonomics and facilities design. 3 lectures, 1 laboratory. Prerequisite: MATH 241 and IME 223 or consent of instructor. Recommended: STAT 321.

IME 351 Advanced Material Removal Process Design (4)

Advanced turning and milling processes; grinding and non-traditional processes. Thread and gear manufacturing, producibility, machinability, part and tool materials, cutting fluids, and tool life testing. Finishes and measurement of surface roughness. Process design projects. 2 lectures, 2 laboratories. Prerequisite: IME 241, MATE 210 and MATE 215, and CE 204.

IME 352 Manufacturing Process Design II (4)

Advanced engineering analysis of material shaping processes, surface processing and assembly operations with emphasis on optimizing process parameters, equipment, and operational sequence. Process design projects. 2 lectures, 2 laboratories. Prerequisite: IME 141, IME 142, IME 241, MATE 210/215, CE 204.

IME 356 Manufacturing Automation (4)

Computers in the factory automation environment. Basic control theory including feedback. Programming and use of programmable logic controllers (PLC), human-machine interface (HMI), and industrial control systems. Interfacing of electro-mechanical systems; analog and digital inputs, output; programmable controllers. Computer process control. 3 lectures, 1 laboratory. Prerequisite: EE 321.

IME 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limit to 4 units. Prerequisite: Consent of instructor.

IME 401 Sales Engineering (2)

Concepts and principles of engineering in sales. Role of the professional engineer in the analysis, design, development, production, and final application of a product or system required by the buyer. 2 seminars. Prerequisite: Senior standing in engineering, or consent of instructor.

IME 404 Engineering Economic Decision Management (3)

Quantitative approaches to engineering and management problems. Time value concepts, breakeven and replacement analysis, optimization techniques for scheduling. Project cost estimation, resource management and risk analysis. Use of computer software packages. For non-majors only. 3 lectures. Prerequisite: Junior standing.

IME 405 Operations Research II (4)

Stochastic decision analysis. Queuing models, inventory models and analysis. Markov processes. Computer aided modeling and case studies. 3 lectures, 1 activity. Prerequisite: IME 301, IME 326 or consent of instructor.

IME 407 Operations Research III (4)

Systems modeling and solution of large scale problems using advanced operations research methods. Integer and goal programming. Application of nonlinear, quadratic, dynamic programming concepts. Case studies of systems modeling including software aided analysis. 3 lectures, 1 activity. Prerequisite: IME 301 or consent of instructor.

IME 408 Systems Engineering (3)

Systems, subsystems, static, dynamic, closed and open systems. Systems design requirements. Performance measures. Process control modeling and analysis, transform methods, linear systems analysis, digital, adaptive and steady state optimal control. Optimal search strategies. Manufacturing, maintenance, replacement and engineering applications. 3 lectures. Prerequisite: IME 326, IME 405, CSC 232.

IME 409 Economic Decision Systems (3)

Economic evaluation of information for complex decisions. Analysis of risks and uncertainties. Bayes theory and models. Decision theory, sequential decisions, and value of information applied to financial evaluation and control. Major project justification procedures. 3 lectures. Prerequisite: IME 239, IME 314, and IME 405, or consent of instructor.

IME 410 Production Planning and Control Systems (4)

Building blocks of manufacturing resource planning (MRP II). Demand forecasting, production planning, master scheduling development. BOM and inventory files. MRP computations and operational challenges. Capacity analysis

and production control in push and pull systems. Enterprise Resource Planning (ERP). Principles of JIT and lean manufacturing. 3 lectures, 1 laboratory. Prerequisite: IME 405 or IME 342.

IME 411 Production Systems Analysis (3)

Systems analysis for production control. Design of computer integrated planning and control systems for scheduling manufacturing orders, monitoring operating costs and control system performance evaluation. Development of computer-aided decision making framework. Interactive decision making using simulation modeling. 2 lectures, 1 laboratory. Prerequisite: IME 410, or equivalent.

IME 413 Flexible Manufacturing Systems (3)

Structure of flexible manufacturing systems. Planning and control for FMS. Tool management and operations control. Application of techniques related to production scheduling decisions. Cellular manufacturing and production flow analysis. Case studies of flexible manufacturing systems. Computer applications. 3 lectures. Prerequisite: IME 301. Recommended: STAT 321.

IME 416 Automation of Industrial Systems (3)

Automation in manufacturing and warehousing. Economic selection of automation systems. Projects in automation. 2 lectures, 1 laboratory. Prerequisite: IME 356 or equivalent.

IME 417 Supply Chain and Logistics Management (4)

Overview of key logistics and supply chain management concepts. Models and solution methods for the design, control, operation, and management of supply chains. Techniques that are used to analyze supply chains. Team projects in partnership with industry sponsors. 4 lectures. Prerequisite: IME 342, or IME 410 or consent of instructor.

IME 418 Product-Process Design (4)

Innovation for product development, engineering management of new product development and manufacturing competitiveness. Concurrent engineering. Study of manufacturability constraints in terms of prototyping, designing, testing, pre-production support, processing, quality, delivery, and customer satisfaction. Industrial design projects. Examination of relevant environmental and ethical problems. 3 lectures, 1 laboratory. Prerequisite: Senior standing in engineering or graduate standing or consent of instructor. Recommended: IME 341.

IME 420 Simulation (4)

Design and analysis of manufacturing and service systems by simulation. System modeling. Random number and function generators, programming, and characteristics of simulation languages. Design projects using real world problems. Introduction to rule-based expert systems. 3 lectures, 1 laboratory. Prerequisite: IME 326, IME 405, or consent of instructor.

IME 421 Manufacturing Organizations (3)

Theory and principles for manufacturing organizations. Competitive advantage. Strategic planning and operations management for organizations and teams in a rapidly changing environment. Engineering management concepts and practices. Team-based projects and cases. 3 seminars. Prerequisite: Junior standing; PSY 201, PSY 202, or KINE 250 or consent of instructor. Recommended: IME 314.

IME 422 Manufacturability Engineering (4)

Manufacturability constraints in terms of issues related to prototyping, designing, testing, preproduction support, processing, quality, delivery, and customer satisfaction. Hands-on projects to discuss the experimental results in dealing with the process of casting, machining, plastic modeling, and electronic board manufacturing. 3 lectures, 1 laboratory. Prerequisite: IME 341, IME 326. Recommended: IME 342.

IME 427 Process Optimization through Designed Experiments (4)

Experiments for optimization of industrial processes: process variables, response, measurements, analysis and interpretations. Statistical principles in design. Design approaches: conventional methods, response surface methodology, and Taguchi methods. Type of experiments: factorial, fractional factorial, mixture, and orthogonal arrays. Design projects using real world problems. 3 lectures, 1 laboratory. Prerequisite: IME 326 or consent of instructor.

IME 428 Engineering Metrology (4)

Measurement of attributes and variables; standards, accuracy and precision; mechanical, electronic and optical/laser measurement systems. Contact and non-contact measurement; straightness, flatness and squareness; GDT (Geometric Dimensioning and Tolerancing); CMM (Coordinate Measurement Machines); surface roughness; metrology for electronic products. 3 lectures, 1 laboratory. Prerequisite: IME 335 or consent of instructor.

IME 429 Ergonomics Laboratory (1)

Investigation of various physiological, sensory, and cognitive capabilities and limitations of people in work and living environments through laboratory data collection, design of experiments and statistical analysis. 1 laboratory. Prerequisite: IME 319, IME 326.

IME 430 Quality Engineering (4)

Quality control, reliability, maintainability, and integrated logistic support. Statistical theory of process control and sampling inspection. Risks associated with decisions based on operating characteristics of control charts and sampling plans. Reliability and life testing methods. Economics of statistical QC. Specifications and standards. 4 lectures. Prerequisite: IME 326 or STAT 302.

IME 431 Supplier Quality Engineering (4)

Customer-supplier partnership. Functions of Supplier Quality Engineering. Supplier selection, development, process qualification, concurrent engineering, value engineering. Process characterization, repeatability, consistency, process control. Quality system standards. Supplier survey, audit, rating, measurement of quality, delivery performance and certification. Customer service, corrective action approaches. 3 lectures, 1 laboratory. Prerequisite: IME 430.

IME 433 Advanced Work Measurement (3)

Predetermined time systems. Time formulas. Standard data systems. Use of statistical methods. Standard data systems applied to clerical, manufacturing, and micro assembly. Developing and maintaining computerized systems. Course will be administered with project orientation. 2 lectures, 1 laboratory. Prerequisite: IME 223, IME 326 or equivalent.

IME 435 Reliability Engineering I (3)

Reliability concepts and mathematical models, mechanical device reliability, electrical device reliability, systems reliability and maintainability, reliability data, assurance program elements. 3 lectures. Prerequisite: IME 326.

IME 437 Advanced Human Factors Engineering (3)

Team-based approach to human factors assessment of consumer and industrial products, systems, and information technology. Team building principles and techniques in human factors analysis. Usability analysis and ergonomics auditing through experimental methods. 2 lectures, 1 laboratory. Prerequisite: IME 319 and either IME 326 or IME 503.

IME 440 Quality Process Management (4)

Quantitative approaches to engineering and management of quality. Statistical process control, quality assurance concepts. Variability loss and off-line QC. Tolerance design and experimental design. Human factors and managerial dimensions influencing quality. For non-majors only. 4 lectures. Prerequisite: Junior standing or consent of instructor.

IME 441, 442 Engineering Supervision I, II (1,1)

Theory and principles of supervision. Application of fundamental concepts and techniques of supervision provided by assignment in engineering laboratories. 1 laboratory each. Prerequisite: Consent of instructor.

IME 443 Facilities Planning and Design (4)

Design concepts and input requirements in planning and design of new or renovation of existing manufacturing systems. Product, process, and flow and activity analysis techniques. Flow lines and buffering techniques. Computer-aided layout design and evaluation. Design of handling systems. Math models of location problems. Multidisciplinary team project. 3 lectures, 1 laboratory. Prerequisite: IME 144, IME 223, IME 405 or IME 342, IME 314, or equivalent. Recommended: IME 319, IME 420.

IME 455 Manufacturing Design and Implementation I (3)

A mix of industry and in-house structured group projects. Projects progress through a complete cycle from design through implementation. Application of project management methods. Examination of relevant economical and safety issues. 3 laboratories. Prerequisite: IME 418.

IME 457 Advanced Electronic Manufacturing (4)

Design and fabrication of commercial electronic products; PCB layout design, bill of material analysis and component purchasing, production planning and scheduling, programming automated surface-mount assembly line, marketing of products. Multidisciplinary project teams exposed to real-world challenges of electronics manufacturers. 2 lectures, 2 laboratories. Prerequisite: IME 156 or IME 157.

IME 458 Microelectronics and Electronics Packaging (4)

Materials, processes, and reliability of microelectronics and electronics packaging, surface mount assembly and printed circuit board fabrication.

Overview of semiconductor manufacturing and optoelectronics packaging. 3 lectures, 1 laboratory. Prerequisite: MATE 210 and PHYS 133 or consent of instructor. *Crosslisted as CPE 488/IME 458/MATE 458.*

IME 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Consent of instructor.

IME 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

IME 481 Senior Project Design Laboratory I (2)

Culminating design project typical of problems faced in professional practice. Individual or group projects typically involve system design, modeling, analysis and testing. Project method includes costs, planning, scheduling, appropriate research methodology and formal reports. 2 laboratories. Prerequisite: Senior standing in major and consent of instructor.

IME 482 Senior Project Design Laboratory II (3)

Continuation of IME 481. Involves research methodology: problem statement, method, results, analysis, synthesis, project design, construction (when feasible), and evaluation/conclusions. Project results presented in thesis-like formal reports suitable for reference library and formal oral presentations. 3 laboratories. Prerequisite: IME 481.

IME 493 Cooperative Education Experience (2) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units. Prerequisite: Sophomore standing and consent of instructor.

IME 494 Cooperative Education Experience (6) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units. Prerequisite: Sophomore standing and consent of instructor.

IME 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

IME 500 Individual Study (1–4)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Consent of department chair and supervising faculty member.

IME 501 Graduate Survey I (4)

Survey of traditional industrial engineering applications in industrial systems, work methods, measurements and analysis. Facilities design, automation and logistics of industrial operations. Human factors and cost estimation of industrial applications. 3 seminars, 1 activity. Prerequisite: Graduate standing.

IME 502 Graduate Survey II (4)

Survey of current issues in data analysis and mathematical modeling of industrial systems. Queuing theory, Markov Chains quality control and supply chain issues. 4 lectures. Prerequisite: Graduate standing and consent of instructor.

IME 503 Applied Statistical Methods in Engineering (4)

Application of hypothesis testing, regression models, and ANOVA models to forecasting, process optimization, cost estimation, work measurement, inventory control, scheduling, and ergonomics. Probability distributions of process outputs in industries and service systems such as Normal, exponential, Uniform, Hypergeometric, Binomial, and Poisson. Applications in queuing, reliability, Markov chains. Expectations of random variables. Measures of central tendency and variation. Population and a random sample. Central limit theorem and its

application in simulation of processes. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

IME 507 Graduate Seminar (2)

Selected topics of interest to industrial engineering, integrated technology management, and engineering management graduate students. The Schedule of Classes will list topic selected. Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 seminar, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

IME 510 Systems Engineering I (4)

Project management. Scheduling and budgeting. Queuing theory. Process control and life-cycle cost analysis. Contracts and negotiation. 4 lectures. Prerequisite: Graduate standing or consent of instructor. *Crosslisted as AERO/IME 510.*

IME 511 Systems Engineering II (4)

Risk management. Design strategies to meet system/mission requirements. Design for supportability, manufacturability, reliability, etc. Quality function development and quality control concepts. 4 lectures. Prerequisite: AERO 510 or IME 510, graduate standing or consent of instructor. *Crosslisted as AERO/IME 511.*

IME 516 Mechatronics Systems Analysis (4)

Overview of smart products and intelligent manufacturing systems. Tools and technologies utilized in the design, manufacturing, and operations of such products and systems. Artificial Intelligence Technologies and Fuzzy Logic. Design of smart products and intelligent systems. Case studies. Team projects and formal presentations. 3 seminars, 1 laboratory. Prerequisite: IME 416 or ME 405 or equivalent.

IME 520 Advanced Information Systems for Operations (4)

Advanced information systems (IS) applications in manufacturing and service operations. Introduction of common IS applications, such as manufacturing execution systems; reporting systems; capacity planning systems; scheduling systems; and customer inquiry systems. Industry-specific analysis of IS requirements and availability. 4 seminars. Prerequisite: IME 410 or consent of instructor.

IME 526 Advanced Topics in Manufacturing System Design (4)

Modeling and analysis of manufacturing systems. Advanced topics in manufacturing system design to support development of complex systems: Virtual Reality, discrete event simulation, system architectures, systems integration, scheduling and control of manufacturing systems. Total credit limited to 12 units. 3 seminars, 1 laboratory. Prerequisite: IME 410 or equivalent.

IME 541 Advanced Operations Research (4)

Operations Research approach to model building. Linear programming and sensitivity analysis. Network flow models. Integer programming, large scale linear programming. Goal programming and multi-attribute decision making. Dynamic programming. Nonlinear programming and search methods. Applications in model building and computer solutions in planning, resource allocation, scheduling, and other industrial and service operations. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

IME 542 Reliability Engineering II (4)

Reliability engineering terminology and definitions. Reliability mathematics; probability plotting; load-strength interference and safety margin. Failure distributions and failure rate models. Weibull analysis; bath tub curve; reliability of parts. Reliability of systems; redundancy; reliability allocation. Maintainability and availability. Failure modes and effects analysis. Fault tree analysis. Failure data analysis; reliability testing; reliability growth testing. Electronic system, mechanical and software reliability. Safety and human reliability; reliability management. 3 lectures, 1 laboratory. Prerequisite: IME 503.

IME 543 Advanced Human Factors (4)

Theory and application of man-machine relations and system design. Concepts of mathematical models, human information input channels, decision making based on capability of human operator. 3 seminars, 1 laboratory. Prerequisite: IME 319 or equivalent, IME 326 or equivalent and graduate standing.

IME 544 Advanced Topics in Engineering Economy (4)

Review of interest calculations and comparison of economic alternatives. Replacement analysis. Capital planning and budgeting. Mathematical programming and capital budgeting. Utility theory. Decision making under risk and uncertainty. Application of simulation in risk modeling. Benefit-cost analysis. Multi-attribute decision making. Analytic hierarchy process. 3 lectures, 1 activity. Prerequisite: Undergraduate course in engineering economy.

IME 545 Advanced Topics in Simulation (4)

Validation of simulation models. Statistical techniques for variance reduction. Experimental design and optimization. Comparison of attributes of simulation languages. Review of current manufacturing and service industry applications. Case studies. 3 lectures, 1 laboratory. Prerequisite: IME 420 and graduate standing.

IME 548 Engineering Decision Making (4)

Principles, concepts, models, and case studies of decision making, both quantitative and nonquantitative. Emphasizes commonly used techniques when quantitative models do not exist, do not cover all key factors, or when sufficient data are not available. 3 lectures, 1 laboratory. Prerequisite: IME 301, IME 314, STAT 321 or equivalent and graduate standing.

IME 555 Computer-Integrated Manufacturing (4)

CIM and concurrent engineering concepts. Systems analysis methodologies and functional specifications. Technological and managerial strategies for system integration. Analysis of contemporary CIM frameworks. Information networks and protocols for integrated manufacturing systems. Implementation strategies for CIM and concurrent engineering. 3 seminars, 1 laboratory. Prerequisite: IME 335, IME 411 or equivalent, graduate standing.

IME 556 Technological Project Management (4)

Projects in industrial organizations and enterprises. Emerging technologies and project management. Relationship to strategic plans and managing change in organizations. Formulating, selecting, structuring, and planning projects. Project organization and control. Overcoming barriers. Application of project management software. 3 seminars, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

IME 557 Technological Assessment and Planning (4)

Assessing likely future technological environments, speed of change in competitive environments, relationship to business, strategic, and technology plans of firms. Past, present and technological evolution and operational changes. Technological and competitive impact assessment and business/technology strategy development. Use of case studies and company experiences. 4 seminars. Prerequisite: IME 503 or equivalent, and graduate standing.

IME 558 Executive Seminars (4)

Culminating overview of major issues facing organizations as they meet the challenge to sustain a competitive advantage in a business environment characterized by rapid and pervasive change. Topics include project management, virtual organizations, the service sector, manufacturing futures, and information technology. 2 seminars, 2 supervision. Prerequisite: Advanced graduate program status or consent of instructor.

IME 559 Engineering Research and Development (4)

Principles, approaches and practices for effective engineering innovation, design, research and development (R&D) in business and industry. Relationship of R&D with corporate strategy and technology base. R&D objectives through implementation. Integration of creativity, evaluation, design, and ongoing operations. Case studies. 4 seminars. Prerequisite: IME 314 or equivalent and graduate standing.

IME 560 Quality Engineering II (4)

Integrated total quality system engineering for manufacturing and service firms. Classical and modern quality philosophies and quality assurance and improvement methods. Statistical methods. Designing for quality, continuous quality improvement, and total quality system integration. Case studies. 4 seminars. Prerequisite: IME 421, IME 430, or equivalent.

IME 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors. The Schedule of Classes will list title selected. 1-4 seminars. Prerequisite: Graduate standing and/or consent of instructor.

IME 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

IME 575 Critical Technologies (4)

Scientific, engineering and strategic overview of numerous critical emerging technologies. Topics include: technologies critical for different engineering disciplines, critical to numerous industries, and/or critical to the national interest. Focus on each technology to include: understanding key scientific fundamentals, evaluating commercialization potential to industry, and identifying conditions

and outlook for future technological breakthroughs. 3 seminars, 1 laboratory. Prerequisite: Engineering graduate student and consent of instructor.

IME 577 Engineering Entrepreneurship (4)

The special requirements of entrepreneurship in a high-tech environment. Guest lectures, focused seminar topics, a business plan project, and case studies provide the tools to evaluate and pursue technology-based business opportunities. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

IME 580 Manufacturing Systems (4)

Modern approaches in production and inventory planning and control to support large-scale manufacturing systems, material requirements planning (MRP I), manufacturing resource planning (MRP II), and just-in-time (JIT) manufacturing systems. Enterprise resource planning (ERP) and integration with financials. Information requirements, operational issues, and policy matters. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

IME 591, 592 Integrated Product Development I, II (4) (4)

Team taught course addressing: product opportunity identification, customer needs analysis, concept definition, requirements definition, product-process analysis, product specification, design/process description, prototyping, project management, packaging, product promotion/introduction, and manufacturing ramp-up. Team projects in partnership with industry sponsors, field-trips and formal presentations. 3 seminars, 1 laboratory for each. Prerequisite: Graduate standing.

IME 593 Cooperative Education Experience (2) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

IME 594 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

IME 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

IME 596 Team Project/Internship (1-10)

Integrative learning experience through internship and team project with industrial organization. Requires advanced study and focuses on industrial unstructured problem or opportunity requiring integration across disciplines. Team project involves student, faculty, and sponsoring firm representative(s) in a collaborative learning environment, and culminates in comprehensive written report. Total credit limited to 10 units, normally taken over 2 quarters. Prerequisite: Advanced graduate standing, completion of, or concurrent enrollment in, engineering courses in specialization, and consent of participating faculty.

IME 599 Design Project (Thesis) (1-9)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing and consent of instructor.

IS-INTERDISCIPLINARY STUDIES**IS 101 Interdisciplinary Studies (4)**

Introduction to collaborative interdisciplinary inquiry. Topics include: Scholarly knowledge production and bibliographic finding tools, University role in knowledge dissemination and creation, and information search and evaluation processes. "Learn-by-doing" disciplinary investigation and interdisciplinary analysis and synthesis. 4 lectures.

IS 301 Critical Issues Seminar (4)

Discussion-oriented seminar focusing on ethics and effective interdisciplinary decision-making in the contemporary world. Examination of ethical and other issues facing society through current public debates, as well as great intellectual traditions that have shaped the past. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Admission to

the Adult Degree Program (Bachelor of Arts in Interdisciplinary Studies) prior to enrolling in this seminar.

IS 302 Analytical Skills Seminar (4)

Improvement of abilities to collect data, analyze information, frame questions, reach and defend logical conclusions. Emphasis on applying methods of data analysis to a variety of contemporary interdisciplinary issues. 4 seminars. Prerequisite: Admission to the Adult Degree Program (Bachelor of Arts in Interdisciplinary Studies) prior to enrolling in this class, IS 101 and IS 301 or consent of instructor.

IS 352 Organizational Leadership (4)

An interdisciplinary study of the definitions, theories, skills, and styles of organizational leadership in contemporary society. Strategies for managing human capital and an understanding of the relationship between attributes of good leadership and organizational change. Emphasis on developing an understanding of leadership in diverse organizations. 4 lectures. Prerequisite: Completion of GE Area A, or junior standing or consent of instructor.

IS 450 Advanced Investigation Seminar (4)

In-depth interdisciplinary investigation into a narrowly defined issue of personal and/or professional interest. Identification of topic and examination from a variety of standpoints (e.g., cultural, environmental, religious, political, or economic). 4 seminars. Prerequisite: Admission to Adult Degree Program (Bachelor of Arts in Interdisciplinary Studies), IS 301 and IS 302 with a minimum grade of C-.

IS 453 Special Topics in Organizational Leadership (4)

Directed interdisciplinary analysis of selected contemporary issues or topics in organizational leadership. Topics may be examined from local, national or international perspectives. Total credit limited to 8 units. 4 seminars. Prerequisite: Completion of GE Area A, or junior standing, or consent of instructor.

IS 460 Capstone Project (4)

Selection and completion of a summative project or report under the supervision of a faculty member. Investigation of the topic from an inter-disciplinary approach. Prerequisite: Senior standing, IS 301, IS 302, IS 450 with a minimum grade of C-.

IT—INDUSTRIAL TECHNOLOGY

IT 137 Electrical/Electronic Systems (4)

Introduction to electrical and electronic circuit fundamentals. Essential information for technical managers regarding the universal law, theory, principles, application and troubleshooting of AC and DC circuits and devices. Familiarity with concepts used extensively in manufacturing/ production and countless electronic products. Understanding of inductance, capacitance, resistance, integrated circuit components and the relationship they have with each other. Strategic decision and problem solving skills developed using electricity/electronics as the environment. 3 lectures, 1 laboratory.

IT 150 Industrial Power Systems (4)

Introduction to systems that supply energy, convert energy to power, transmit energy and power, and use energy and power to drive industrial enterprises. Energy systems include fossil, atomic and prominent alternative resources. Power conversion systems include reactors, internal and external combustion, direct conversion, and alternative technologies. Power transmission and end-use systems include mechanical, thermal, fluid, and electrical. Industrial facilities management strategies including advantages and disadvantages of economics, safety, conservation, design and maintenance. 3 lectures, 1 laboratory. Prerequisite: IT 137.

IT 233 Decision Making and Problem Solving Using CAD (4)

Fundamental theory and practice of technical design communication and management of information systems. The basic application of 2-D and 3-D computer-aided design (CAD) and fundamental skills in communication of product design and their impact on the industrial organization. 2 lectures, 2 laboratories.

IT 260 Manufacturing Processes (4)

Manufacturing processes; emphasis on shaping metallic products. Precision measuring, technical drawings, safety and equipment use as they apply to metal machining, welding, casting and sheet metal fabrication. 2 lectures, 2 activities. Prerequisite: IT 150.

IT 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

IT 300 Symposium Organization (2) (CR/NC)

Managing the development of a technical information symposium from concept through symposium presentation. Organization of facilities, speakers, dinner meeting, professional meetings, industrial displays, food services, personnel, finances, and advertising. Credit/No Credit grading only. Total credit limited to 6 units. 2 seminars. Prerequisite: Completion of Area A or equivalent.

IT 326 Product Evaluation (4)

Value engineering, product dissection and the study of reverse product engineering as they relate to product design for manufacturing; improved product quality; reduced usage of energy and materials; material recycling and reuse; product design and development, proving value to the customer and society. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Area B3 via a college course in physics (PHYS), or PSC 101.

IT 329 Industrial Materials (4)

Structure, properties, applications and limitations of select industrial materials to include ferrous and nonferrous metals, ceramics, glasses, composites, and organic materials. Materials testing and material selection. 3 lectures, 1 activity. Prerequisite: CHEM 110 or CHEM 111 or equivalent, and junior standing.

IT 330 Issues of Packaging (4)

Overview of packaging. Historical development, functions, and materials. Processes and technology employed to protect goods through the supply chain. Container types, package design, development, research and testing. Economic and international importance and perspective as an industrial activity. Packaging and the environment, and laws affecting packaging. 3 lectures, 1 laboratory. Prerequisite: Junior standing; completion of GE Area B3 via a course in physics (PHYS), Honors Contract physics (HNRS), or physical science (PSC). Fulfills GE Area F.

GE Area F

IT 336 Textile Technology (4)

Physical and chemical characteristics of natural and manufactured fibers. Production of synthetic polymers. Technology of fabric production and finishes. Industrial and consumer applications. Textiles as a global industry. Legislation. Laboratory identification of fibers and evaluation of performance properties of fabrics. 3 lectures, 1 laboratory. Prerequisite: Junior standing, completion of Area A and one laboratory science course, or consent of instructor. Fulfills GE Area F.

GE Area F

IT 341 Plastic Processes and Applications (4)

Cultural, social and economic implications of plastics in a worldwide environment. Study of materials, costs, processes, resource management, recycling, safety, laws and regulations. Applied laboratory experiences with common industry processes, i.e., injection, blow, rotational and compression; molding with plastic casting and fabrication. Application of laboratory experiences to improve consumer conformance to specifications and economic analysis of raw material cost and availability. Evaluation of current materials and technologies to reduce waste and improve reuse and recycling plastics. 3 lectures, 1 laboratory. Prerequisite: Junior standing and completion of GE Area B3. Recommended: CHEM 110 or CHEM 111. Fulfills GE Area F.

GE Area F

IT 371 Decision Making in Supply Chain, Services, and Project Management (4)

Introduction to supply chain, services, and project management decision making using information technology tools. Application of flowchart, project management network and spreadsheet software to process improvement, project planning, forecasting, and inventory management planning and control in manufacturing and service industries. Understanding current practices for decision making in manufacturing and service operations and project management. 4 lectures. Prerequisite: A grade of C- or better, or consent of instructor, in: MATH 141 or MATH 221, and STAT 211 or STAT 252.

IT 381 Industrial Management (4)

Organization and functioning of management in industry. Planning, direction, and control of the business enterprise in terms of policy formation, organizational structure, finance, sales, procurement, plant location, facilities and production processes. 4 lectures. Prerequisite: Junior standing.

IT 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of instructor.

IT 402 Analyzing and Presenting the Operations Infrastructure for New Industrial Enterprises (4)

Taking a new industrial enterprise from concept to successful launch. The planning and management of a successful product-based start-up to include the integration of: product development; manufacturability and costs of production; manufacturing/outsourcing decisions; market channel selection; supply chain and distribution alternatives; inventory investment and scheduling to meet estimated demand. Successful new enterprises and application to a class project case study. Special emphasis on skills associated with developing effective technical presentations. 2 lectures, 2 activities. Prerequisite: COMS 101 or COMS 102, BUS 346.

IT 403 Quality Systems Management (4)

Quality assurance as viewed from a systems perspective that includes cost, time, and process elements. Lean thinking applied as a problem solving approach to achieve continuous process improvement through the elimination of waste and the reduction of variability. 4 lectures. Prerequisite: IT 341 or IT 371 and STAT 217, or STAT 218, or STAT 251; Business majors must have formally declared their concentration to enroll.

IT 406 Industrial Sales (4)

Development of the technical competencies required in industrial selling and purchasing through the application of value stream mapping techniques and the philosophies and tool sets encompassing the discipline of process management as it relates to sales, marketing and customer service in Industrial settings. Includes guests speakers and team-based projects with local business organizations, individual and team product presentations, with written proposals. 3 lectures, 1 activity. Prerequisite: BUS 346 and IT 341.

IT 407 Applied Business Operations (4)

An integrative experience replicating a manufacturer's business/production systems, including the design, fabrication, processing, quality control, resource management, cost-control, marketing, sales and packaging functions. Focus of instruction methodology on the development of the student's comfort with ambiguity and change inherent in business/ production systems. Builds upon the foundational concepts developed throughout the Industrial Technology curriculum. 2 lectures, 2 laboratories. Prerequisite: IT 411, BUS 346, IT 326, IT 260, and IT 233.

IT 408 Paper and Paperboard Packaging (4)

Physical and chemical properties, manufacture, conversion and use of paper, paperboard, corrugated board and related components. Design, use and evaluation of packages made from these materials. Survey of tests and procedures for paper based packaging materials and packaging products following ASTM, TAPPI, and ISO standards. 2 lectures, 2 activities. Prerequisite: IT 330.

IT 409 Machinery For Packaging (4)

Analysis of major types of packaging machinery from a practical, operational and marketing viewpoint. Basic processes utilizing packaging machinery. Specialized operations, contract specifications, selection, operation and maintenance. Material handling and distribution equipment and systems, and storage and retrieval systems. Required field trips to packaging operations. 3 lectures, 1 activity. Prerequisite: IT 330, PHYS 104 or PHYS 121, or consent of instructor.

IT 410 Operations Planning and Control (4)

Linking supply chain operations to deliver value to the end customer. Contrasting of advanced manufacturing concepts, such as pull systems, sales and operations planning, mixed model manufacturing, level production, and theory of constraints to traditional materials requirements planning systems. 3 lectures, 1 activity. Prerequisite: IT 341 or IT 371 and BUS 391.

IT 411 Industrial Safety and Quality Program Leadership (4)

Effective program development and leadership required to implement safety and quality process improvement in industry. Application of industrial leadership, knowledge, skills and methods to develop and implement total safety and quality management programs. Class safety/quality process project includes the oral presentation. 3 lectures, 1 activity. Prerequisite: IT 150, senior standing.

IT 419 Cooperative Education/Internship (2-12) (CR/NC)

Work experience in business, industry, government and other areas of student career interest. Periodic written progress reports, final report, and evaluation by work supervisor required. Credit/No Credit grading. Major credit limited to 4 units; total credit limited to 12 units. Prerequisite: Approval of area chair, junior standing, and a CPSLO cumulative GPA of at least 2.5 without being on academic probation.

IT 422 Computer Process Simulation of Operational Systems (4)

Focus on management of business process flows, utilizing computer process simulation software. Transformation of inputs into outputs by means of capital and labor resources. Models, modeling tools, solution approaches and methodologies for process improvement, including product development within both service and manufacturing organizations. 2 lectures, 2 laboratories. Prerequisite: IT 407.

IT 428 Commercialization of New Technologies (4)

Concepts, frameworks, and experiences necessary to understand the business potential of technology innovations and determine if one or more sustainable market opportunities can be identified to exploit them. Hands-on exercises and real new inventions to illustrate concepts. 4 lectures. Prerequisite: IT 326 or BUS 342 or BUS 346 and BUS 212 or BUS 214.

IT 435 Packaging Development (4)

The development of industrial and consumer goods packaging from concept to marketplace. Interplay of package design for marketing, production and distribution. Development of the package function for optimal market and consumer performance. Case studies of domestic and international package/product successes and failures with critical examination of performance, economic and social factors. Class project for analysis and solution. 3 lectures, 1 activity. Prerequisite: IT 330 and IT 233.

IT 445 Computer Numerical Control and Robotics (4)

Automated manufacturing systems, including computer numerical control (CNC), flexible manufacturing systems, computer-integrated manufacturing and robotics. Laboratory work in manual/automatic programming and set-up of CNC machines and robots. 2 lectures, 2 laboratories. Prerequisite: IT 233, IT 260, or consent of instructor.

IT 446 Textile Product Design and Development (4)

Organization/structure of the textile and apparel industries. Creating and developing a textile product line; sourcing, pre-production, and production processes; costing. Markets, distribution channels, store and non-store retailing. Quick response. Quality assurance. Trade associations and professional organizations. 4 lectures. Prerequisite: IT 336.

IT 451 Facility Equipment and Systems (4)

Develop an understanding of how major mechanical equipment and systems are incorporated in the utility and production support systems of a modern industrial facility. Includes field trips to industrial/commercial facilities. 4 lectures. Prerequisite: IT 150 or consent of instructor.

IT 454 Facilities Development (4)

Construction and maintenance of physical facilities and equipment as related to plant layout/design, regulatory and environmental compliance, safety/security, energy conservation, and process improvement. 4 lectures. Prerequisite: IT 451 or consent of instructor.

IT 457 Radio Frequency Identification in Supply Chain Management (4)

An overview of Radio Frequency Identification (RFID) technology from the managerial standpoint. Developing simple RFID solutions using development kits. 2 lectures, 2 laboratories. Prerequisite: PHYS 121 or PHYS 122, MATH 141 or MATH 221.

IT 461, 462 Senior Project I, II (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems graduates must solve in their field of employment. Project results presented in a formal report, and must be completed in two quarters. Minimum 120 hours total time. Prerequisite: Consent of instructor.

IT 464 Applied Industrial Technology Senior Project Seminar (4)

Selection and analysis of industrial and technological problems and opportunities in directed individual or group-based projects. Problems typical to those which graduates could encounter in their fields of employment. Formal report required. 4 seminars. Prerequisite: Senior standing.

IT 470 Selected Advanced Topics (1-4)

Directed group study and seminars in selected topics in industrial technology. Open to undergraduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

IT 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title

selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

IT 475 Packaging Performance Testing (4)

Survey of tests and procedures for packaging materials and packaging products following ASTM and ISTA standards. The testing procedures include tests for shock, vibration, drop and impact as prescribed for shipment by truck, rail, sea, and air. Hands-on product/packaging testing for quality control. 2 lectures, 2 laboratories. Prerequisite: IT 330.

IT 482 Advanced Operations Management (4)

Advanced principles in operations management as applied to both manufacturing and service organizations. Product-service conversion systems, capacity planning and utilization, aggregate planning, scheduling and control, inventory management, and operations subsystem coordination with the organization's strategy. 4 lectures. Prerequisite: IT 371, and senior standing.

IT 487 Seminar in Quality Management (4)

Principles and techniques of quality and performance management as applied to organizations in the private and public sector. Emphasis on competitive implications. Integrations of fundamental management techniques, existing improvement efforts, technical tools, and new management technologies focused on continuous organizational improvement. 4 seminars. Prerequisite: Senior standing, IT 371.

IT 500 Individual Study (1-6)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Maximum of 6 units may be applied to degree requirements. Prerequisite: OCOB graduate standing and formal petition with approval from the Associate Dean.

IT 521 Training in Industrial and Technical Systems (4)

Developing and managing technological training in industry. The integration of people, technology, philosophy, corporate visions, missions, goals, objectives, resources, populations, facilities, budgets and evaluation in the development of industrial training curriculum and instruction. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 522 Facilities Planning (4)

Introduction of prospective managers to the methods and techniques used in the planning of the modern industrial facility, including but not limited to: site selection, layout, materials handling, utilities, color and lighting, sound, air, safety standards, and current trends. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 523 Industrial Sales (4)

Development and implementation of a base of competencies that support the sale of products whose intended application is in manufacturing. Refinement of technical knowledge and selling in an industrial setting. 4 lectures. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 527 Trends and Issues in Technology Management (4)

Advanced study of key current trends and issues relative to technology management of industrial and technical systems. 4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 531 Lean Six Sigma Value Chain Management (4)

Familiarization with the Lean Six Sigma process improvement methodology and practice using Six Sigma Black Belt tools. A Six Sigma Black Belt is an individual skilled in applying basic and advanced process improvement and project management methods in order to complete projects that will result in significant, sustainable improvements within an organization. 2 lectures, 2 laboratories. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 532 Technology Entrepreneurship (4)

An understanding of the technology entrepreneurship processes by which new and innovative technologies are developed, embodied in products and/or services, brought to market, financed, and yield significant company growth. Focus on the technology startup experience, which has become a critical ingredient in national competitiveness as well as the career path of many former IT students. 2 lectures, 2 laboratories. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 533 Industrial Processes and Materials (4)

Survey of emerging industrial processes and materials, and enterprise management implications of alternatives. Integrative problems such as

concurrent engineering, material and process selection. 2 lectures, 2 laboratories. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 534 Advanced Packaging Dynamics for Distribution (4)

The latest technologies and techniques utilized to protect a product from common and singular distribution hazards. Distribution hazards, product fragility, cushion performance, structural package design and the ASTM, ISTA and military packaging regulations and testing protocols. Distribution environment measurement using data recorders and simulation of the captured data in a packaging dynamics lab. 2 lectures, 2 laboratories. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 545 Product Conceptualization and Execution Using Rapid Prototyping (4)

Product development using current solid modeling and rapid prototyping technologies. Comprehensive simulation of the product development life cycle from initial concept to completed prototype. Applications of three-dimensional solid modeling and rapid prototyping to follow a product from concept to completion. 2 lectures, 2 laboratories. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate students. The Schedule of Classes will list title selected. Total credit limited to 16 units. 1-4 seminars. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 571 Selected Advanced Topics Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 16 units. 1-4 laboratories. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 591, 592 Applied Industry Project I, II (2) (3)

Initiation, completion and presentation of an individual project, involving research, allowing an opportunity to apply knowledge, skills, and competencies to address a significant business issue in the field of industrial technology, preferably in connection with the student's employment. As part of IT 591 a formal written project proposal must be accepted and approved by the Industrial Technology Area Chair before work begins. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

IT 594 Business and Technology Project I (3)

Development of a comprehensive applied research project proposal, including problem statement, literature review, questions and hypotheses, research design and methodology, procedures, research sample, proposed data collection and analyses. The project proposal must be accepted and approved by the Industrial Technology Area Chair. Prerequisite: Graduate standing in the Master of Science in Business and Technology program or approval from the Associate Dean.

IT 595 Business and Technology Project II (3)

Execution of the comprehensive applied research project proposal developed in IT 594. Included by illustration: securing a study sample, developing data collection instruments and procedures, completing data collection, and preparing the project data set for statistical or qualitative analyses. Prerequisite or corequisite: Satisfactory completion of IT 594 and Graduate standing in the Master of Science in Business and Technology program or approval from the Associate Dean.

IT 596 Business and Technology Project III (3)

Completion of the applied research project executed in IT 595. Included by illustration: final analyses, developing data displays, writing the final discussion chapter, editing project report and making an oral presentation to IT faculty. Prerequisite or corequisite: Satisfactory completion of IT 595 and Graduate standing in the Master of Science in Business and Technology program or approval from the Associate Dean.

IT 599 Industrial and Technical Studies Thesis (3)

Completion of a thesis involving individual research that is significant to the field of industrial and technical systems. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. Course satisfies culminating experience requirement through the completion of the comprehensive thesis. Total credit limited to 9 units. Prerequisite: OCOB graduate standing or approval from the Associate Dean.

ITAL-ITALIAN

ITAL 101, 102, 103 Elementary Italian I, II, III (4) (4) (4)

Italian for beginners. Class practice in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. Language taught in its cultural context. To be taken in numerical sequence. 3 lectures, 1 activity. **ITAL 102** prerequisite: ITAL 101 or consent of instructor. **ITAL 103** prerequisite: ITAL 102 or consent of instructor.

JOUR-JOURNALISM

JOUR 201 Journalism History (4)

Survey of historical influences in the development of today's journalism. Contributions of women and minorities to American mass media. Rise of technology in the communication industry. 4 lectures.

JOUR 203 News Reporting and Writing (4)

Introduction to the fundamental techniques of reporting and writing news articles from print and online perspectives. Extensive laboratory and field practices in gathering and evaluating information. Writing basic news stories under close supervision. 3 lectures, 1 laboratory.

JOUR 205 Agricultural Communications (4)

Survey of the media of agricultural communication. Newspaper farm pages and sections, general and specialized agricultural magazines. Radio and TV farm broadcasts. Public and private agencies involved in agricultural communication. Role of California minorities in agriculture. Writing on agriculture-related issues. 3 lectures, 1 activity.

JOUR 219 Multicultural Society and the Mass Media (4) USCP

The role of the mass media in a democratic multicultural society. Portrayal and stereotyping of ethnic minorities by different mass media forms throughout U.S. history. The growing impact of minorities in the United States. Achievement and goals of current American ethnic media, with special attention to Latinos/as and African-Americans. 4 lectures. Fulfills USCP.

JOUR 233 Copy Editing (4)

Introduction to the techniques of newspaper, magazine, and on-line copy desk work. Rewriting and editing copy and headlines for news, feature stories, and on-line material. Headline, caption, and display copy writing. Ethical issues in copy editing. Selecting, cropping, and writing captions. Art/photography selection, sizing, and cropping. Basic editing functions of Photoshop and Quark. Practical laboratory experience in editing. 3 lectures, 1 laboratory. Prerequisite: JOUR 203.

JOUR 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

JOUR 285 Introduction to Web-Based Journalism (4)

Introduction to the social, editorial and technical issues surrounding the Web as a new form of communication. Fundamentals of gathering, writing and publishing content for the Web that includes using photographs, sound, pictures and video to tell a story. 3 lectures, 1 laboratory. Prerequisite: JOUR 203.

JOUR 302 Mass Media Law (4)

Legal basis for freedom of expression. Court decisions resolving conflicts between First Amendment and right to fair trial, privacy, reputation. Source confidentiality, freedom of information, contempt, copyright. Federal and state laws and regulations affecting mass media reporters, editors, publishers, news directors. 4 lectures. Prerequisite: JOUR 203 or consent of instructor.

JOUR 303 Multimedia Reporting and Production (4)

Advanced exploration of the social editorial and technical issues surrounding the Web as a new form of communication. Advanced application of multimedia reporting skills including production, editing and online publishing using a variety of platforms. Focus on using the most effective online medium to report on a particular news event. 3 lectures, 1 laboratory. Prerequisite: JOUR 285 or consent of instructor.

JOUR 304 Public Affairs Reporting (4)

Experience leading to advanced skills in reporting and writing stories about contemporary issues, government and courts. Field and laboratory assignments in beat reporting, public meeting coverage, writing style, investigative techniques and online journalism research. 3 lectures, 1 laboratory. Prerequisite: JOUR 233 or JOUR 342 or consent of instructor.

JOUR 312 Introduction to Public Relations (4)

Overview of the history, growth and ongoing development of public relations as an information management function in a multi-cultural environment. Public relations practices used in commercial and non-profit sectors, and first-hand application of public relations skills. 4 lectures. Prerequisite: Sophomore standing.

JOUR 331 Contemporary Advertising (4)

Principles of advertising, copy, layout, and production for print and broadcast media. Economic, political, and social function of advertising in a free market society. Advertising ethics. Social responsibility of advertising in a multicultural environment. Emerging advertising technologies. Advertising on the Internet. 4 lectures. Prerequisite: Completion of GE Area A3.

JOUR 333 Broadcast News (4)

Beginning broadcast news writing and reporting for radio and television. Emphasis on developing news judgment and producing radio newscasts. Introduction to television studio equipment and procedures. Lab experience includes writing and reporting live on-air for KCPR. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Area A3.

JOUR 342 Public Relations Writing and Editing (4)

Theory, strategic planning and practice in writing persuasive public relations copy for diverse internal and external audiences. Emphasis on gathering information, preparing news releases, newsletters and other communications vehicles. Analysis of various media case studies. 4 lectures. Prerequisite: JOUR 312 or consent of instructor.

JOUR 346 Broadcast Announcing and Production (4)

Develop on-air skills in the performance of voice-overs, stand-ups, hosting and the production of televised public service announcements. Emphasis on the effective use of audio and non-linear video editing techniques as well as broadcast writing. 3 lectures, 1 activity. Prerequisite: JOUR 203. Recommended: JOUR 285.

JOUR 348 Electronic News Gathering (4)

Instruction on electronic news gathering (ENG) that includes advanced news writing, field reporting and editing for broadcast. Emphasis on developing research techniques, interviewing skills, responsible and effective non-linear video editing, compelling use of natural sound and professional on-air delivery. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 and JOUR 333 or consent of instructor.

JOUR 352 Advanced Newspaper Reporting: *Mustang Daily* (3)

Reporting lab for students holding editorial positions on *Mustang Daily*. Total credit limited to 6 units. 2 lectures, 1 laboratory. Prerequisite: JOUR 304 or consent of instructor.

JOUR 353 Broadcast Journalism Practicum (3)

Senior-level course synthesizing the diverse skills and experiences developed through the broadcast journalism curriculum. Students produce a live 30-minute CPTV newscast per week, or a one-hour KCPR segment that incorporates news, information, talk and entertainment. Emphasis on news producing, reporting and announcing skills. Total credit limited to 6 units. 2 lectures, 1 laboratory. Prerequisite: JOUR 333 and JOUR 346 or JOUR 348 or consent of instructor.

JOUR 390 Visual Communication for the Mass Media (4)

Theory and application of visual communication in today's print, broadcast and public relations media. Extensive experience in visual and text manipulation for effective information communication. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 or consent of instructor.

JOUR 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 chair.

JOUR 401 Global Communication (4)

Global communications facilities and operations; world transmission of information; survey of world wire services and international print and electronic media. Analysis of press operations under varying government ideologies, including third world countries. 4 seminars. Prerequisite: JOUR 203 and junior standing or consent of instructor.

JOUR 402 Journalism Ethics (4)

Current issues revolving around the social responsibility of the mass media. Role of the public, government, and media in considerations of media accountability. Professional behavior in media organizations. 4 seminars. Prerequisite: JOUR 203 or consent of instructor.

JOUR 407 Feature Writing (4)

Practice in researching, interviewing, writing and marketing nonfiction articles for print media, and analysis of similar work in current distribution. 4 lectures. Prerequisite: JOUR 304 or consent of instructor.

JOUR 410 Applied Multimedia Reporting (4)

Exploration of the uses of computers for newsgathering and reporting. Focus on information gathering from mass media, governmental and corporate data bases and contextual manipulation using personal computers and mainframe computers. Commercial online and Internet tools (such as the World Wide Web) and database tools used for day-to-day and project oriented reporting. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 or consent of instructor.

JOUR 413 Public Relations Campaigns (3)

Development of skills needed to plan and conduct internal and external public relations campaigns for corporate and non-profit organizations. Includes goal setting, management of resources, budgeting, creation of campaign communications, and outcomes analysis. 3 lectures. Prerequisite: JOUR 312 and JOUR 342 or consent of instructor.

JOUR 415 Advanced Public Relations Practice: CCPR (3)

Proposing, creating, managing, and implementing public relations campaigns for community-based clients on behalf of the student-run firm, Central Coast PRspectives. 2 lectures, 1 laboratory. Prerequisite: JOUR 413 or consent of instructor.

JOUR 444 Media Internship (3)

Application of techniques on daily basis with media under supervision of department faculty. Prerequisite: Internship coordinator approval.

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. Journalism majors only. Prerequisite: Consent of instructor.

JOUR 470 Selected Advanced Topics (2–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 2–4 lectures. Prerequisite: Consent of instructor; junior standing.

JPNS–JAPANESE**JPNS 101, 102, 103 Elementary Japanese I, II, III (4) (4) (4)**

Beginning Japanese class practice in pronunciation, sentence structure, reading, writing, basic conversation, and introduction to Japanese culture. Activity drill required. To be taken in numerical sequence. 3 lectures, 1 activity. **JPNS 102** prerequisite: JPNS 101 or consent of instructor. **JPNS 103** prerequisite: JPNS 102 or consent of instructor.

KINE–KINESIOLOGY**BASIC INSTRUCTIONAL PROGRAM**

Enrollment is open to all students except for designated intramural courses. Courses carry 1 unit of credit, meet 2 hours per week, and are designed to develop skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in physical activities. The beginning course or its equivalent is prerequisite to the intermediate, and the intermediate to the advanced. Prerequisite may be waived by consent of the instructor.

No more than two different activity courses nor more than one section of an individual activity course may be taken for credit in any one quarter. A student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course. Any level of an activity course can be repeated only once for credit.

Students not majoring in kinesiology may apply a maximum of 12 units of credit earned in general and intramural activity courses toward the bachelor's degree. All basic instructional courses (KINE 100–176) are evaluated on a Credit/No Credit basis. A miscellaneous course fee may be required—see the Schedule of Classes.

¹ KINE 100 Adaptive Activity

KINE 104 Badminton

KINE 108 Basketball

KINE 109 Bowling

KINE 110 Cycling

KINE 111 Fencing

KINE 112 Bowling, Int.

KINE 116 Aerobic Exercise

KINE 121 Golf

KINE 122 Golf, Int.–Adv.

KINE 125 Jogging

KINE 129 Stretch, Flex and Relax

KINE 131 Physical Conditioning

KINE 132 Racquetball, Beg.

KINE 133 Racquetball, Int.–Adv.

KINE 137 Self-Defense

² KINE 138 Karate

KINE 139 Soccer

KINE 140 Ultimate Disc

KINE 142 Softball

KINE 143 Swimming for Non-Swimmers

KINE 147 Swim Conditioning

KINE 148 Tennis, Beg.

KINE 149 Tennis, Int.–Adv.

KINE 151 Volleyball

KINE 154 Weight Training

KINE 156 Aqua-Aerobics

KINE 176 Fitness Walking

PROFESSIONAL ACTIVITIES

Kinesiology majors only. Kinesiology majors may apply a maximum of 12 units of credit earned in KINE 101-176 or KINE 208-229 toward the bachelor's degree. When applicable, course selection should be determined by students after consultation with their advisor. All courses are one or two units and meet for two or four hours per week. The primary purpose of all professional activities is for students to attain intermediate skills in performance and analysis and knowledge of rules and strategy. Secondary purposes may include leadership and teaching experiences.

KINE 208 Golf (1)

Beginning to intermediate golf skills, rules, and etiquette including a combination of skill instruction and course play. Leadership activity assigned. 1 activity. Prerequisite: Kinesiology majors only.

KINE 210 Tennis (1)

Beginning to intermediate tennis skills, etiquette, rules, and equipment. Singles and doubles play. Leadership activity assigned. 1 activity. Prerequisite: Kinesiology majors only.

KINE 212 Racquetball (1)

Beginning to intermediate racquetball skills. Rules, regulations, basic strokes and shots, strategies and tournament play. Leadership activity assigned. 1 activity. Prerequisite: Kinesiology majors only.

KINE 213 Basketball (1)

Beginning to intermediate basketball skills. Skill development, knowledge of rules, advanced strategies for playing basketball. Leadership activity assigned. 1 activity. Prerequisite: Kinesiology majors only.

KINE 214 Volleyball (1)

Beginning to intermediate volleyball skills. Basic fundamentals, rules, regulations, strategies, skill development and games. Leadership activity assigned. 1 activity. Prerequisite: Kinesiology majors only.

KINE 216 Wrestling (1)

Beginning to intermediate skills. Basic fundamentals of wrestling, rules and regulations. Leadership activity assigned. 1 activity. Prerequisite: Kinesiology majors only.

KINE 221 Combatives/Self Defense (1)

Beginner skills emphasizing offensive and defensive techniques for self-protection. 1 activity. Prerequisite: Kinesiology majors only.

KINE 223 Cross Country and Track Events (1)

Beginning to intermediate skills in performance and analysis. Knowledge of rules and strategies. Development of skills and knowledge relating to performance, training, and scoring for cross-country and track running events. Leadership activity assigned. 1 activity. Prerequisite: Kinesiology majors only.

KINE 224 Field Events (1)

Intermediate skills in performance and analysis. Knowledge of rules and strategies. Development of skills relating to performance, training, and scoring

¹ Prerequisite for KINE 100: Consent of instructor.

² KINE 138 meets 3 hours per week.

track field events. Leadership activity assigned. 1 activity. Prerequisite: Kinesiology majors only.

KINE 226 Soccer (1)

Development of beginning and intermediate skills. Rules, regulations and game play. Leadership activity assigned. 1 activity. Prerequisite: Kinesiology majors only.

KINE 227 Aerobic Dance and Activities (2)

Development of instructional competency in the basic components of aerobic exercise, specifically relating to aerobic dance. Emphasis on warm-up, cardiovascular fitness, heart-rate monitoring, dance choreography, elements of higher risk stretching, relaxation protocols and equipment. 2 activities. Prerequisite: Kinesiology majors only.

KINE 228 Cooperative Games and Activities (1)

Introduction of a variety of cooperative games. Non-traditional movement experiences designed to enhance social, cognitive, and physical development. Leadership activity assigned. 1 activity. Prerequisite: Kinesiology majors only.

KINE 229 Badminton (1)

Beginning and intermediate skills. Rules, regulations and strategies for competition. Leadership activity assigned. 1 activity. Prerequisite: Kinesiology majors only.

ACADEMIC COURSES

Professional courses designed primarily for the student majoring in kinesiology.

KINE 180 Orientation to Kinesiology (3) (CR/NC)

Designed to acquaint the student with disciplinary and professional perspectives in kinesiology and the Kinesiology program at Cal Poly. Credit/No Credit grading only. 3 lectures. Prerequisite: Kinesiology majors only. *Formerly KINE 270.*

KINE 181 First Aid/CPR/AED (1) (CR/NC)

An American Red Cross certification course in Standard First Aid, CPR, and AED (Automated External Defibrillation). Skills and knowledge necessary in the treatment of life-threatening emergencies, other injuries, and sudden illnesses. Red Cross First Aid/CPR/AED certifications issued upon successful completion of certification requirements. Credit/No Credit grading only. 1 activity. *Formerly KINE 280.*

KINE 230 Aquatic Fitness Activities (1)

Aquatic based resistance and cardiovascular activities for individual and group settings. Stroke development also included for front crawl, backstroke, breaststroke, butterfly, elementary backstroke and sidestroke. Must be able to swim 25 yards non-stop in order to participate. Leadership activity assigned. 1 laboratory. Prerequisite: KINE 180. *Formerly KINE 218.*

KINE 231 Leading Group Fitness Activities (2)

Aerobic fitness activities appropriate for large and small group exercise sessions. Development of instructional competency in the basic components of aerobic exercise, and leadership skills associated with the delivery of these activities. Emphasis on warm-up, cardiovascular fitness, heart-rate monitoring, dance choreography, elements of higher risk stretching and relaxation protocols, and equipment, and muscle conditioning. 2 activities. Prerequisite: KINE 230. *Formerly KINE 220.*

KINE 241 Understanding Fitness and Training (1)

Introduction to physiological principles and factors which provide the basis for the development and maintenance of optimal physical fitness. 1 lecture. Prerequisite: Consent of instructor.

KINE 250 Healthy Living (4) GE D4

Personal health with emphasis on healthful behavioral practices including physical fitness, nutrition, psychosocial well-being, alcohol and other drugs, intentional and unintentional injury, reproductive health, infectious and non-infectious diseases. 4 lectures. Not open to students with credit in KINE 255 or Liberal Studies majors. Fulfills GE D4.

KINE 255 Personal Health: A Multicultural Approach (4) GE D4 USCP

Personal health with special emphasis on multicultural practices. Not open to students with credit in KINE 250. 4 lectures. Fulfills GE D4 and USCP.

KINE 260 Women's Health Issues (4) GE D4 USCP

Introduction to major health issues that affect women disproportionately or differently from men. Topics include female sexual health and reproduction, exercise and eating behaviors, substance abuse, mental health and stress, and violence against women. 4 lectures. Fulfills GE D4 and USCP.

KINE 265 Introduction to Community Health Issues (4)

Introduction to community health issues and related problems. Epidemiological trends in health and disease. Sociological, educational, environmental, biological and policy influences on health status. 4 lectures. Prerequisite: KINE 180 or FSN 101; KINE 250, KINE 255, or KINE 260. Recommended: STAT 217 or STAT 218. *Formerly KINE 405.*

KINE 266 Introduction to Psycho/Social Aspects of Physical Activity (4)

Psychological and sociological effects of physical activity on individuals and groups in American society. 4 lectures. Prerequisite: KINE 180 or RPTA 101 or RPTA 160. Recommended: Completion of GE Area A. *Formerly KINE 411.*

KINE 275 Sports Officiating (2)

Designed to provide knowledge, understanding, appreciation of officiating in general, and the development of skills in officiating. 1 lecture, 1 activity.

KINE 276 Athletic Coaching Theory (3)

Basic concepts, methods, practices, strategies and philosophies as they apply to competitive athletics. 3 lectures.

KINE 277 Coaching Practicum (2-3) (CR/NC)

Practical experience through the actual coaching of a competitive sports team. 2-3 activities; minimum of 2 hours per week per unit. Total credit limited to 6 units. Credit/No Credit grading only. Learning outcomes must be developmental if more than one practicum is completed. Prerequisite: Consent of instructor.

KINE 290 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

KINE 298 Chronic and Communicable Disease Prevention (4)

Significant chronic and communicable diseases including disparities among population groups in the U.S. Social, ecological, behavioral and lifestyle factors. Primary, secondary and tertiary prevention strategies that promote health, prevent disease and improve quality of life. 4 lectures. Prerequisite: KINE 250, KINE 255, or KINE 260, and BIO 111 or BIO 161.

KINE 300 Planning Techniques in Physical Education (3)

Practical skills and techniques of teaching physical education in schools. Unit and lesson planning, class management, implementation and evaluation of a lesson in a laboratory setting. 2 lectures, 1 laboratory. Prerequisite: KINE 270. Corequisite: KINE 306.

KINE 301 Functional Muscle Anatomy (2)

Functional organization of the human muscular system. Review of all major muscle groups, with emphasis on segmental motion. 2 lectures. Prerequisite: KINE 180 or FSN 101; corequisite: BIO 432 or ZOO 231 or ZOO 331.

KINE 302 Biomechanics (4)

Fundamental biomechanical concepts and their application to human movement activities, and analyses of exercise mechanics and skill performance. 3 lectures, 1 laboratory. Prerequisite: PHYS 118 or PHYS 121; KINE 301.

KINE 303 Physiology of Exercise (4)

Application of human physiology to exercise situations. 3 lectures, 1 laboratory. Prerequisite: KINE 270 and ZOO 231 or ZOO 331 and ZOO 232 or ZOO 332.

KINE 304 Pathophysiology and Exercise (3)

Selected human diseases, their etiology, pathophysiology, symptoms, diagnosis, effects on health and physical performance, and as affected by preventive or therapeutic exercise. 3 lectures. Prerequisite: KINE 303.

KINE 305 Drug Education (4)

Social, biological, and psychological factors of the major drugs associated with therapeutic and recreational use and abuse in society. Topics include drug use as a social problem, theories and treatment of addiction, how drugs work, and the detrimental health effects of drug use. Emphasis on illegal and legal drugs. 4 lectures. Prerequisite: KINE 250 or KINE 255 or KINE 260 or KINE 443.

KINE 306 Assessment in K-12 Physical Education (3)

Measurement and evaluation techniques in physical education, including statistics, computer applications, and measurement theories. Assessment tools in psychomotor, cognitive, and affective domains. 2 lectures, 1 laboratory. Prerequisite: KINE 270.

KINE 308 Motor Development (3)

Motor development of individuals from birth to maturity. Emphasis on interrelationship between motor and cognitive characteristics and affective needs and interests. 3 lectures. Prerequisite: GE D4.

KINE 309 Creative and Nontraditional Games (3)

Introduction of preparatory teachers to non-traditional and multicultural games and activities which address the State Framework and the National Standards. Students present the activities in a manner which demonstrates effective models of instruction, including maximum participation. 1 lecture, 2 activities. Prerequisite: KINE 300.

KINE 310 Concepts and Applications in Elementary Physical Education (3)

Movement as it relates to physical motor skill development, fitness, wellness, social development, cross-cultural understanding, and self-image. 2 lectures, 1 activity. Prerequisite: Junior standing.

KINE 311 Strength Training Instruction (1)

Proper use of weight room resistance modalities including free weights and machine based exercises. Emphasis on effective and safe methods for leading individuals through an exercise session. 1 activity. Prerequisite: KINE 231, KINE 301. *Formerly KINE 219.*

KINE 315 Field Sports (3)

Introduction and preparation for teaching field sports in accordance with state and national standards for K-12 physical education programs. Students learn to present activities in a manner that reflects effective models of instruction. 1 lecture, 2 activities. Prerequisite: KINE 300.

KINE 316 Net and Wall Games (3)

Introduction and preparation for teaching net and wall games in accordance with state and national standards for K-12 physical education programs. Students learn to present activities in a manner that reflects effective models of instruction. 1 lecture, 2 laboratories. Prerequisite: KINE 300, KINE 306.

KINE 319 Introduction to Research Methods in Kinesiology (4)

Principles of measurement and evaluation including contemporary research perspectives in kinesiology, health and exercise science. 3 lectures, 1 laboratory. Prerequisite: KINE 180, STAT 217 or STAT 218.

KINE 320 Media and Technology in Science and Human Performance (4)

Applications of computers, electronic media and information technology as related to understanding and solving problems in the field of kinesiology and human performance. Projects include white papers, digital video, ePortfolios, and blogs. 3 lectures, 1 laboratory. Prerequisite: KINE 180, KINE 265 and KINE 266, junior standing, completion of GE Area A and basic computer literacy.

KINE 323 Sport and Gender (4) GE D5 USCP

Intersections between sport and gender in American society. Identification and discussion of the historical, sociological and psychological issues that affect the sport experiences of males and females, especially as they relate to class, race/ethnicity, sexuality, and political movements. 4 lectures. Prerequisite: Junior standing; completion of GE Areas A, D1 and either D3 or D4. Fulfills GE D5 except for Kinesiology majors. Fulfills USCP.

KINE 324 Sport, Media and American Popular Culture (4) GE D5 USCP

Issues of class, race/ethnicity, gender, various forms of deviance, and other aspects of social life. Exploration of sociological manifestations and implications of how the aforementioned social issues are embedded in mediated forms of sports. 3 lectures, 1 activity. Prerequisite: Junior standing; completion of GE Areas A, D1 and D3. Fulfills GE D5 except for Kinesiology majors. Fulfills USCP.

KINE 384 Water Safety Instructor (4)

Analysis of swimming strokes and techniques with emphasis on teaching methods for beginners through advanced swimmers. Those students who complete the course requirements are eligible for American Red Cross Water Safety Instructor certification. 2 lectures, 2 activities. Prerequisite: Consent of instructor.

KINE 396 Outdoor Education (3)

Introduction and preparation for teaching Outdoor Education activities in accordance with the Physical Education Content Standards for California. Students learn to present activities in a manner that reflects effective models of instruction. Includes a clinical teaching experience. 1 lecture, 2 activities. Prerequisite: KINE 300, KINE 306, and KINE 384.

KINE 400 Special Problems for Advanced Undergraduates (1-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Senior standing or consent of instructor.

KINE 401 Managing Kinesiology Programs (3)

Planning, organizing and controlling programs in public, commercial, private and clinical physical activity settings. Emphasis on legal, ethical and budgetary considerations. 3 lectures. Prerequisite: KINE major and senior standing.

KINE 402 Motor Learning and Control (4)

Variables which control sensory-motor integration. Analysis of factors which affect the acquisition of motor skills as related to the learning process and the learning environment. 3 lectures, 1 activity. Prerequisite: STAT 217 or STAT 218 or STAT 221 or equivalent coursework.

KINE 406 Neuroanatomy (4)

Structure and function of the human nervous system. Afferent and efferent pathways involved in perception and action. Behavioral aspects of motor control and related neurological dysfunction and pathologies. Designed for allied health professions students. 4 lectures. Prerequisite: ZOO 331 and ZOO 332.

KINE 407 Adapted Physical Activity (4)

Major categories of disabling conditions with implications for the development of physical activity programs for specific disabilities. 3 lectures, 1 laboratory. Prerequisite: KINE 270, GE B2, GE B3, sophomore standing.

KINE 408 Exercise and Health Gerontology (4)

Special fitness, exercise, and health needs of elder adults. Theories of aging and age-related changes. Health and physical activity programs for elder adults. 3 lectures, 1 activity. Prerequisite: KINE 250 or KINE 255 or KINE 260 and one of the following: KINE 219, KINE 220, KINE 227, or KINE 228.

KINE 410 Psychology of Coaching (3)

Psychological considerations of the coach-athlete relationship and mental preparation of teams and individuals for competition and practice. Special emphasis on the male and female adolescent with regard to the psychological implications of sports participation. 3 lectures. Prerequisite: Junior standing. Recommended: PSY 201 or PSY 202.

KINE 419 Physical Education Program Content in the Elementary School (3)

Cognitive and psychomotor competencies required to design a developmental physical education program for elementary aged school children. 2 lectures, 1 activity. Prerequisite: KINE 300 and two activity classes.

KINE 421 Strategies for Teaching Physical Education (3)

Systematic analysis and refinement of teaching skills within the discipline of physical education. 2 lectures, 1 activity. Prerequisite: KINE 419.

KINE 422 Teaching Elementary School Physical Education (4)

Implementation of a developmental physical education program for elementary aged children. The program will complement that conducted in the local public schools. 1 lecture, 1 seminar, 2 laboratories. Prerequisite: KINE 421.

KINE 423 Teaching Middle School Physical Education (4)

Techniques for teaching physical education in middle school. Emphasis on class organization, lesson plan development and evaluation, class management and control, and understanding the middle school setting. For students teaching middle school physical education in the local public schools. 1 lecture, 1 seminar, 2 laboratories. Prerequisite: KINE 422.

KINE 424 Organization and Implementation of a K-12 Physical Education Program (4)

Methods of teaching K-12 physical education, with emphasis on alignment with the California Physical Education Challenge Standards, English language learners, special students, and educational technologies. 4 lectures. Prerequisite: KINE 425 or consent of instructor.

KINE 425 Teaching High School Physical Education (4)

Techniques for teaching physical education in high schools. Emphasis on teaching strategies, organization, lesson plan development, self-evaluation, class management, and behavior management. 1 seminar, 1 lecture, 2 laboratories. Prerequisite: KINE 423, and one 300-level activity class.

KINE 426 Senior Seminar (2)

Capstone course which engages students in activities that integrate the sub-disciplines of kinesiology, and facilitates the development of a personal portfolio. 2 seminars. Prerequisite: Senior standing.

KINE 434 Health Promotion Program Planning I (4)

Introduction to theory and methods to facilitate individual and group behavior change to promote health and prevent disease. Concepts from behavioral sciences and theories of health behavior change. Development of needs

assessment and health promotion program design skills. 3 lectures, 1 laboratory. Prerequisite: KINE 250 or KINE 255 or KINE 260, KINE 265, and junior standing.

KINE 435 Health Promotion Program Planning II (4)

Planning, implementation and evaluation of health promotion programs in school, community, medical, public health, worksite, and college/university settings. Planning, intervention design, implementation and design of evaluation protocols including process, impact and outcome assessments. 3 lectures, 1 laboratory. Prerequisite: KINE 265, KINE 298, KINE 319, and KINE 434.

KINE 437 Directed Fieldwork (1-3) (CR/NC)

Practical work experience in related activities of kinesiology under qualified supervision. Total credit limited to 9 units. Credit/No Credit grading only. Minimum of 2 laboratory hours per week per unit. Prerequisite: Senior standing or consent of instructor.

KINE 438 Adapted Physical Activity Fieldwork (1-3) (CR/NC)

Practical experience in adapted physical activity programming. Students plan and conduct physical activity programs for people who are disabled. Total credit limited to 6 units. Credit/No Credit grading only. Prerequisite: KINE 407.

KINE 440 Physical Education Practicum (1)

Supervised experience involving organizational and instructional responsibilities in activity, lecture and/or laboratory classes as determined by curricular concentration or certificate program. Total credit limited to 3 units. Prerequisite: Consent of instructor.

KINE 443 Health Education for Teachers (4)

The health status, special concerns and national health objectives for school aged children. Coordinated school health programs and California Health Framework. Health, nutrition, safety, alcohol, tobacco and other drugs, reproductive health, and chronic disease prevention. Satisfies CCTC requirement for credential. 4 lectures. Prerequisite: GE B2, D4 and junior standing.

KINE 445 Electrocardiography (4)

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, myocardial ischemia/infarction, and exercise. 3 lectures, 1 laboratory. Prerequisite: KINE 303 or consent of instructor.

KINE 446 Echocardiography (4)

Basic principles of echocardiography, including practical skills of the echocardiographer. Recognition of normal echocardiographic patterns and abnormalities, including those caused by pathology and exercise conditioning. 2 lectures, 2 laboratories. Prerequisite: KINE 445 or consent of instructor.

KINE 449 Exercise Prescription and Leadership (4)

Use of medical history, physical examination, laboratory and exercise testing data for establishment of appropriate exercise programs for healthy adults and those with chronic and acute disease. Exercise leadership for normal and clinical populations. 3 lectures, 1 laboratory. Prerequisite: KINE 230, KINE 231, KINE 304 and KINE 311.

KINE 450 Worksite Health Promotion Programs (3)

Designed to acquaint students with those events, situations and relationships leading to healthy lifestyles in fitness and occupational settings. Design and implementation of workplace health promotion programs. 3 lectures. Prerequisite: KINE 250 or KINE 255 or KINE 260, and senior standing.

KINE 451 Nutrition for Fitness and Sport (3)

Application of nutritional and metabolic facts to selected aspects of physical training, degenerative disease, obesity and weight control, diet manipulation and modification in sport, nutritional supplementation and special dietary considerations for the young and old, male and female athletes. 3 lectures. Prerequisite: KINE 250, KINE 255 or KINE 260; KINE 303. Recommended: FSN 210.

KINE 452 Exercise Testing and Prescription for Fitness Specialists (4)

Selected areas of health/fitness screening and evaluation. Application of components relevant to the development and administration of exercise programs for persons regardless of sex, age, functional capacity and presence or absence of CHD or CHD risk factors. 2 lectures, 2 laboratories. Prerequisite: KINE 303.

KINE 453 Lifestyle Prescriptions for Wellness (3)

Understanding weight, physical activity, and dietary recommendations for diverse patient populations. Effectively communicating with patients. Promoting health behaviors in multidisciplinary exercise science and health promotion

settings. 3 lectures. Prerequisite: FSN 210 or FSN 250, and KINE 298, KINE 304.

KINE 454 Exercise Metabolism (3)

Advanced understanding of endocrine, metabolic, and physiological responses to physical activity, exercise and nutrition. How physical activity impacts human storage, delivery, and use of fuel required for energy conversion. 3 lectures. Prerequisite: KINE 303 and CHEM 312 and CHEM 313. Recommended: KINE 304.

KINE 460 Experiential Senior Project (1) (CR/NC)

A comprehensive applied capstone experience that integrates content from Kinesiology courses under faculty supervision. Projects must be approved by the supervising faculty member. Minimum 30 hours. Credit/No Credit grading only. 1 laboratory. Prerequisite: KINE 319, completion of GE Area A, and senior standing.

KINE 461 Senior Project Report (1)

A comprehensive synthesis of professional literature that integrates content from kinesiology courses resulting in a report. Topic must be approved by the instructor. Minimum 30 hours. Prerequisite: KINE 319 and completion of GE Area A.

KINE 462 Research Honors Senior Project (1-2)

Completion of an advanced research, or creative project. Intended for students taking a significant or leadership role in a professional area. Results may be submitted for poster presentation or other public/professional forum. Total credit limited to 4 units. 1-2 laboratories (minimum 30 hours). Prerequisite: KINE 319, completion of GE Area A, and consent of instructor.

KINE 463 Exercise Science and Health Promotion Fieldwork (1-3) (CR/NC)

Practical experience at an approved agency that provides exercise/fitness/health promotion programs. Students participate in program administration under the direct supervision of an approved on-site coordinator. Credit/No Credit grading only. Total credit limited to 3 units. Prerequisite: Junior or senior standing and minimum GPA of 2.0.

KINE 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Consent of instructor.

KINE 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

KINE 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

KINE 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 24 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

KINE 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: KINE 517, graduate standing, and consent of instructor.

KINE 501 Evaluation of Literature and Current Trends in Kinesiology (3)

Analysis and evaluation of published studies and current trends in kinesiology. 3 seminars. Prerequisite: Graduate standing.

KINE 503 Current Health Issues (3)

Advanced seminar investigating current health issues. Factors that influence health status, current and historical trends in health and disease, and the healthcare system in the U.S. 3 seminars. Prerequisite: KINE 250 or KINE 255 or KINE 260 and graduate standing.

KINE 504 Advanced Pathophysiology and Exercise (3)

Selected human diseases, their etiology, pathophysiology, symptoms, diagnosis, effects on health and physical performance, and as affected by preventive or therapeutic exercise. Not open to students with credit for KINE 304. 3 lectures. Prerequisite: KINE 303 or equivalent, and graduate standing.

KINE 505 Introduction to Issues, Ethics and Policies in Teaching (1) (CR/NC)

Knowledge and skills of teaching at the college level. Preparation and support for teaching activity and laboratory classes in the department. Prepares students to be supervisors and teachers in their current or future employment. Credit/No Credit grading only. 1 seminar. Prerequisite: Graduate standing.

KINE 510 Health Behavior Change (3)

Examination of contemporary research, theory and practice related to facilitating healthy behavior change. Analysis of health problems from biological, ecological, and psycho-social perspectives with emphasis on understanding the acquisition and maintenance of healthy behavior. 3 seminars. Prerequisite: KINE 250 or KINE 255 or KINE 260 and KINE 503 or KINE 504 and graduate standing.

KINE 511 Administration and Leadership in Kinesiology (3)

Principles and techniques of administration in health, activity and academic settings including budget, personnel supervision, resource acquisition, leadership techniques, and facility management. 3 seminars. Prerequisite: Graduate standing.

KINE 517 Research Methods in Kinesiology (3)

Experimental, descriptive, historical, philosophical, survey, and action research in kinesiology. Selection of adequate problems for investigation; various sampling techniques and analyses; use of library facilities; manuscript requirements for the thesis. 3 seminars. Prerequisite: KINE 501 or consent of instructor.

KINE 518 Research Prospectus and Proposal Writing (2) (CR/NC)

Strategies for identifying academically valid research topics. Planning considerations for qualitative and quantitative research including grant writing, human subjects review, personnel, equipment, and timelines. Design and composition of effective research proposals. Credit/No Credit grading only. 2 seminars. Prerequisite: KINE 517.

KINE 522 Advanced Biomechanics (4)

Advanced biomechanical concepts applied to human movement, examination of research, and biomechanical analyses of movement activities. Performance, occupational, and clinical settings. Laboratory techniques including motion analysis, force platform, and electromyography. 3 seminars, 1 laboratory. Prerequisite: KINE 302 or equivalent.

KINE 525 Advanced Motor Learning and Control (3)

Analysis of control theories, research principles and motor learning variables involved in the acquisition of skilled movement with an emphasis on the behavioral level of learning. 3 seminars. Prerequisite: KINE 402 or equivalent.

KINE 526 Sport and Exercise Psychology (3)

Theoretical and professional issues in the psychological foundations of sport and exercise. 3 seminars. Prerequisite: Graduate standing.

KINE 530 Advanced Physiology of Exercise (4)

Physiological determinants of physical work capacity and sports performance. 3 seminars, 1 laboratory. Prerequisite: KINE 303 and graduate standing.

KINE 534 Advanced Health Promotion Program Planning: Theory and Practice (4)

Theory and methods to facilitate individual and group behavior change to promote health and prevent disease. Concepts from behavioral sciences, health behavior theory, motivation, and decision making. Development of planning and evaluation skills. Not open to students with credit in KINE 434. 3 lectures, 1 laboratory. Prerequisite: KINE 503 or KINE 504 or KINE 510; graduate standing.

KINE 536 Advanced Electrocardiography (4)

Theory and application of electrocardiography and other techniques for cardiovascular assessment and treatment of cardiac disease and other abnormalities. 3 seminars, 1 laboratory. Prerequisite: KINE 445.

KINE 537 Internship (3-12) (CR/NC)

Supervised work experience in an approved wellness/fitness clinical facility, school, or other faculty approved setting. Total credit limited to 12 units. Maximum of 6 units may be applied toward Master of Science in Kinesiology.

Credit/No Credit grading only. Prerequisite: Graduate standing; consent of instructor.

KINE 539 Effective Practice in Teaching and Coaching (3)

Observation and analysis of teaching physical education and coaching sports with special emphasis in pedagogical systems. 2 seminars, 1 laboratory. Prerequisite: Graduate standing.

KINE 570 Selected Advanced Topics (4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Graduate standing.

KINE 581 Graduate Seminar in Kinesiology (1-3)

Directed group study of selected topics for advanced students. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1-3 seminars. Prerequisite: Graduate standing.

KINE 585 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing.

KINE 599 Thesis or Project (1-6)

Completion of a thesis or project pertinent to the field of kinesiology. Independent research under the guidance of the faculty. Prerequisite: KINE 517, KINE 518 and graduate standing.

LA-LANDSCAPE ARCHITECTURE**LA 101 Introduction to Landscape Architecture (4)**

Introduction to the profession of landscape architecture and orientation to the department curriculum and learning processes. 3 lectures, 1 discussion.

LA 130 Landscape Interpretation (4)

Introduction to the relationships between culture and art, architecture and the natural environment through the description and exploration of significant landscapes and related societies and cultures. 4 lectures.

LA 170 Principles of Design Communication (4)

Overview of design communications for landscape architects incorporating the principles, techniques, skills and tools used in design generation, exploration, review and implementation. 4 laboratories.

LA 202 Design Fundamentals I (4)

Introduction to the principles, methods and elements of two- and three-dimensional design in order to communicate intended concepts and meanings. Exploration of the basic design elements including composition, design process and the creation of spatial settings. 4 laboratories. Corequisite: LA 170.

LA 203 Design Fundamentals II (4)

Continuation of ideas introduced in LA 202 with the introduction of environmental and visual perception, including three-dimensional site design and landscape architectural design principles. Spatial design and sequencing of space with concern for human behavioral, environmental and natural site factors and generation of program, concept and design development. 4 laboratories. Prerequisite: LA 202, LA 243; concurrent: LA 241.

LA 204 Design Fundamentals III (4)

Continuation of ideas introduced in LA 202 and LA 203 with the introduction of the principles of design theory, landscape ecology and technical applications. Problems of increasing complexity incorporate critical and creative problem solving, the relationship of aesthetics, response to human needs and design for sustainable environments. 4 laboratories. Prerequisite: LA 203, LA 241; concurrent: LA 242.

LA 211 History of Landscape Architecture: Ancient Civilizations through Colonial America (4) GE C3

Exploration of the continuous alteration of the landscape through recorded time and examination of how humankind has influenced this change. The metaphor of "garden" provides understanding for agrarian regions, urban spaces, and vernacular landscapes of the world. 4 lectures. Fulfills GE C3.

LA 212 History of Modern and Contemporary Landscape Architecture (4) GE C3

Philosophies and ethics of important personalities in twentieth century landscape architecture. Design theories supporting these individuals' projects and the

nature of their practice, combined with the influential events in industry, the arts and sciences, politics, and society of this century. 4 lectures. Fulfills GE C3.

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. CRP majors only.

LA 220 Landscape Ecology: Concepts, Issues and Interrelationships (4)

Concepts, theories and techniques related to landscape analysis, ecology, planning and design with an emphasis on landscape assessment, sustainability, land health, environmental protection and restoration, and natural resource management. 4 lectures.

LA 221 California Plants and Plant Communities (4)

Concepts, theories and techniques related to landscape analysis, ecology, planning and design with an emphasis on landscape assessment, sustainability, land health, environmental protection and restoration, and natural resource management. 4 lectures. Prerequisite: BIO 114 or BOT 121 or consent of instructor.

LA 240 Additional Landscape Architecture Laboratory (1–3)

Total credit limited to 6 units, with a maximum of 3 units per quarter. 1–3 laboratories.

LA 241 Site Engineering Techniques and Applications (4)

Introduction and application of the techniques, methods, principles and criteria for site engineering and landform design. Includes an introduction to soil science, survey methods, and experiences in the principles, procedures and application of site grading and drainage for landscape architecture. 4 laboratories. Prerequisite: LA 202, LA 243; corequisite: MATH 118; concurrent: LA 203.

LA 242 Implementation Strategies (4)

Introduction and application of the methods, principles and criteria for landscape implementation. Encompasses fundamental design and technical decisions common to landscape architectural design and construction projects including the development of concept, design development and working drawings, and construction management process. 3 lectures, 1 activity. Prerequisite: LA 203, LA 241; concurrent: LA 204.

LA 243 Materials and Techniques of Landscape Construction (4)

Introduction to the properties, uses and inherent qualities of the fundamental materials of landscape architectural concerns and associated construction techniques and processes. Materials and techniques explored as a source of design ideas, form and expression in landscape architecture. 3 lectures, 1 activity. Corequisite: LA 170; concurrent: LA 202.

LA 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

LA 317 The World of Spatial Data and Geographic Information Technology (4) GE Area F

Basic foundation for understanding the world through geographic information and the tools available to utilize spatial data. Application of Geographic Information Systems (GIS) and related technologies, including their scientific basis of operation. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B2. *Crosslisted as GEOG/LA/NR 317.* Fulfills GE Area F.

LA 318 Applications in GIS (3)

ARC/INFO and ArcView Geographic Information System (GIS) computer software to explore environmental, natural resource, social and economic issues using spatial data. Develop and apply data base and software management competencies. 1 lecture, 2 laboratories. Prerequisite: Junior standing or consent of instructor. *Crosslisted as LA/NR 318.*

LA 320 Design Theory for Landscape Architects (4)

Complements the material and knowledge presented in the history of landscape architecture, architecture and art courses. Design theory and associated concepts as they are related to landscape architecture. Literature research and analysis of completed design projects. The artists/designers, materials and overall expressions of work are related to the social and economic issues of the time as well as their associations with the other arts and sciences. 4 lectures. Prerequisite: LA 211, LA 212, or consent of instructor.

LA 330 Cultural Landscapes: People, Places and Ethical Decisions (4)

Investigation of the complexities and interrelatedness of culture, environment and ethical decisions. Interpretation of personal and cultural values and ethics in terms of decisions made and behaviors and actions expressed in the built landscape. 4 lectures. Prerequisite: LA 211, LA 212.

LA 349 Advanced Planting Design (4)

Advanced examination of the theories and applied principles of planting design. Emphasis on connections between art and science in the design of parks, gardens and other landscapes. Case studies and field trips. 2 lectures, 2 activities. Prerequisite: EHS 231, EHS 232 and EHS 381 or LA 221.

LA 363 Recreation and Open Space Planning and Design (4)

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, 1 activity. Prerequisite: Must have completed minimum of one 200-level course in planning, design or recreation and third-year standing or consent of instructor.

LA 370 Professional Practice (4)

Issues related to the practice of landscape architecture incorporating processes, procedures and outcomes of professional practice. Topics include professional ethics, business and legal aspects of the profession, relationships to the client and society, personal goal setting, resume and portfolio preparation. 4 lectures. Prerequisite: LA 204.

LA 371 Internship (3) (CR/NC)

Involvement in a work setting related to landscape architecture. Thirty hours work experience per unit of credit. Credit/No Credit grading only. Prerequisite: Third year standing in Landscape Architecture.

LA 400 Special Problems for Advanced Undergraduates (1–4)

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.

LA 401 Research Project (2)

Research methods in landscape architecture and proposal writing techniques. Students prepare proposal and strategy for fifth year study in area of concentration. 2 seminars. Prerequisite: Completion of four design focus studios (16 units from LA 402 – LA 405).

LA 402 Design Theory and Exploration Focus Studio (4)

Exploration and application of design theory, exploratory design process and form exploration to design and planning projects. Emphasis on incorporation of inquiry techniques based on the synthesis of interdisciplinary frameworks of art and design theory with historical and cultural issues. Total credit limited to 12 units. 4 laboratories. Prerequisite: LA 204, LA 211, LA 212 or consent of instructor; prerequisite or concurrent: LA 320; concurrent: Integrated Learning Course (ILC) of student's option.

LA 403 Natural Environments Design Focus Studio (4)

Assessment, exploration and integration of landscape ecology, sustainability and environmental planning to design and planning projects. Emphasis on interpretation and application of environmental and ecological issues at a range of design scales. Total credit limited to 12 units. 4 laboratories. Prerequisite: LA 204, LA 211, LA 212 or consent of instructor; corequisite: LA 220; concurrent: Integrated Learning Course (ILC) of student's option.

LA 404 Cultural Environments Design Focus Studio (4)

Assessment, exploration and interpretation of cultural values, issues and landscapes to design and planning projects. Emphasis on observation and inquiry of diverse cultural settings, differences in cultural values and personal ethics in the design process. Total credit limited to 12 units. 4 laboratories. Prerequisite: LA 204, LA 211, LA 212 or consent of instructor; concurrent: Integrated Learning Course (ILC) of student's option.

LA 405 Project Design and Implementation Focus Studio (4)

Development, exploration and integration of project design and implementation strategies to design and planning projects. Emphasis on creative and exploratory problem solving, spatial design, project resolution, and graphic communication. Total credit limited to 12 units. 4 laboratories. Prerequisite: LA 204, LA 243, LA 242, LA 241 or consent of instructor; concurrent: Integrated Learning Course (ILC) of student's option.

LA 411 Regional Landscape History (4)

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. 4 lectures. Prerequisite: Fourth year standing or consent of instructor.

LA 431 CAD and Digital Media Communications (ILC) (4)

Integrated Learning Course (ILC) to assist integration and application of computer-aided drafting (CAD) skills in coursework, project planning and design studio courses. Focus on CAD skills and integration of digital media. Total credit limited to 12 units. 4 activities. Prerequisite: LA 170, LA 204 or consent of instructor.

LA 432 Landscape Ecology Applications (ILC) (4)

Integrated Learning Course (ILC) to assist integration and application of landscape ecology principles in project planning and design studio courses. Focus on understanding and developing a framework for ecological planning and design to anticipate consequences of planning and design decisions. Total credit limited to 12 units. 4 activities. Prerequisite: LA 221 or consent of instructor; corequisite: LA 220; concurrent: Design Focus Studio of student's option.

LA 433 Cultural Environments (ILC) (4)

Integrated Learning Course (ILC) to assist integration and application of culture, environment and personal ethics in coursework, project planning and design studio courses. Focus on skills, distinctions and integration of analyzing the cultural landscape, understanding diverse cultural values and assessing personal ethics. Total credit limited to 12 units. 4 activities. Prerequisite: LA 211 or consent of instructor; concurrent: Design Focus Studio of student's option.

LA 434 Project Design and Implementation (ILC) (4)

Integrated Learning Course (ILC) to assist integration and application of project design principles and implementation strategies in project planning and design studio courses. Focus on skills, techniques and decisions of the design, documentation and construction processes. Total credit limited to 12 units. 4 activities. Prerequisite: LA 241, LA 242, LA 243 or consent of instructor; concurrent: Design Focus Studio of student's option.

LA 435 Professional Practice (ILC) (4)

Integrated Learning Course (ILC) to assist integration and application of professional practice principles and techniques in planning and design studio and internship courses. Focus on achieving a high level of professional quality, ethical concern, and legal responsibility in project work. Total credit limited to 12 units. 4 activities. Concurrent: Design Focus Studio of student's option.

LA 436 Traditional and Digital Media Communications (ILC) (4)

Integrated Learning Course (ILC) to assist integration and application of graphic communication and presentation skills in coursework, project planning and design studio courses. Focus on skills, distinctions and integration of traditional and digital media explorations. Total credit limited to 12 units. 4 activities. Prerequisite: LA 170, LA 202, LA 203, LA 204 or consent of instructor; concurrent: Design Focus Studio of student's option.

LA 437 3D Digital Design Communications (ILC) (4)

Integrated Learning Course (ILC) to assist integration and application of 3D digital graphic communication and presentation skills in coursework, project planning and design studio courses. Focus on skills and integration of three-dimensional digital media explorations. Total credit limited to 12 units. 4 activities. Prerequisite: LA 170, LA 204 or consent of instructor; concurrent: Design Focus Studio of student's option.

LA 438 GIS Application to Design Projects (ILC) (4)

Integrated Learning Course (ILC) to assist integration and application of geographic information systems (GIS) and spatial information into focus design studio courses. Total credit limited to 12 units. 4 activities. Corequisite: LA 220; concurrent: Design Focus Studio of student's option.

LA 461 Senior Design Project Focus Studio (4)

Comprehensive landscape architectural design and research project showing professional level competency in the integration of design theory, landscape architectural principles and project resolution. Emphasis on creative resolutions, organization and communication skills and technical abilities in program generation, design process, design and research. Total credit limited to 8 units. 4 laboratories. Prerequisite: Completion of Design Focus Sequence (20 units from LA 402-LA 405).

LA 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Consent of instructor.

LA 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title

selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

LA 481 Visual Resource Management Methods (4)

Investigation and application of the major visual resource management methods relevant to landscape architecture. Theoretical basis for visual resource assessment, the different assessment techniques, and the process of translating assessment results into visual resource management techniques. 2 lectures, 2 activities. Prerequisite: Fourth-year standing or graduate standing, or consent of instructor.

LA 482 Evaluating Social and Behavioral Factors for Open Space Design (4)

User oriented approach to open space design. Interview and survey techniques, behavioral trace mapping and systematic observation, post occupancy evaluation and similar methods are used to generate user input and feedback in the design process. Understanding the behavioral implications of designed environments. 2 lectures, 2 activities. Prerequisite: Fourth-year or graduate standing or consent of instructor.

LA 483 Special Studies in Landscape Architecture (1-12)

Special issues and problems through research, field trips, seminars and other forms of investigation and involvement. Course requirements are determined prior to each individual project through a contractual agreement between students and department. Departmental Off Campus Study Program guidelines apply. Total credit limited to 36 units. 1-12 activities. Prerequisite: Fourth- or fifth-year standing, or consent of instructor.

LA 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 18 units. Credit/No Credit grading only. Prerequisite: Junior standing and consent of instructor.

LA 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 24 units. Credit/No Credit grading only. Prerequisite: Junior standing and consent of instructor.

LA 551 Regional Landscape Assessment I (4)

Definition, research and filing of data covering the biological, cultural and physical resources of a specific region. Concepts of regionalism, land planning, reclamation and preservation are integral to the course. Utilization of mainframe and microcomputer facilities and software. 4 laboratories. Prerequisite: Graduate standing or consent of instructor.

LA 552 Regional Landscape Assessment II (4)

Application of data manipulation techniques in order to model both impacts on natural systems and land development potentials. Use of planning strategies to predict outcomes resulting from the land use decision process. Utilization of mainframe and microcomputer facilities and software. 4 laboratories. Prerequisite: LA 551 and graduate standing.

LA 585 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

LA 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

LAES–LIBERAL ARTS and ENGINEERING STUDIES

LAES 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.

LAES 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

LAES 301 Project-Based Learning in Liberal Arts and Engineering Studies (4)

Researching, writing, revising and presenting a technical proposal suitable for submission to a national design competition seeking innovative solutions to complex technological/social problems. Examination of how to define LAES as a new field of study; analysis of the creative process and team building in theory and in application. For LAES majors only. 4 lectures. Prerequisite: MATH 241; PHYS 133, PHYS 132; GE Area A; completion of 4 engineering fundamentals courses.

LAES 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.

LAES 411 Global Synthesis in Liberal Arts and Engineering Studies (4)

Onsite work with a global technical development and/or design team to develop a project to be completed/expanded upon in LAES 461. Through guided online discussion with the instructor and fellow LAES students, work through intercultural collaboration and design issues, and present works-in-progress. 4 lectures. Prerequisite: LAES 301, junior standing.

LAES 430 Internship (2–12) (CR/NC)

Work experience in business, industry, government and other areas of student career interest. Periodic written progress reports, final report, and evaluation by work supervisor required. Credit/No Credit grading. Total credit limited to 12 units. Prerequisite: Approval of area chair, junior standing, and a CPSLO cumulative GPA of at least 2.5 without being on academic probation.

LAES 461 Senior Project in Liberal Arts and Engineering Studies (4)

Under faculty supervision, the selection and completion of a senior project, demonstrating an interdisciplinary focus in LAES. With one-on-one format with the instructor, individual or small group work through many iterations of the senior project, with occasional showing of works in small student groups. Prerequisite: LAES 411, senior standing.

LAES 462 Capstone Senior Seminar in Liberal Arts and Engineering Studies (4)

The final refinement and completion of LAES senior projects and other projects. In a development workshop format, presentation of final versions of works-in-progress to combined faculty and professional review committees throughout the quarter. Prerequisite: LAES 461.

LAES 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

LAES 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

LAES 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. Major credit limited to 6 units; total credit limited to 18 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

LAES 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Major credit limited to 6 units; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

LS–LIBERAL STUDIES

LS 101 Orientation to Liberal Studies (1)

Overview of the career pathway into the elementary teaching profession and available options. Academic policies and procedures, study skills, goals setting, career planning, wellness and other topics relevant to student success. To be taken during the first quarter in attendance at Cal Poly as a Liberal Studies major. 1 lecture.

LS 214 Constitutional Issues in the History of U.S. and California Education (4)

Examination of U.S. and California constitutions, significant legislation, and court cases affecting public education from the colonial period to the present. Overview of contributions by individuals of historical, national, and international educational significance. Examination of landmark decisions. 4 lectures.

LS 230 Field Experience in the Elementary Classroom I (2)

Overview of current practices and issues in elementary education, including teacher compensation, cultural impact on schools, time and classroom management, English learners, and the affective aspect of teaching. 24 hours of fieldwork required. 1 lecture, 1 activity.

LS 250 Field Experience in the Elementary Classroom II (2)

Overview of current practices and issues in elementary education, including components of effective teaching, motivating students, diagnostic/prescriptive teaching, curriculum, and accountability. In addition to class time, 24 hours of fieldwork required. 1 lecture, 1 activity.

LS 260 Children's Literature (4)

Analysis and evaluation of traditional literature, fantasy, realistic fiction, historical fiction, informational books, picture books, and poetry for children in multiple subject classroom grades K–6. Emphasis on multicultural texts. 4 lectures. Prerequisite: Completion of GE Area A. *Crosslisted as ENGL/LS 260.*

LS 270 Introduction to Visual and Performing Arts Standards in the Elementary Classroom (4)

Introduction to the California visual and performing arts teaching standards. Emphasis on artistic perception, creative expression, historical/cultural context, aesthetic valuing and application to the elementary classroom. Must attend three outside art performances. 4 lectures.

LS 280 Subject Matter Apprenticeship (2) (CR/NC)

Structured application of a specific content area in schools and informal educational settings. Topics include: arts, English, science, mathematics, social studies, and physical education and health. The Schedule of Classes will list topic selected. Credit/No Credit grading only. 1 lecture, 1 activity. Prerequisite: Consent of instructor. Recommended: LS 230, LS 250 or EDUC 300.

LS 282 Supervised Fieldwork (1-2) (CR/NC)

Fieldwork experience in the application of a specific content area or program in an educational setting. The Schedule of Classes will list topic selected. Total credit limited to 4 units. Credit/No Credit grading only. 1-2 activities. Prerequisite: LS 280 and consent of instructor.

LS 290 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

LS 310 Storytelling: Modern Applications of Traditional Narrative (4)

Techniques for selection, preparation and presentation of traditional folktales and myths for an audience. Applications of storytelling in teaching and organizations; theory and history of folk literature and mythology. 4 lectures. Prerequisite: COMS 101 or COMS 102.

LS 311 Visual Arts in the Elementary Classroom (4)

Theory, philosophy and applications of visual arts, through multiple strategies, as related to child development and educational processes for the elementary classroom. One Saturday field trip required. 4 lectures. Prerequisite: LS 270.

LS 312 Advanced Visual Arts in the Elementary Classroom (4)

Application of visual arts, through multiple strategies including direct curriculum inclusion for the elementary schools and art community settings. Two Saturday field trips required. 4 lectures. Prerequisite: LS 311.

LS 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: consent of instructor, junior standing.

LS 461 Senior Project Seminar (4)

Examination of issues in education of state, national and international concern. Students prepare presentations and conduct individual research and analysis of selected problems. Substantial research paper required. 4 seminars. Prerequisite: Senior standing, completion of GWR or consent of instructor.

LS 462 Senior Project Research (4)

Application of content and theory to the educational experience of one specific subject matter area in the Liberal Studies program. The Schedule of Classes will list topic selected. 2 seminars, 2 units of independent study. Prerequisite: Senior standing, completion of GWR and emphasis in the targeted content area.

LS 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

LS 475 Elements and Principles of Art in Elementary Classrooms (4)

Standards-based, visual art concepts for K-6 learning. Focus on the elements of art, principles of design and fostering of artistic perception within historical and cultural contexts. Events and theories influencing current practices in art education. Taught on-line. 4 lectures. Prerequisite: LS 270.

LS 476 Elementary Learning Through Art-Making Processes (4)

Analysis and practice of skills and techniques to facilitate K-6 learning through art-making processes, deconstructed into inquiry through anchor artworks, techniques, criteria development, aesthetic valuing, assessment, curriculum integration and technology. Taught on-line. 4 lectures. Prerequisite: LS 475.

LS 477 Myth and Folklore in Art for Elementary Classrooms (4)

Symbols, metaphors, attributes of myths and folktales in artworks and literature. Both image and story used for teaching standards-based integrative lessons in art and other content areas in the elementary classroom. Taught on-line. 4 lectures. Prerequisite: LS 270.

MATE–MATERIALS ENGINEERING**MATE 110 Introduction to Materials Engineering Design I (1)**

Laboratory work in teams to design, build and test a product. Material from math, science and engineering courses tied together. 1 laboratory. MATE majors only.

MATE 120 Introduction to Materials Engineering Design II (1)

Second design laboratory, working in teams to design, build and test a complex system that benefits humanity. Focus on complete design process including project management, documentation in design, manufacturing techniques, and analysis of testing data. Issues of engineering ethics, technology and society, the environment and sustainability also studied. 1 laboratory. Prerequisite: MATE 110.

MATE 130 Introduction to Materials Engineering Design III (1)

Third design laboratory in a sequence. Includes working in teams on project that benefits humanity. Issues of engineering ethics, technology and society, the environment and sustainability. 1 laboratory. Prerequisite: MATE 120.

MATE 200 Special Problems for Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

MATE 210 Materials Engineering (3)

Structure of matter. Physical and mechanical properties of materials including metals, polymers, ceramics, composites, and electronic materials. Equilibrium diagrams. Heat treatments, materials selection and corrosion phenomena. 3 lectures. Prerequisite: CHEM 111 or CHEM 124 or CHEM 127. Recommended concurrent enrollment in MATE 215.

MATE 215 Materials Laboratory I (1)

Laboratory experiments on the heat treatment and resulting properties of metals. Effects of cold deformation of metals. Brittle-ductile fracture behavior, equilibrium phase relationships, corrosion. Mechanical behavior of polymers. Properties of semiconductor devices. 1 laboratory. Prerequisite or concurrent: MATE 210.

MATE 222 Materials Selection for the Life Cycle (4)

Materials and product design, materials selection methodologies using current software, principles of green engineering, eco-design, and sustainability. Life cycle analysis of engineered products using current software. Ecological impact of materials and processes. Case studies used to illustrate concepts. 4 lectures. Prerequisite: ARCH 106 or MATE 210 or consent of instructor.

MATE 225 Materials Laboratory II (1)

Microstructural analysis by qualitative and quantitative metallography. Computer acquisition of metallographic images. Emphasis on structure-property relationships. 1 laboratory. Prerequisite: MATE 215. Concurrent: MATE 232.

MATE 232 Materials, Ethics, and Society (4)

Examination of several current issues as focal points for themes of materials science and technology society, ethics, and systems thinking. The focal points provide natural contexts for learning fundamental materials engineering knowledge while simultaneously developing greater acuity in dealing with complex social problems. 4 lectures. Prerequisite: MATE 210.

MATE 235 Materials Laboratory III (1)

Interpretation of microstructures in metals and alloys from manufacturing processes; laboratory methods for revealing and documenting such microstructures. 1 laboratory. Prerequisite: MATE 225. Concurrent: MATE 222.

MATE 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

MATE 310 Noncrystalline Material Systems (4)

Design and synthesis of noncrystalline material systems. Synthesis, processing techniques, properties and fabrication methods of organic and inorganic polymeric materials. 3 lectures, 1 laboratory. Prerequisite: MATE 210, MATE 340, STAT 312. Concurrent: MATE 350.

MATE 322 Leadership and Project Management (2)

Theory and practice in leadership and project management skills for engineering design teams. Basic issues related to, and tools used for, managing projects and concepts comprising project management. Emphasis on situations requiring resolutions and management decisions by groups representing various elements of an enterprise. 2 lectures. Prerequisite: Junior standing in an engineering program or consent of instructor. *Crosslisted as HNRS/IME/MATE 322.*

MATE 330 Hybrid Material Systems (4)

Design of hybrid material systems, including polymer-matrix, ceramic-fiber composites. Materials (matrices, fibers) and manufacturing methods treated in detail. 3 lectures, 1 laboratory. Prerequisite: MATE 350. Concurrent: MATE 370.

MATE 340 Electronic Materials Systems (4)

Design of electronic materials systems utilizing the basic concepts in electron theory of solids, electrical properties and conduction in materials, magnetic phenomena and optical properties in materials. 3 lectures, 1 laboratory. Prerequisite: MATE 210, PHYS 133. Concurrent: MATE 360. Prerequisite or concurrent: EE 201, EE 251.

MATE 350 Structural Materials Systems (4)

Design of structural materials systems. Topics include continuum mechanics — stress, strain, elasticity, anelasticity, plasticity. 3 lectures, 1 laboratory. Prerequisite: MATE 360, CE 204. Concurrent: MATE 310.

MATE 359 Living in a Material World (4)**GE Area F**

Evolution of materials (ceramics, metals, polymers, composites, semiconductors) in the context of history. Traces the link between historical and technological developments enabled by materials from the Stone Age to the Electronic Age. 4 lectures. Prerequisite: Completion of one course from GE Area B. Recommended: Junior standing. *Crosslisted as HIST/MATE 359.* Fulfills GE Area F.

MATE 360 Metallurgical Materials Systems (4)

Mass and energy balances applied to metallurgical materials systems, design of materials products and processes including evaluation of energy needs and

input/output stream compositions. 3 lectures, 1 laboratory. Prerequisite: IME 144. Corequisite: MATE 215. Concurrent: MATE 340.

MATE 370 Process Design (4)

Design of processes for engineering materials. Topics include kinetics in materials: solid-state diffusion (steady-state and non-steady-state), nucleation and growth kinetics, solid state phase transformations. 3 lectures, 1 laboratory. Prerequisite: MATE 310, CHEM 305. Concurrent: MATE 330.

MATE 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

MATE 401 Materials Characterization (3)

Metallographic practices for metals and non-metals. Theory and application of quantitative microscopy and image analysis. Fundamental and advanced Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) analysis of metals, ceramics, and polymers. Introduction to Differential Scanning Calorimetry (DSC). 3 lectures. Prerequisite: MATE 210, MATE 215. Corequisite: MATE 406.

MATE 406 Materials Characterization Laboratory (2)

Interpretation of microstructures in metals and non-metals and laboratory methods for revealing and documenting such microstructures. Fundamental and advanced Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) analysis of metals, ceramics, and polymers. Introduction to Differential Scanning Calorimetry (DSC). 2 laboratories. Prerequisite: MATE 210, MATE 215. Corequisite: MATE 401.

MATE 425 Corrosion Engineering (4)

Forms of corrosion. Influences of environmental variables on corrosion. Methods of corrosion control. 3 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 128, MATE 210, MATE 215.

MATE 430 Microfabrication (3)

Silicon-based fabrication science and technology. Oxidation, diffusion, ion implantation, etching, chemical and physical vapor deposition, photolithography. 3 lectures. Prerequisite: MATE 210.

MATE 435 Microfabrication Laboratory (2)

Basic processes involved in microfabrication; cleanroom protocol, oxidation, diffusion, photolithographic and etching processes, sputtering and evaporation, process development through experimentation, device testing. Each student will be part of a 4-6 person team that will fabricate a micro electronic device or integrated circuit. 2 laboratories. Prerequisite or concurrent: MATE 430, STAT 312 or equivalent.

MATE 440 Welding Metallurgy and Joining of Advanced Materials (3)

Principles, primary variables, and microstructural changes associated with the joining process. Physics of energy transfer. Heat and mass balances in joining, thermodynamic and kinetic justification of solidification and near interface microstructures. Heterogeneous interfaces, adhesion, wetting. Relation between process selection, interface design, microstructure, and properties, weldability. 3 lectures. Prerequisite: MATE 210.

MATE 445 Joining of Advanced Materials Laboratory (2)

Laboratory to accompany MATE 440. Illustration of principles, primary variables, and microstructural changes associated with the joining process. Physics of energy transfer. Heat and mass balances in joining, thermodynamic and kinetic justification of solidification and near interface micro-structures. Heterogeneous interfaces, adhesion, wetting. Relation between process selection, interface design, microstructure, and properties, weldability. 2 laboratories. Prerequisite: MATE 210.

MATE 446 Surface Chemistry of Materials (3)

Surface energy. Capillarity, solid and liquid interface, adsorption. Surface areas of solids. Contact angles and wetting. Friction, lubrication and adhesion. Relationship of surface to bulk properties of materials. Applications. 3 lectures. Prerequisite: CHEM 305 or CHEM 351 or ME 302. *Crosslisted as CHEM/MATE 446.*

MATE 450 Failure Analysis (4)

Procedures for analyzing failed materials and processes. Actual failure analysis of a component by each student. Topics include fracture, fatigue, wear and overload failures, exposure to techniques of metallography, electron microscopy, energy dispersive x-ray spectroscopy, chemical analysis and heat treatment. 3 lectures, 1 laboratory. Prerequisite: MATE 210, MATE 360, MATE 350.

MATE 458 Microelectronics and Electronics Packaging (4)

Materials, processes, and reliability of microelectronics and electronics packaging, surface mount assembly and printed circuit board fabrication. Overview of semiconductor manufacturing and optoelectronics packaging. 3 lectures, 1 laboratory. Prerequisite: MATE 210 and PHYS 133 or consent of instructor. *Crosslisted as CPE 488/IME 458/MATE 458.*

MATE 460 Materials Selection in Mechanical Design (4)

Materials-based approach to mechanical design. Using mechanical and physical properties of materials (performance indices) to select them for design needs (Materials Selection Charts). Detailed background of material properties – information from materials and mechanics. Numerous case studies highlight the concepts covered. 4 lectures. Prerequisite: MATE 210, MATE 222, CE 204, or consent of instructor.

MATE 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

MATE 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

MATE 481 Corporate Culture (1)

Practical working knowledge of key corporate topics such as leadership, ethics, organizational structure, intellectual property, professional communications, life-long learning, global and social impacts of technology. The product development process. 1 activity. Prerequisite: Senior standing.

MATE 482 Senior Project Design I (1)

Foundations of senior project design. Completion of the preliminary stages of selecting a senior project, designing experiments, evaluating realistic constraints, conducting initial experiments, and managing a project timeline. 1 lecture. Prerequisite: Senior standing. For MATE majors.

MATE 483 Senior Project II (2)

Continuation of senior project. Completion of a senior project experimental component under the guidance of a faculty supervisor. Research methodology, experimental design, experimental work and data analysis. 1 lecture and supervised work. Prerequisite: MATE 482.

MATE 484 Senior Project III (2)

Continuation of MATE 483. Completion of a senior project data analysis and communication under the guidance of a faculty supervisor. Mathematical modeling and technical communication. 1 lecture and supervised work. Prerequisite: MATE 483.

MATE 493 Cooperative Education Experience (2) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units. Prerequisite: Sophomore standing and consent of instructor.

MATE 494 Cooperative Education Experience (6) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units. Prerequisite: Sophomore standing and consent of instructor.

MATE 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

MATE 500 Individual Study (1–4)

Advanced study planned and completed under the direction of a member of department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limited to

12 units. Prerequisite: Consent of department head, graduate advisor, or supervising faculty member.

MATE 501 Advanced Engineering Materials (4)

An advanced treatment of the structure of matter. Physical and mechanical properties of materials including metals, alloys, ceramics, insulating materials, semiconductors, super semiconductors, polymers and composites based on detailed theoretical understanding of material microstructures. Discussions of Equilibrium diagrams, processing approaches, material selection based on thermodynamic and kinetic arguments. Degradation and failure, fitness for purpose. 4 lectures. Prerequisite: Graduate standing or permission of instructor. Formerly MATE 570.

MATE 504 Research and Development in Materials Engineering (4)

Overview of the materials science and engineering field. Current materials research and technologies, such as fuel cells, nanotechnology, etc. Emphasis on independent learning, individual research topics, and presentations. Analysis of information from different media used to comprehend how advancements in materials research and development are made. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: MATE 210 and graduate standing or consent of instructor.

MATE 510 Materials Analysis (4)

Fundamentals of materials surface analysis methods and thin-film microanalytical techniques, including SPM, AES, XPS, SIMS, Raman and FTIR. 4 lectures. Prerequisite: MATE 210, MATE 340.

MATE 520 X-Ray Diffraction (3)

Theory and application of x-ray diffraction as applied to advanced materials problems such as crystal quality and identification, thin film applications and structural transformations at high and low temperatures. Course will cover techniques in sample preparation, operation of equipment and interpretation of diffraction data. 3 lectures. Prerequisite: Graduate status or instructor's permission.

MATE 522 Advanced Ceramics (5)

Development, utilization, and control of properties in ceramic materials (inorganic-nonmetallic solids). Emphasis on application on processing to achieve structure and properties. Structure of crystalline ceramics and of glasses. Mechanical, thermal, optical, magnetic, and electrical properties. Application of ceramics in technology. Physical chemistry of ceramics. 4 lectures, 1 seminar. Prerequisite: Graduate standing or permission of instructor.

MATE 525 X-Ray Diffraction Laboratory (2)

X-ray diffraction laboratory experiments of advanced materials problems such as crystal quality and identification, thin film applications and structural transformations at high and low temperatures. Radiation safety training, techniques in sample preparation, operation of equipment and interpretation of diffraction data. 2 laboratories. Prerequisite: Graduate standing in engineering or science or instructor's permission. Concurrent: MATE 520.

MATE 530 Biomaterials (4)

Structure-function relationships for materials in contact with biological systems. Interactions of materials implanted in the body. Histological and hematological considerations including foreign body responses, inflammation, carcinogenicity, thrombosis, hemolysis, immunogenic and toxic properties. Microbial interaction with material surfaces, degradation. 4 lectures. Prerequisite: BIO 213, ENGR 213, MATE 210 and graduate standing or consent of instructor. *Crosslisted as BMED/MATE 530.*

MATE 540 Tribology (3)

Wear and degradation of engineering systems. Dry and lubricated wear modes, identification, and prevention. Materials selection. Friction, contact mechanics, and lubrication theory. Case studies of mechanical systems and failure analysis. Wear Modeling and testing. 3 lectures. Prerequisite: MATE 210, MATE 215.

MATE 545 Tribology Laboratory (1)

Wear testing and measurement through various processes including dry sand rubber wheel, cavitation/erosion, and simulated chemical/mechanical polishing. Wear analysis to include wear modeling, materials characterization via metallography, scanning electron microscopy, and surface profilometry. Experiments focus on real engineering systems and their degradation as a result of wear. 1 laboratory. Prerequisite: MATE 210, MATE 215, MATE 235 or consent of instructor. Corequisite: MATE 540.

MATE 550 Micro Systems (4)

Fundamentals of intelligent systems employing sensors, actuators and intelligent controls. Impact on material properties as devices shrink in the micrometer

realm. Applications toward exploring nanotechnology. 4 lectures. Prerequisite: MATE 210, graduate standing or consent of instructor.

MATE 555 Micro Systems Laboratory (2)

Design, fabrication, and testing of a microfluidic device. Utilization of a rapid prototype soft lithography processing technique to create micro channels, valves, mixing chambers, etc. for controlling fluid flow dynamics. 2 laboratories. Prerequisite: Senior or graduate standing or consent of instructor. Corequisite: MATE 550. *Crosslisted as MATE/ME 555.*

MATE 560 Thin-Film Processing (3)

Thin film science and technology: deposition techniques, surface crystal notation, energy and kinetic processes, epitaxy. Schottky barriers and surface states, stress analysis, characterization techniques, electronics devices incorporating thin films. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 3 lectures. Prerequisite: Graduate standing or permission of instructor.

MATE 565 Thin-Film Processing Laboratory (2)

Thin film processing and analytical techniques: direct current and radio frequency magnetron sputtering, reactive sputtering, co-evaporation, epitaxy, grazing incidence x-ray diffraction, magnetic force imaging. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 2 laboratories. Concurrent: MATE 560 or consent of instructor.

MATE 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing or consent of instructor.

MATE 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Senior or graduate standing or consent of instructor.

MATE 580 Fracture Mechanics and Failure Mechanisms in Materials (4)

Fracture modes and mechanisms in engineering materials, fracture mechanics fundamentals (stress analysis of cracks, energy analysis of fracture process). Use of fracture mechanics in design. Laboratory gives concentrated exposure to fracture development in materials, fracture surface evaluation, fracture toughness testing. 3 lectures, 1 laboratory. Prerequisite: MATE 350, or graduate standing.

MATE 590 Solidification and Densification (4)

Thermodynamics, kinetics and morphologies of solid-liquid interfaces. Heat flow in castings, crystal growth. Solidification mechanics, solute redistribution. Production, characterization and testing of metal powders. Compacting of powder. Sintering with/without liquid phase. Hot pressing, properties of sinterings as a function of processing conditions. Application of theory to the production of useful materials. 4 lectures. Prerequisite: Graduate standing or permission of instructor.

MATE 599 Design Project (Thesis) (2) (2) (5)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

MATH-MATHEMATICS

Satisfactory completion of the Entry Level Mathematics (ELM) requirement is a prerequisite for enrollment in all mathematics courses except MATH 100 and MATH 104. For additional mathematics placement (MAPE) information, see page 31.

MATH 100 Beginning Algebra Review (3) (CR/NC)

Review of basic algebra skills at the beginning algebra level intended primarily to prepare students for MATH 104. Course open only to students who have taken the ELM examination and are not qualified for MATH 104. Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures.

MATH 104 Intermediate Algebra (3) (CR/NC)

Review of basic algebra skills at the intermediate algebra level intended primarily to prepare students for MATH 116. Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures. Prerequisite: Appropriate score on the ELM examination, or credit in MATH 100.

MATH 110 Beginning Algebra Workshop (1) (CR/NC)

Facilitated study and discussion of the theory, problems, and applications of beginning algebra. Not for baccalaureate credit. Credit/No Credit grading only.

1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 100.

MATH 112 The Nature of Modern Mathematics (4) GE B1

Topics from contemporary mathematics, their development, applications, and role in society. Some typical topics, to be chosen by the instructor: graph theory, critical path analysis, statistical inference, coding, game theory, and symmetry. 4 lectures. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104. Fulfills GE B1.

MATH 114 Intermediate Algebra Workshop (1) (CR/NC)

Facilitated study and discussion of the theory, problems, and applications of intermediate algebra. Not for baccalaureate credit. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 104.

**MATH 116, 117 Pre-Calculus Algebra I, II (3) (3)
For MATH 116 and 117: GE B1**

Pre-calculus college algebra without trigonometry. Special products and factoring, exponents and radicals. Fractional and polynomial equations. Matrices, determinants, and systems of equations. Polynomial, rational, exponential, and logarithmic functions. Graphing, inequalities, absolute value, and complex numbers. MATH 116 and MATH 117 are equivalent to MATH 118, but are taught at a slower pace. Upon completion of MATH 116 and MATH 117, a student will receive 4 units of GE credit for Area B1. Not open to students with credit in MATH 118. 3 lectures. **MATH 116** prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104. **MATH 117** prerequisite: MATH 116 with a grade of C- or better or consent of instructor.

MATH 118 Pre-Calculus Algebra (4) GE B1

Pre-calculus algebra without trigonometry. Special products and factoring, exponents and radicals. Fractional and polynomial equations. Matrices, determinants, and systems of equations. Polynomial, rational, exponential, and logarithmic functions. Graphing, inequalities, absolute value, and complex numbers. MATH 118 is equivalent to MATH 116 and MATH 117. Not open to students with credit in MATH 117. 4 lectures. Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination. Fulfills GE B1.

MATH 119 Pre-Calculus Trigonometry (4) GE B1

Rectangular and polar coordinates. Trigonometric functions, fundamental identities. Inverse trigonometric functions and relations. Vectors, complex numbers, conic sections, and analytic geometry. 4 lectures. Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 117, or MATH 118. Fulfills GE B1.

MATH 126, 127 Pre-Calculus Algebra Workshop I, II (1) (1) (CR/NC)

Facilitated study and discussion of the theory, problems, and applications of pre-calculus algebra. Credit/No Credit grading only. 1 laboratory. **MATH 126** corequisite: Concurrent enrollment in the associated section of MATH 116. **MATH 127** corequisite: Concurrent enrollment in the associated section of MATH 117.

MATH 128 Pre-Calculus Algebra Workshop (1) (CR/NC)

Facilitated study and discussion of the theory, problems, and applications of pre-calculus algebra. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 118.

MATH 129 Pre-Calculus Trigonometry Workshop (1) (CR/NC)

Facilitated study and discussion of the theory, problems, and applications of pre-calculus trigonometry. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 119.

MATH 141, 142, 143 Calculus I, II, III (4) (4) (4) GE B1

Limits, continuity, differentiation, integration. Techniques of integration, applications to physics, transcendental functions. Infinite sequences and series, vector algebra, curves. 4 lectures. **MATH 141** prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 118 and high school trigonometry, or MATH 119. **MATH 142** prerequisite: MATH 141 with a grade of C- or better or consent of instructor. **MATH 143** prerequisite: MATH 142 with a grade of C- or better or consent of instructor. *Crosslisted as HNRS/MATH 141, 142, 143.* Each fulfills GE B1.

MATH 151, 152, 153 Calculus Workshop 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. **MATH 151** corequisite: Concurrent enrollment in the associated section of MATH 141. **MATH**

152 corequisite: Concurrent enrollment in the associated section of MATH 142. **MATH 153** corequisite: Concurrent enrollment in the associated section of MATH 143.

MATH 161, 162 Calculus for the Life Sciences I, II (4) (4) GE B1

Review of exponential, logarithmic, and trigonometric functions. Differential and integral calculus with applications to the biological sciences. Introduction to differential equations and mathematical modeling. Examples, exercises and applications to emphasize problems in life sciences. Not open to students with credit in MATH 141, 142, respectively. 4 lectures. **MATH 161** prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 118. **MATH 162** prerequisite: MATH 161. Each fulfills GE B1.

MATH 171 Calculus for the Life Sciences Workshop I (1) (CR/NC)

Facilitated study and discussion of the theory, problems, and applications of calculus for the life sciences. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 161.

MATH 182 Calculus for Architecture and Construction Management (4) GE B1

Integral calculus with applications to architecture and construction management. The algebra of vectors. Polar, cylindrical, and spherical coordinate systems. Not open to students with credit in MATH 142. 4 lectures. Prerequisite: MATH 141. Fulfills GE B1.

MATH 192 Calculus for Architecture and Construction Management Workshop (1) (CR/NC)

Facilitated study and discussion of the theory, problems, and applications of calculus to architecture and construction management. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 182.

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: MATH 143.

MATH 206 Linear Algebra I (4)

Matrices, inverses, linear systems, determinants, eigenvalues, eigenvectors, vector spaces, linear transformations, applications. 4 lectures. Prerequisite: MATH 143.

MATH 211, 212 Computational Mathematics I, II (4) (4)

Fundamentals of procedural programming in C/C++ and selected applications to problems in integral and differential calculus, matrix analysis, geometry, and physics. 4 lectures. **MATH 211** prerequisite: MATH 141. **MATH 212** prerequisite: MATH 211.

MATH 221 Calculus for Business and Economics (4) GE B1

Polynomial calculus for optimization and marginal analysis, and elementary integration. Not open to students with credit in MATH 142. 4 lectures. Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 118. Fulfills GE B1.

MATH 227 Mathematics for Elementary Teaching I (4) GE B1

Introduction to problem solving, set theory, number systems, arithmetic operations, models, and number theory. This class is designed for Liberal Studies majors. Other students will be admitted only by consent of instructor. 4 lectures. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104. Fulfills GE B1.

MATH 231 Calculus for Business and Economics Workshop (1) (CR/NC)

Facilitated study and discussion of the theory, problems, and applications of business calculus. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 221.

MATH 241 Calculus IV (4)

Partial derivatives, multiple integrals, introduction to vector analysis. 4 lectures. Prerequisite: MATH 143. *Crosslisted as HNRS/MATH 241.*

MATH 242 Differential Equations I (4)

Ordinary differential equations: first-order linear equations, separable equations, exact equations, second-order linear equations, nonhomogeneous equations, systems of first-order linear equations, systems of nonlinear equations, modeling and applications. Not open to students with credit in MATH 244. 4 lectures. Prerequisite: MATH 206 and MATH 241.

MATH 244 Linear Analysis I (4)

Separable and linear ordinary differential equations with selected applications; numerical and analytical solutions. Linear algebra: vectors in n -space, matrices, linear transformations, eigenvalues, eigenvectors, diagonalization; applications to the study of systems of linear differential equations. 4 lectures. Prerequisite: MATH 143. *Crosslisted as HNRS/MATH 244.*

MATH 248 Methods of Proof in Mathematics (4)

Methods of proof (direct, contradiction, conditional, contraposition); valid and invalid arguments. Examples from set theory. Quantified statements and their negations. Functions, indexed sets, set functions. Proofs in number theory, algebra, geometry and analysis. Proof by induction. Equivalence and well-defined operations and functions. The axiomatic method. 4 lectures. Prerequisite: MATH 143.

MATH 258 Methods of Proof in Mathematics Workshop (1) (CR/NC)

Facilitated study and discussion of the methods and techniques of proof in mathematics. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 248.

MATH 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

MATH 300 Technology in Mathematics Education (4)

Examination of existing hardware and software designed for educational uses. Discussion of mathematical topics appropriate for computer enhancement. Special methods and techniques for educational uses of computers. Emphasis on activity learning and applications. Computer as a classroom management device. 4 lectures. Prerequisite: MATH 330 or SCM 300, and MATH 142.

MATH 304 Vector Analysis (4)**GE B6**

Differential and integral calculus of vector-valued functions. Green's Theorem, Stokes' Theorem, and the Divergence Theorem. Applications and generalizations. 4 lectures. Prerequisite: MATH 206 or MATH 244, and MATH 241. Fulfills GE B6.

MATH 306 Linear Algebra II (4)

Inner product spaces, orthogonality, Fourier series and orthogonal bases, linear transformations and similarity, eigenvalues and diagonalization. 4 lectures. Prerequisite: MATH 241, and MATH 206 or MATH 244, and a C- or better in MATH 248, or consent of instructor.

MATH 316 Introduction to Linear Algebra Workshop II (1) (CR/NC)

Facilitated study and discussion of the methods and techniques of proof in linear algebra. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 306.

MATH 326 Mathematics and Visual Art (4)**GE B5**

Topics connecting mathematics and visual art including regular polygons, symmetry groups, repetition and pattern, perspective, straightedge and compass constructions, and origami. Examples of mathematical art including historic and contemporary art. 4 lectures. Prerequisite: Completion of GE Area B1 and a college course in art or design. Fulfills GE B5.

MATH 328, 329 Mathematics for Elementary Teaching II, III (4) (4)

Introduction to rational and real numbers, probability and counting techniques, statistics, and geometry. Computer applications. 4 lectures. **MATH 328** prerequisite: MATH 227 with a grade of C- or better or consent of instructor. **MATH 329** prerequisite: MATH 328.

MATH 330 Algebraic Thinking with Technology (4)

Algebraic concepts for elementary teachers. Mathematical patterns, equations and inequalities, linear and quadratic functions, exponential and logarithmic functions, systems of equations, roots of polynomials, factoring of polynomials, and right-triangle trigonometry. Computer applications. 4 lectures. Prerequisite: MATH 329.

MATH 335 Graph Theory (4)

Introduction to graph theory and its applications: isomorphism, paths and searching, connectedness, trees, tournaments, planarity, graph colorings, matching theory, network flow, adjacency and incidence matrices. Further topics to be selected from the theory of finite state machines, Ramsey theory, extremal theory, and graphical enumeration. 4 lectures. Prerequisite: MATH 248 or junior standing.

MATH 336 Combinatorial Mathematics (4)

Methods of enumerative combinatorics: sum, product, and division rules, bijective and recursive techniques, inclusion and exclusion, generating functions, and the finite difference calculus. Advanced topics to be selected from the theory of partitions, Polya theory, designs, and codes. 4 lectures. Prerequisite: MATH 248 or junior standing.

MATH 341 Theory of Numbers (4)

Properties of numbers. Euclid's Algorithm, greatest common divisors, diophantine equations, prime numbers, congruences, number theoretic functions, the quadratic reciprocity laws, primitive roots and indices. 4 lectures. Prerequisite: MATH 248 with a grade of C- or better or consent of instructor.

MATH 344 Linear Analysis II (4)**GE B6**

Linear methods applied to the solution of differential equations. Laplace transforms. Series solutions to ordinary differential equations. Orthogonality in n -space, Gram-Schmidt orthogonalization and least squares methods. Orthogonal bases in function spaces, Sturm-Liouville theory. Fourier series and transforms. Special functions of applied mathematics. 4 lectures. Prerequisite: MATH 206 and MATH 242, or MATH 241 and MATH 244. Fulfills GE B6.

MATH 350 Mathematical Software (4)

Problem-solving using mathematical software. 4 lectures. Prerequisite: MATH 206 or MATH 244, and MATH 241, and an introductory college-level programming course, or consent of instructor.

MATH 351 Typesetting with LaTeX (1) (CR/NC)

Preparing documents, especially mathematical ones, using LaTeX and AMS-LaTeX. Credit/No Credit grading only. 1 lecture. Prerequisite: Junior standing.

MATH 370 Putnam Exam Seminar (2)

Directed group study of mathematical problem-solving techniques. Open to undergraduate students only. Class members are expected to participate in the annual William Lowell Putnam Mathematical Competition. Course may be repeated up to eight units. 2 seminars. Prerequisite: Consent of instructor.

MATH 371 Math Modeling Seminar (2)

Directed group study of mathematical modeling techniques. Open to undergraduate students only. Class members are expected to participate in the annual Mathematical Competition in Modeling. Total credit limited to 8 units. 2 seminars. Prerequisite: Consent of instructor.

MATH 372 Mathematical Community Service Projects (2) (CR/NC)

Directed group mathematical research in support of volunteer community service projects. Total credit limited to 8 units. 2 seminars. Prerequisite: consent of instructor and consent of department chair.

MATH 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units. Prerequisite: Junior standing and consent of department chair.

MATH 404 Introduction to Differential Geometry (4)

Theory of curves and surfaces in space. Topics such as Frenet formulas, curvature, geodesics, Cartan structural equations, Gauss-Bonnet Theorem. 4 lectures. Prerequisite: MATH 304.

MATH 406 Linear Algebra III (4)

Complex vector spaces, unitary and self-adjoint matrices, Spectral Theorem, Jordan canonical form. Selected topics in linear programming, convexity, numerical methods, and functional analysis. 4 lectures. Prerequisite: MATH 306.

MATH 408, 409 Complex Analysis I, II (4) (4)**MATH 408: GE B6**

Elementary analytic functions and mappings. Cauchy's Integral Theorem; Poisson's Integral Formula. Taylor and Laurent series, theory of residues, and the evaluation of integrals. Harmonic functions, conformal mappings. 4 lectures. **MATH 408** prerequisite: MATH 242, or MATH 241 and MATH 244. **MATH 408** fulfills GE B6. **MATH 409** prerequisite: MATH 408.

MATH 412 Introduction to Analysis I (4)

Introduction to concepts and methods basic to real analysis. Topics such as the real number system, sequences, continuity, uniform continuity and differentiation. 4 lectures. Prerequisite: MATH 306.

MATH 413, 414 Introduction to Analysis II, III (4) (4)

A continuation of Introduction to Analysis I covering such topics as integration, infinite series, uniform convergence and functions of several variables. Highly recommended for students planning to enter graduate programs or secondary

teaching and those interested in applied mathematics. 4 lectures. **MATH 413** prerequisite: MATH 412. **MATH 414** prerequisite: MATH 413.

MATH 416 Differential Equations II (4)

Qualitative theory of ordinary differential equations: Existence and Uniqueness Theorem, phase portraits, limit sets, stability of fixed points and periodic orbits, energy functions, Poincaré-Bendixson Theorem, Poincaré maps, bifurcations, attractors, chaos. 4 lectures. Prerequisite: MATH 206 and MATH 242, or MATH 241 and MATH 244.

MATH 418 Partial Differential Equations (4)

Mathematical formulation of physical laws. Separation of variables. Orthogonal functions and generalized Fourier series. Bessel functions, Legendre polynomials. Sturm-Liouville problem. Boundary value problems; nonhomogeneous techniques. Applications to heat flow, potential theory, vibrating strings and membranes. 4 lectures. Prerequisite: MATH 344 or consent of instructor. Recommended: MATH 304.

MATH 419 Introduction to the History of Mathematics (4)

Evolution of mathematics from earliest to modern times. Major trends in mathematical thought, the interplay of mathematical and technological innovations, and the contributions of great mathematicians. Appropriate for prospective and in-service teachers. 4 lectures. Prerequisite: MATH 248 with a grade of C- or better and at least one upper division course in mathematics, or consent of instructor.

MATH 422 Introduction to Analysis I Workshop (1) (CR/NC)

Facilitated study and discussion of the methods and techniques of proof in introductory analysis. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 412.

MATH 423 Advanced Mathematics for Teaching (4)

Introduction to mathematics education research and advanced exploration of the mathematics taught in California's public high schools and middle schools through problem analysis, concept analysis, and problem connections. 4 lectures. Prerequisite: MATH 442 and MATH 481.

MATH 424 Organizing and Teaching Mathematics (4) (CR/NC)

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. Credit/No Credit grading only. 4 lectures. Prerequisite: Acceptance into the Mathematics Single Subject Credential Program, or senior standing in the mathematics major, or consent of instructor.

MATH 425 Mathematics Student Teaching Seminar (1) (CR/NC)

Principles and practice in effective teaching of mathematics at the middle and high school level, learning theories, curriculum content and structure, classroom issues, and the teaching profession. Credit/No Credit grading only. Total credit limited to 2 units. 1 seminar. Prerequisite: Acceptance into Step II of the Single Subject Credential Program in Mathematics. Concurrent: EDUC 469 or EDUC 479.

MATH 435 Discrete Mathematics with Applications I (4)

Methods of discrete mathematics with applications. Generating functions and Lagrange inversion, partition theory, permutation statistics and q-analogues, posets and Möbius inversion. Additional topics including lattice paths and basic hypergeometric series. 4 lectures. Not open to students with credit in MATH 530. Prerequisite: MATH 248 with a grade of C- or better and MATH 336, or consent of instructor.

MATH 436 Discrete Mathematics with Applications II (4)

Methods of discrete mathematics with applications. Polya theory, codes, designs, matroids, the combinatorics of symmetric functions, and tableaux combinatorics. Additional topics including transversals and Latin squares, asymptotics, and discrete probability theory. 4 lectures. Not open to students with credit in MATH 531. Prerequisite: MATH 435; corequisite: MATH 482.

MATH 437 Game Theory (4)

Development of the mathematical concepts, techniques, and models used to investigate optimal strategies in competitive situations; games in extensive, normal, and characteristic form, Nash equilibrium points and Nash Bargaining Model. 4 lectures. Prerequisite: MATH 206 or MATH 244, and MATH 248 with a grade of C- or better, or consent of instructor.

MATH 440 Topology I (4)

Introduction to general topological spaces with emphasis on surfaces and manifolds. Open and closed sets, continuity, compactness, connectedness.

Quotient spaces. 4 lectures. Not open to students with credit in MATH 540. Prerequisite: MATH 412; corequisite: MATH 481.

MATH 441 Topology II (4)

Introduction to general topological spaces with emphasis on surfaces and manifolds. Fundamental group. Triangulations of spaces, classification of surfaces. Other topics may include covering spaces, simplicial homology, homotopy theory and topics from differential topology. 4 lectures. Not open to students with credit in MATH 541. Prerequisite: MATH 440.

MATH 442 Euclidean Geometry (4)

Foundations of Euclidean geometry, finite geometries, congruence, similarities, polygonal regions, circles and spheres. Constructions, mensuration, the parallel postulate. Appropriate for prospective and in-service mathematics teachers. 4 lectures. Prerequisite: MATH 248 with a grade of C- or better or consent of instructor. Recommended: MATH 300 or familiarity with dynamic geometry software.

MATH 443 Modern Geometries (4)

Non-Euclidean and projective geometries. Properties of parallels, biangles, Saccheri and Lambert quadrilaterals, angle-sum and area. Limiting curves, hyperbolic trigonometry, duality, perspectivity, quadrangles, fundamental theorems of projective geometry, conics. 4 lectures. Prerequisite: MATH 442.

MATH 451 Numerical Analysis I (4)

Topics in interpolation and approximation methods, initial value problems, and boundary value problems of ordinary differential equations. 4 lectures. Prerequisite: MATH 206 and MATH 242, or MATH 241 and MATH 244, and an introductory college-level programming course.

MATH 452 Numerical Analysis II (4)

Numerical techniques for solving partial differential equations of the parabolic, hyperbolic and elliptic type. Further topics in approximation theory. 4 lectures. Prerequisite: MATH 451.

MATH 453 Numerical Optimization (4)

Algorithms for solving optimization problems that cannot be solved analytically. Descent algorithms including exact and practical line-searches, steepest descent method, and Newton and quasi-Newton methods for unconstrained minimization. Optimality conditions for constrained optimization, linear programming. Projection and Lagrangian methods, and interior point methods for constrained minimization. 4 lectures. Prerequisite: MATH 306 and MATH 451. *Formerly MATH 431.*

MATH 459 Senior Seminar (4)

Written and oral analyses and presentations by students on topics from advanced mathematics and mathematical modeling. 4 seminars. Prerequisite: MATH 306, and completion of at least two additional upper-division courses in the math major.

MATH 460 Applied Mathematics Senior Seminar (4)

Written and oral analyses and presentations by students on topics in applied mathematics, including applications to sustainability. Construction of mathematical models for physical and biological problems, with analysis and interpretation of the solutions of these models using both analytical and numerical techniques. 4 seminars. Prerequisite: MATH 306, MATH 344, and MATH 451.

MATH 461, 462 Senior Project I, II (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. **MATH 461** prerequisite: MATH 459 or MATH 460. **MATH 462** prerequisite: MATH 461.

MATH 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

MATH 481, 482 Abstract Algebra I, II (4) (4)

Introduction to the study of algebraic structures, including groups, rings and fields. 4 lectures. **MATH 481** prerequisite: MATH 306 or MATH 341. **MATH 482** prerequisite: MATH 481.

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. No major credit allowed; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Consent of instructor.

MATH 491 Abstract Algebra I Workshop (1) (CR/NC)

Facilitated study and discussion of the methods and techniques of proof in abstract algebra. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 481.

MATH 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Consent of instructor.

MATH 500 Individual Study (1-4)

Individual research or advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Total credit limited to 12 units. Prerequisite: Graduate standing and consent of department chair.

MATH 501, 502 Methods of Applied Mathematics I, II (4) (4)

Introduction to advanced methods of mathematics useful in the analysis of engineering problems. Theory of vector fields, Fourier analysis, Sturm-Liouville theory, functions of a complex variable. Selected topics in asymptotic analysis, special functions, perturbation theory. Not open to students in math major or master's degree program in mathematics. MATH 501: Distance Learning Lab fee may be required—see the Schedule of Classes. 4 lectures. MATH 501 prerequisite: MATH 344 or AERO 300, and graduate standing.

MATH 502 prerequisite: MATH 501.

MATH 504 Mathematical Topics for Teachers (1-4) (CR/NC)

Mathematical topics for practicing credentialed teachers. Professional growth through improvement of teachers' mathematical content knowledge and pedagogical approaches using technology, discussion, reflection, and hands-on activities. Content will vary according to teaching level. The Schedule of Classes will list topic selected. Total credit limited to 12 units. Not open to students in math major or master's degree program in mathematics. Credit/No Credit grading only. 1-4 activities. Prerequisite: Multiple Subject or Single Subject teaching credential or consent of instructor.

MATH 505 Graduate Teaching Seminar (1) (CR/NC)

Principles and practice in effective teaching of college-level mathematics. Issues related to present and future teaching experiences, including time management, professionalism, student assessment, grading, classroom management, and qualities of good mathematics teachers. Reflection on individual teaching, and consideration of improvements in instruction. Credit/No Credit grading only. Total credit limited to 2 units. 1 seminar. Prerequisite: Graduate standing.

MATH 520, 521 Applied Analysis I, II (4) (4)

Advanced mathematical methods of analysis in science and engineering, integrated with modeling of physical phenomena. Topics include applications of complex analysis, Fourier analysis, ordinary and partial differential equations. Additional topics to be drawn from perturbation methods, asymptotic analysis, dynamical systems, numerical methods, optimization, and the calculus of variations. 4 lectures. MATH 520 prerequisite: MATH 408, MATH 412 and graduate standing. Recommended: MATH 418. MATH 521 prerequisite: MATH 520.

MATH 530 Discrete Mathematics with Applications I (4)

Methods of discrete mathematics with applications. Generating functions and Lagrange inversion, partition theory, permutation statistics and q-analogues, posets and Möbius inversion. Additional topics including lattice paths and basic hypergeometric series. 4 lectures. Not open to students with credit in MATH 435. Prerequisite: MATH 248 with a grade of C- or better and MATH 336 and graduate standing, or consent of instructor.

MATH 531 Discrete Mathematics with Applications II (4)

Methods of discrete mathematics with applications. Polya theory, codes, designs, matroids, the combinatorics of symmetric functions, and tableaux combinatorics. Additional topics including transversals and Latin squares, asymptotics, and discrete probability theory. 4 lectures. Not open to students with credit in MATH 436. Prerequisite: MATH 530; corequisite: MATH 482.

MATH 540 Topology I (4)

Introduction to general topological spaces with emphasis on surfaces and manifolds. Open and closed sets, continuity, compactness, connectedness. Quotient spaces. 4 lectures. Not open to students with credit in MATH 440. Prerequisite: MATH 412 and graduate standing; corequisite: MATH 481.

MATH 541 Topology II (4)

Introduction to general topological spaces with emphasis on surfaces and manifolds. Fundamental group. Triangulations of spaces, classification of surfaces. Other topics may include covering spaces, simplicial homology, homotopy theory and topics from differential topology. 4 lectures. Not open to students with credit in MATH 441. Prerequisite: MATH 540 and graduate standing.

MATH 550 Real Analysis (4)

Introduction to Lebesgue measure and integration, convergence theorems, L_1 spaces, Radon-Nikodym Theorem and Fubini's Theorem. 4 seminars. Prerequisite: Satisfactory completion of the Graduate Written Examination in Analysis or consent of the Graduate Committee.

MATH 560 Field Theory (4)

Polynomial rings, field extensions, normal and separable extensions, automorphisms of fields, fundamental theorem of Galois theory, solvable groups, solution by radicals, insolubility of the quintic. 4 lectures. Prerequisite: Satisfactory completion of the Graduate Written Examination in Algebra or consent of the Graduate Committee.

MATH 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing and 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 599 Thesis (3)

Serious research endeavor devoted to the development, pedagogy or learning of mathematics. Course to be taken twice for a total of 6 units. Prerequisite: Graduate standing and consent of instructor. Formerly MATH 596.

MCRO—MICROBIOLOGY

MCRO 221 Microbiology (4)

GE B2 & B4

Morphology, metabolism, classification, and identification; microbiology of air, soil, water, and foods with applications to industry, agriculture, medicine, and public health. Not open to students with credit in MCRO 224; not for credit for BIO or MCRO majors. 3 lectures, 1 laboratory. Prerequisite: CHEM 110 or CHEM 111 or CHEM 124 or CHEM 127. Fulfills GE B2 & B4.

MCRO 224 General Microbiology I (5)

GE B2 & B4

Microbial cellular structure and function, nutrition and growth dynamics, control of microbial growth, metabolism, genetics, and viruses. Both prokaryotic and eukaryotic microorganisms emphasized. 3 lectures, 2 laboratories. Prerequisite: BIO 161 and CHEM 111, CHEM 124 or CHEM 127. Recommended: CHEM 128. Fulfills GE B2 & B4.

MCRO 225 General Microbiology II (5)

Microbial diversity, systematics, ecology, and symbiotic relationships. Introduction to host-microorganism interactions including pathogenesis, epidemiology, and immunology. 3 lectures, 2 laboratories. Prerequisite: MCRO 224.

MCRO 301 Wine Microbiology (4)

Wine yeasts, bacteria, and molds: morphology and methods of identification; successful alcoholic and malolactic fermentations; management and prevention of unwanted microbial growth; microorganisms and flavor development. 3 lectures, 1 laboratory. Open to MCRO or WVIT majors only. Prerequisite: MCRO majors must have MCRO 224; WVIT majors must have MCRO 221 and WVIT 202. Crosslisted as MCRO/WVIT 301.

MCRO 320 Emerging Infectious Diseases (3)

Recent outbreaks of human diseases, interrelationships between infectious disease agents, human biology, and the environment. Infectious agents and disease processes, surveillance methods to detect, investigate, and monitor emerging pathogens. Factors involved in the accelerating emergence of diseases and bioterrorist agents. 3 lectures. Prerequisite: BIO 161 or MCRO 221 or MCRO 224. Recommended: BIO 161 and MCRO 221 or MCRO 224.

MCRO 342 Sanitary Microbiology (4)

Principles of disease prevention and control. Water-, food-, and air-borne microbial contaminations and epidemiology of ensuing diseases. 3 lectures, 1 laboratory. Prerequisite: MCRO 221 or MCRO 224.

MCRO 402 General Virology (4)

Infective macromolecules (prions, viroids, and viruses) associated with microbes, plants, and animals. Epidemiology, immune responses, pathogenicity, carcinogenesis, diagnoses, vaccination, and therapy. 3 lectures, 1 laboratory. Prerequisite: BIO 351 or CHEM 373. Recommended: BIO 452.

MCRO 421 Food Microbiology (4)

Physiological activities of microorganisms involved in the preparation, preservation, deterioration, and toxicity of foods and related products. Detection and prevention of spoilage microorganisms and foodborne pathogens. 3 lectures, 1 laboratory. Prerequisite: MCRO 221 or MCRO 224. Recommended: CHEM 212/312.

MCRO 423 Medical Microbiology (5)

Microorganisms as agents of disease in humans. Epidemiology, host-parasite relationships, and chemotherapy. The compromised host and opportunistic disease. Laboratory safety. Procedures for laboratory diagnosis of human diseases. Rapid miniaturized methods of identification. 3 lectures, 2 laboratories. Prerequisite: Junior standing; MCRO 225 and CHEM 312 or CHEM 316; and consent of instructor.

MCRO 424 Microbial Physiology (5)

Cellular structure and life processes of bacteria; chemical composition, growth, and metabolism. General biological and evolutionary considerations. 3 lectures, 2 laboratories. Prerequisite: MCRO 225 and CHEM 313 or CHEM 371.

MCRO 433 Microbial Biotechnology (3)

Principles and methods used for production of enzymes, pharmaceuticals, chemicals, and food additives using micro-organisms. Topics include screening and strain improvement, regulation of metabolite production, genetic engineering, heterologous gene expression systems, large-scale production, and intellectual property. 3 lectures. Prerequisite: MCRO 221 or MCRO 224, and BIO 303, BIO 351 or equivalent, and CHEM 312, CHEM 316 or equivalent.

MCRO 436 Environmental Microbiology (4)

Ecology and interactions of microorganisms in natural environments. Fundamentals of microbial ecology, microbes and ecosystem function, and practical aspects of microbes in the environment: nutrient cycling, extreme environments, symbioses, bioremediation, biocontrol, biofuels. 2 lectures, 2 activities. Prerequisite: BIO 160 and BIO 161, or MCRO 221, or MCRO 224.

ME—MECHANICAL ENGINEERING**ME 134 Introduction to Mechanical Engineering (1)**

Introduction to mechanical engineering and its application in professional practice. Includes design, analysis, testing and dissection of mechanical engineering systems, from simple machines to more complicated systems. 1 laboratory.

ME 151 Engineering Design Communication I (2)

Communication of designs to manufacturing using basic definitions of points, lines and planes in space. Pictorials, orthographic projection, section views and auxiliary views. Techniques from geometry, vectors, analysis, and spatial definitions integrated to provide information to both the design and manufacturing processes. 1 lecture, 1 laboratory.

ME 152 Engineering Design Communication II (2)

Use of advanced communication principles to communicate project designs to manufacturing processes. Projects evaluated in terms of meeting design criteria. Techniques of advanced communication including weld symbols, threaded fasteners, dimensioning and tolerancing. Use of computers to enhance these processes. 1 lecture, 1 laboratory. Prerequisite: ME 151.

ME 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 or PHYS 141.

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 or ARCE 211.

ME 234 Philosophy of Design (3)

General approach to the meaning of engineering design. Conceptual blocks, creativity, design process, design considerations and elements. 3 lectures.

ME 236 Thermal Measurements (3)

Introduction to principles of experimental measurement, including practical instrument reading, data collection, and uncertainty analysis. Techniques for measuring temperature, pressure, and other parameters. Introduction to theory and practice of writing lab reports and communication of experimental data. 2 lectures, 1 laboratory. Prerequisite: CHEM 125, ENGL 134, PHYS 132.

ME 251 Intermediate Solid Modeling (1)

Continuation of solid modeling introduced in ME 152, using current software and hardware. Creation of more involved part models with varied configurations and dynamic assembly models. Working drawings produced from the models. Introduction to mass and inertia using the chosen software. Emphasis of group work and peer review in the production of parts for assemblies. 1 laboratory. Prerequisite: ME 152 or equivalent. *Formerly ME 153.*

ME 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

ME 302 Thermodynamics I (3)

Properties of working fluids and fundamental relations for processes involving the transfer of energy. First and second laws of thermodynamics, irreversibility and availability. 3 lectures. Prerequisite: PHYS 132, ME 212 or CHEM 128.

ME 303 Thermodynamics II (3)

Vapor and gas power cycles, refrigeration cycles, thermodynamic relations, psychrometrics, and chemical reactions. 3 lectures. Prerequisite: ME 236, ME 302.

ME 305 Introduction to Mechatronics (4)

Introduction to microcontrollers and assembly language programming. Emphasis on components and techniques for interfacing that are typical of embedded microcontroller applications (A/D conversion, D/A conversion, interrupts, timers, and pulse-width modulation). Laboratory exercises involve real-time interfacing of microcontrollers to external mechanical and/or electromechanical devices. 3 lectures, 1 laboratory. Prerequisite: EE 321 and EE 361, or consent of instructor.

ME 318 Mechanical Vibrations (4)

Free and forced vibration response of single and multiple degree of freedom systems. Experimental studies of the dynamic behavior of structures and machines. Instrumentation methods utilized in field and laboratory. 3 lectures, 1 laboratory. Prerequisite: ME 326, MATH 344. Recommended: EE 201.

ME 320 Consumer Energy Guide (4)

Interdisciplinary connection of everyday consumer decisions with energy costs, security, and global warming. Energy consumption by home appliances and automobiles. Methods to reduce the individual "energy footprint" with renewable energy, purchasing carbon offsets, and behavioral modifications. 4 lectures. Prerequisite: Junior standing and completion of GE Areas A and B. Fulfills GE Area F.

ME 321 Solar Energy (4)

Methods of utilizing solar energy. Energy concepts, collection and storage systems; greenhouse effect. Commercial and residential building applications. Solar power generation and recent technical developments. International achievements in solar energy with emphasis on solar energy application in developing countries for water purification and other life support functions. 4 lectures. Prerequisite: Junior standing, PHYS 131 or PHYS 123, and completion of GE Area B. Fulfills GE Area F.

GE Area F**GE Area F**

ME 326 Intermediate Dynamics (4)

Continuation of ME 212. Additional analysis of planar motion of rigid bodies with particular attention to the kinematics of mechanisms. Rotating reference frames. Introduction to three dimensional dynamics. Dynamic simulation of mechanisms. 3 lectures, 1 activity. Prerequisite: MATH 244 (or concurrent), ME 212, CSC 231 or CSC 234 or CPE/CSC 101.

ME 328 Introduction to Design (4)

Design of machine parts by stress and deflection. Effects of fluctuating stresses and stress concentration. Design of shafts and other machine parts. Modern industrial design practice using standard components and design layout drawings. 3 lectures, 1 laboratory. Prerequisite: CE 207, ME 152, MATE 210, CSC 231 or CSC 234, ME 212, ME 234.

ME 329 Intermediate Design (4)

Design of mechanical equipment and systems using various machine elements and components such as threaded fasteners, power screws, springs, gears, bearings, clutches, prime movers, etc. Decision modeling based on technical and economic feasibility. 3 lectures, 1 laboratory. Prerequisite: ME 318 (or concurrent), ME 328.

ME 341 Fluid Mechanics I (3)

Fluid statics. Conservation equations of fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, compressible flow, turbomachinery. 3 lectures. Prerequisite: ME 212 or ARCE 225.

ME 343 Heat Transfer (4)

Basic principles of heat transfer. Conduction, convection, radiation, and combined modes. Optional thermal engineering design project. 4 lectures. Prerequisite: ME 341, ME 302 or CHEM 305, MATH 244, CSC 231 or CSC 234.

ME 346 Thermal Science Laboratory (1)

Heat transfer and thermodynamic experiments covering combined free convection and radiation, transient conduction, energy conversion, heat exchanger, polytropic blowdown, steam turbine, and refrigeration cycles. 1 laboratory. Prerequisite: ME 303, ME 341, ME 343.

ME 347 Fluid Mechanics II (4)

Conservation equations of fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, compressible flow, turbomachinery. Laboratory measurement of turbomachine performance, velocity profiles, boundary layers on surfaces. 3 lectures, 1 laboratory. Prerequisite: ME 236, ME 341, ME 302 or consent of instructor.

ME 359 Fundamentals of HVAC Systems (4)

Fundamentals of heating, ventilating and air-conditioning (HVAC) systems, human comfort and indoor air quality, primary and secondary systems and components. 3 lectures, 1 laboratory. Prerequisite: ME 302.

ME 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of instructor.

ME 401 Stress Analysis (4)

Advanced strength of materials: behavior of disks, plates, and shells. Theory of elasticity. Energy methods. 3 lectures, 1 laboratory. Prerequisite: CE 207, MATH 344, ME 328 or consent of instructor.

ME 402 Orthopedic Biomechanics (4)

Biomechanical analysis of the musculoskeletal system. Emphasis on the use of statics, dynamics, strength of materials, viscoelasticity, and poroelasticity to analyze the mechanical loads acting on human joints, the mechanical properties of tissues, and the design of artificial joints. 3 lectures, 1 laboratory. Prerequisite: ME 328 or consent of instructor.

ME 404 Applied Finite Element Analysis (4)

Finite element based solutions to engineering problems with an emphasis on elastostatic problems in structural mechanics. The power and pitfalls associated with the finite element method highlighted through practical modeling assignments. Introduces the use of commercial finite element codes. 3 lectures, 1 laboratory. Prerequisite: ME 329 or CE 351 or BMED 410. *Crosslisted as BMED/CE/ME 404.*

ME 405 Mechatronics (4)

Microprocessor applications in machine control and product design. Applied electronics. Drive technology; transducers and electromechanical systems. Real-time programming. Mechatronic design methodology. 3 lectures, 1

laboratory. Prerequisite: ME 305 and ME 329 (or concurrent), or CPE/EE 329 and CPE/EE 369, or consent of instructor.

ME 410 Experimental Methods in Mechanical Design I (4)

Bonded resistance strain gages for static and dynamic measurements; rosettes, bridge circuits, lead wire effects, special gages. Data acquisition systems, and measurement of displacement, velocity, and acceleration. Photoelastic methods including birefringent coatings. Applications in mechanical design and metrology. 3 lectures, 1 laboratory. Prerequisite: ME 328. Recommended: ME 318.

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 331 or ME 328.

ME 415 Energy Conversion (4)

Engineering aspects of energy sources, conversion and storage. Topics selected from fossil fuel systems, nuclear power, thermoelectric systems, thermionic converters, fuel cells, magnetohydrodynamic generators, and geothermal, tidal, wind and ocean temperature energy conversion systems. 4 lectures. Prerequisite: ME 302.

ME 416 Ground Vehicle Dynamics and Design (4)

Design of ground vehicles for directional stability and control. Tire mechanics and their effects on vehicle performance. Simulation of vehicle dynamics using digital computer. Synthesis of steering mechanism and suspension system. 2 lectures, 2 laboratories. Prerequisite: ME 318, ME 328.

ME 422 Mechanical Control Systems (4)

Modeling and control of physical systems. Design of mechanical, hydraulic and electrical systems using time response, frequency response, state space, and computer simulation. 3 lectures, 1 laboratory. Prerequisite: ME 318.

ME 423 Robotics: Fundamentals and Applications (4)

Introduction to robots and their types. Homogeneous transformations. Kinematic equations and their solutions. Motion trajectories, statics, dynamics, and control of robots. Robot programming. Actuators, sensors and vision systems. 3 lectures, 1 laboratory. Prerequisite: ME 326, ME 422.

ME 424 Design of Piping Systems (4)

Pipe specifications and pertinent codes. Valves, fittings, pumps and compressors. The transportation function of piping as related to power plants, refineries, slurry systems, pumping systems and drainage. Philosophy of system design. 3 lectures, 1 laboratory. Prerequisite: CE 207, ME 347, CSC 231, MATE 210.

ME 428 Senior Design Project I (3)

First of three courses taken sequentially in component and system design using real-world problems. Small teams study and apply techniques of the engineering design process including problem definition, concept generation, feasibility studies and decision making. Practice of professional skills including written and oral communication, teaming, project management, societal responsibility and ethics. 1 lecture, 2 laboratories. Prerequisite: ENGL 149, ME 329, ME 343 or consent of instructor.

ME 429 Senior Design Project II (2)

Continuation of a project begun in ME 428. Activities focused on detail design, analysis and material procurement. 2 laboratories. Prerequisite: ME 428. *Formerly ME 481.*

ME 430 Senior Design Project III (1)

Completion of a project begun in ME 428 and continued in ME 429. Design verified through prototyping and testing. 1 laboratory. Prerequisite: ME 429.

ME 431 Mechanical Design Techniques (4)

Comprehensive study of various design methods and techniques. Techniques used to explore various structural concepts such as prestressing, shaping, sizing, etc. Simulation of systems using digital computer. Design criteria identification of design parameters and constraints. 3 lectures, 1 laboratory. Prerequisite: ME 329.

ME 432 Petroleum Reservoir Engineering (4)

Types of reservoirs and reservoir rocks. Measurement and interpretation of physical properties of reservoir rocks and fluids: porosity, permeability, compressibility, electrical resistivity, fluid saturation, viscosity, solution gas and PVT properties of reservoir fluids. Introduction to flow in porous media, reserve calculations for different reservoirs and computer applications. 3 lectures, 1 laboratory. Prerequisite: ME 341.

ME 434 Enhanced Oil Recovery (4)

Primary, secondary, and tertiary (enhanced) oil recovery methods. Waterflooding, polymerflooding, gas injection, steam injection, in-situ combustion, chemical flooding, miscible flooding. Performance calculations and computer applications in EOR. 4 lectures. Prerequisite: ME 302, ME 347, ME 343.

ME 435 Drilling Engineering (4)

Theory and practice of oilwell planning, drilling, well logging, and completion applied to the development of new oil and gas production, from onshore and offshore fields. 4 lectures. Prerequisite: ME 329, ME 347.

ME 436 Petroleum Production Engineering (4)

Design and operation of surface and subsurface equipment required in oil production. Processes and systems involved are rod pumping, gas lifting, acidizing, hydraulic fracturing, fluid gathering and storage, separation of oil, gas, water and sediment from produced fluid. Includes equipment used in enhanced oil recovery processes. 4 lectures. Prerequisite: ME 329, ME 347.

ME 440 Thermal System Design (4)

Design and optimization of thermal systems. Engineering economics, thermal component sizing, steady-state simulation, and optimization techniques applied to the design and performance analysis of thermal systems. 3 lectures, 1 laboratory. Prerequisite: ME 303, ME 347, ME 343.

ME 441 Single Track Vehicle Design (4)

Design of single track vehicles, including handling characteristics, ergonomics and human power, strength and stiffness considerations, braking and suspension. Laboratory focus on designing a single track vehicle, including fabrication of a handling prototype. 3 lectures, 1 laboratory. Prerequisite: ME 318, ME 329, or consent of instructor.

ME 443 Turbomachinery (4)

Performance characteristics of various types for liquids and for gases. Criteria for proper selection of type and main dimensions. Cavitation criteria. Gas turbine cycles and performance. Two-dimensional cascades. Axial flow turbines and compressors. Centrifugal compressors and radial-inflow turbines. 4 lectures. Prerequisite: ME 303, ME 347, ME 343, MATH 344.

ME 444 Combustion Engine Design (4)

Application of design parameters to the various engine cycles. Aspects of the combustion processes. Emission regulation effects on engine design. Static and dynamic loading. 3 lectures, 1 laboratory. Prerequisite: ME 303, ME 343, ME 347.

ME 445 Convective Heat and Mass Transfer (4)

Forced convection in laminar and turbulent flow, free convection, diffusion, combined heat and mass transfer. 4 lectures. Prerequisite: ME 347, ME 343.

ME 446 Advanced and Hybrid Vehicle Design (4)

Systematic methodology to design and optimize hybrid powertrains. Exploration of conventional and hybrid powertrain subsystem models and application in a vehicle simulation, including internal combustion engines, electric motors and generators, transmissions, batteries, fuel cells, hydraulic reservoirs, ultracapacitors, flywheels, etc. Analytical modeling and optimization. 3 lectures, 1 laboratory. Prerequisite: ME 329 and ME 303.

ME 450 Solar Power Systems (4)

High and intermediate temperature systems for conversion of solar energy to mechanical power and heat. Thermal energy storage and total thermal energy system design. Recommended as a complement to ME 415. 3 lectures, 1 laboratory. Prerequisite: ME 343.

ME 456 HVAC Air and Water Distribution System Design (4)

Air and water distribution components and systems and the design of these systems with applications to the heating, ventilating and air-conditioning (HVAC) industry. 3 lectures, 1 laboratory. Prerequisite: ME 302, ME 347.

ME 457 Refrigeration Principles and Design (4)

Basic engineering principles of refrigeration processes including: vapor compression cycles, multipressure systems, absorption systems, steam jet cooling, air cycles, and low temperature refrigeration. 3 lectures, 1 laboratory. Prerequisite: ME 341, ME 343.

ME 458 Building Heating and Cooling Loads (4)

Building heating and cooling load calculations, estimating energy consumption and operating costs for heating, ventilating and air-conditioning system design and selection. 3 lectures, 1 laboratory. Prerequisite: ME 303, and ME 343.

ME 459 HVAC Senior Design Project I (3)

First quarter of a two quarter sequence. Team project work in designing heating, ventilating and air-conditioning (HVAC) systems. New developments, policies and practices in the HVAC industry. Professional ethics relevant for practicing engineers. 1 lecture, 2 laboratories. Prerequisite: ME 456, ME 458.

ME 460 HVAC Senior Design Project II (2)

Continuation of work begun in ME 459. Team project designing heating, ventilating and air-conditioning (HVAC) systems. 2 laboratories. Prerequisite: ME 459.

ME 461, 462 Senior Project I, II (2) (3)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing, ME 303, ME 343 and ME 329 (or concurrent).

ME 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ME 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

ME 488 Wind Energy Engineering (4)

Engineering aspects of windpower systems including mechanical design, support structure design, aerodynamic analysis, wind field analysis, system concepts and analysis, and economics. 4 lectures. Prerequisite: ME 329, ME 347, ME 302.

ME 493 Cooperative Education Experience (2) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units. Prerequisite: Sophomore standing and consent of instructor.

ME 494 Cooperative Education Experience (6) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units. Prerequisite: Sophomore standing and consent of instructor.

ME 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

ME 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

ME 501 Continuum Mechanics and Linear Elasticity (4)

Introduction to continuum mechanics. Kinematics, stress, and balance laws. Constitutive theory for isotropic and anisotropic solids and viscous fluids. Applications including design of beams and pressure vessels, stress concentrations, fiber-reinforced composites, and non-homogeneous biological materials. 4 lectures. Prerequisite: ME 401 or CE 401 or consent of instructor. *Crosslisted as CE 511/ME 501.*

ME 503 Inelastic Stress Analysis (4)

Perfectly plastic and work hardening materials; von Mises and Tresca yield, isotropic and kinematic hardening flow rules, boundary-value problems. Finite elasticity: kinematics, Cauchy- and Green-elasticity, invariance, constraints, Neo-Hookean and Mooney-Rivlin materials, experimental approaches, non-uniqueness, anisotropy, residual stress, thermoelasticity, boundary-value

problems. 4 lectures. Prerequisite: ME 501 or CE 511. *Crosslisted as CE 513/ME 503.*

ME 504 Finite Element Analysis I (4)

Linear finite element theory and analysis. Strong, weak and variational formulations. Physical and isoparametric spaces. Error estimates and numerical integration. Development of finite element algorithms. Use of commercial finite element codes to illustrate course concepts including modeling issues and limitations. 3 lectures, 1 laboratory. Prerequisite: CE/ME 404 and CE 511 or ME 501 or consent of instructor. *Crosslisted as CE/ME 504. Formerly ME 502.*

ME 505 Finite Element Analysis II (4)

Nonlinear and dynamic finite element theory and analysis. Variational formulations and their significance. Isoparametric formulation and numerical integration. Development of two and three-dimensional finite element algorithms. The limitations of FEA. 3 lectures, 1 laboratory. Prerequisite: CE/ME 504. *Crosslisted as CE/ME 505.*

ME 506 System Dynamics (4)

Unified approach for mathematical modeling and analysis of dynamic physical systems which may store energy in multiple energy domains. Emphasis on developing lumped-parameter linear system models from a set of primitive elements in a systematic manner. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

ME 507 Mechanical Control System Design (4)

Application of principles of high-level design to mechanical control system implementation. Use of modified state transition logic in conjunction with object-oriented programming as design methodology. Real-time programming using above techniques for control of mechanical systems. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

ME 517 Advanced Vibrations (4)

Vibration of complex engineering systems. Inertia and stiffness matrices. Natural frequencies and normal modes. Approximate solutions and computer techniques. Response to transient and periodic inputs. 3 lectures, 1 laboratory. Prerequisite: ME 318, graduate standing or consent of instructor.

ME 518 Machinery Vibration and Rotor Dynamics (4)

Vibrations relating to rotating machinery. Modeling of structural rotordynamic phenomena induced by shaft flexibility, bearings, and seals. Laboratory measurement of rotor system dynamic response and interpretation of machinery diagnostic information. Research project on a related topic. 3 lectures, 1 laboratory. Prerequisite: ME 318, graduate standing or consent of instructor.

ME 531 Acoustics and Noise Control (4)

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, 1 laboratory. Prerequisite: ME 318, MATH 344.

ME 540 Viscous Flow (4)

Introduction to tensor calculus and indicial notation. Development of Reynolds' Transport Theory. Special forms of the governing equations of fluid motion. Internal flows and other classical solutions to the Navier-Stokes equations. 4 lectures. Prerequisite: ME 347, MATH 344 and graduate standing or consent of instructor.

ME 541 Advanced Thermodynamics (4)

Selected modern applications of thermodynamics which may include topics from: 1) equilibrium and kinetics as applied to combustion and air pollution, analysis and evaluation of techniques used to predict properties of gases and liquids, and 2) improvement of modern thermodynamic cycles by second law analysis. 4 lectures. Prerequisite: ME 303, ME 343, ME 347 and graduate standing or consent of instructor.

ME 542 Dynamics and Thermodynamics of Compressible Flow (4)

Control volume analysis of fluid-thermo equations for one-dimensional, compressible flow involving area change, normal shocks, friction, and heat transfer. Two-dimensional supersonic flow including linearization, method of characteristics, and oblique shocks. One-dimensional constant area, unsteady flow, 4 lectures. Prerequisite: ME 303, ME 343, ME 347, MATH 244, and graduate standing or consent of instructor.

ME 551 Mechanical Systems Analysis (4)

Various system modeling methods applied to mechanical systems. System stability studies and system optimization methods. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

ME 552 Advanced Heat Transfer I (4)

Advanced principles of heat transfer. Classical solution techniques to problems in conduction and/or radiation. 4 lectures. Prerequisite: ME 343, ME 347, MATH 344, and graduate standing or consent of instructor.

ME 553 Advanced Heat Transfer II (4)

Advanced principles of heat transfer. Classical solution techniques to problems in convection. 4 lectures. Prerequisite: ME 343, ME 347, MATH 344, and graduate standing or consent of instructor.

ME 554 Computational Heat Transfer (4)

Numerical solutions of classical, industrial, and experimental problems in conduction, convection, and radiation heat transfer. 3 lectures, 1 laboratory. Prerequisite: ME 343, ME 347, MATH 418, graduate standing or consent of instructor.

ME 555 Micro Systems Laboratory (2)

Design, fabrication, and testing of a microfluidic device. Utilization of a rapid prototype soft lithography processing technique to create micro channels, valves, mixing chambers, etc. for controlling fluid flow dynamics. 2 laboratories. Prerequisite: Senior or graduate standing or consent of instructor. Corequisite: MATE 550. *Crosslisted as MATE/ME 555.*

ME 563 Graduate Seminar (1)

Current developments in mechanical engineering. Participation by graduate students, faculty and guests. 1 seminar. Prerequisite: Graduate standing in mechanical engineering program.

ME 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units; may be repeated in same term. 1-4 seminars. Prerequisite: Graduate standing or consent of instructor.

ME 571 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units; may be repeated in same term. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

ME 579 Fluid Power Control (4)

Design, analysis, and control of fluid power systems. Analysis of fluid power system components such as valves, actuators, pumps and motors. System response and stability. Dynamic modeling and computer simulation 3 lectures, 1 laboratory. Prerequisite: ME 422.

ME 593 Cooperative Education Experience (2) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ME 594 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ME 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ME 599 Design Project (Thesis) (1-9)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

MLL—MODERN LANGUAGES and LITERATURES

MLL 101, 102, 103 Foreign Language I, II, III (4) (4) (4)

Organized group instruction arranged for students who wish to acquire basic skill in a foreign language indicated by subtitle. Laboratory drill required. Language taught in its cultural context. To be taken in numerical sequence. 3 lectures, 1 activity. **MLL 102** prerequisite: MLL 101 or consent of instructor. **MLL 103** prerequisite: MLL 102 or consent of instructor.

MLL 121, 122 Intermediate Foreign Language I, II (4) (4)

Review of grammar in a foreign language. Practice in writing, speaking and listening and oral expression within a cultural context. To be taken in numerical sequence. 3 lectures, 1 activity. **MLL 121** prerequisite: MLL 103 or consent of instructor. **MLL 122** prerequisite: MLL 121 or consent of instructor.

MLL 200 Special Problems for Undergraduates (1-8)

Individual investigation, research, studies, or surveys of selected problems at the lower division level. Total credit limited to 8 units. Prerequisite: Consent of instructor.

MLL 210 Introduction to Research Methods and Literary Criticism (4)

Methods and techniques of doing research. Critical thinking and library research in languages other than English. Introduction to the most important philosophical and theoretical schools of thought, as seen and applied in academic research. 3 lectures, 1 activity. Prerequisite: Open to MLL majors only.

MLL 270 Language Study Abroad (4)

Acquisition of language and cultural competencies while studying abroad. Total credit limited to 12 units, with a maximum of 12 units per quarter. 3 lectures, 1 activity. Prerequisite: Consent of department chair.

MLL 290 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

MLL 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 chair.

MLL 460 Senior Project (4)

Selection and completion of a project under faculty mentorship. Projects represent individual, well-defined problems and potential solutions that reflect pertinent scholarly activity in the field of modern languages and literatures, with special emphasis on one of the languages/cultures taught in the department. Total credit limited to 4 units. Prerequisite: MLL 210, advanced composition in primary and/or secondary language, senior status and consent of instructor.

MLL 470 Selected Advanced Topics (4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Consent of instructor.

MSL—MILITARY SCIENCE LEADERSHIP

MSL 101 Foundations of Officership I (1)

Introduction to issues and competencies of the Army officer profession. Emphasis on stereotypes about the military, the role of the Army officer, customs and traditions within the military, and personal and physical development. 1 lecture. Prerequisite: Freshman or sophomore standing.

MSL 102 Foundations of Officership II (1)

The role of leadership within a large organization. Emphasis on the definition of leadership, leadership framework, individual and organizational core values, and the moral responsibility of leadership. 1 lecture. Prerequisite: Freshman or sophomore standing.

MSL 103 Basic Leadership (1)

The foundation of basic leadership fundamentals such as problem solving, communications, briefings and effective writing, techniques for improving listening and speaking skills, and an introduction to counseling. 1 lecture. Prerequisite: Freshman or sophomore standing.

MSL 110 Exercises in Military Leadership (1) (CR/NC)

Hands-on instruction on the proper execution of small-unit military operations. Incorporation of the military decision-making process in the planning,

execution and conducting of a wide variety of squad, platoon and company sized missions. Credit/No Credit grading only. 1 activity. Prerequisite: Enrollment in any MSL course or consent of department head.

MSL 111 Orienteering (2)

Principles of orienteering, basic map reading and compass skills; course running techniques applied in field orienteering events. Open to all freshmen and sophomores. 1 lecture, 1 activity.

MSL 112 The Army Physical Fitness Program (1)

The Army Physical Fitness Program and its proper execution. Physical training to the Army standard with the goal of successfully passing the Army Physical Fitness Test. 1 laboratory.

MSL 201 Foundations of Leadership I (2)

The development of individual leadership traits and capabilities using the Army officer as a model. The Army's problem solving methods, written and oral communications, tactics and group leadership. 2 lectures. Prerequisite: Freshman or sophomore standing.

MSL 202 Foundations of Leadership II (2)

The development of individual leadership traits and capabilities using the Army officer as a model. The Army's problem solving methods, tactics and group leadership. 2 lectures. Prerequisite: Freshman or sophomore standing.

MSL 203 Foundations of Leadership III (2)

The development of individual leadership traits and capabilities using the Army officer as a model. The Army's problem solving methods, land navigation techniques, tactics and group leadership. 2 lectures. Prerequisite: Freshman or sophomore standing.

MSL 212 Leader's Training Course (1-7)

One to seven units of credit may be granted depending upon successful completion of training. Five weeks of training, Fort Knox, Kentucky. Travel pay and salary provided through the Military Science Department. No obligation. LTC graduates eligible to enroll in ROTC Advanced Program.

MSL 229 Ranger Challenge (2) (CR/NC)

Selection and preparation of the Ranger Challenge Team which will represent Cal Poly in military tactical skills competition. Includes rope bridging, orienteering, weapons knowledge, hand grenade accuracy, 10K road march with equipment, first aid, marksmanship, physical fitness and tactics. Credit/No Credit grading only. 2 activities.

MSL 240 American Military History and the Evolution of Western Warfare (4)

Comprehensive analysis of American military history from the early Anglo-French period to the end of the 20th Century. Examination of the strategies, operations and tactics of military warfare, and exploration of how social, economic, and technological factors produced the distinct patterns of war that characterize the struggles of the past two hundred plus years. Open to all students. 4 lectures.

MSL 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

MSL 301 Tactical Leadership I (3)

Introduction to the life of a professional Army officer. Instruction in the operational art of small-unit leadership, and the roles and responsibilities of an Army 2nd Lieutenant in preparation for attendance at the Leader Development and Assessment Course. 3 lectures. Prerequisite: Completion of MSL 101, MSL 102, MSL 103, MSL 201, MSL 202, MSL 203, or completion of MSL 212, and consent of department head.

MSL 302 Tactical Leadership II (3)

Continuation of study of the life of a professional Army officer. Instruction in the operational art of small-unit leadership, and the roles and responsibilities of an Army 2nd Lieutenant in preparation for attendance at the Leader Development and Assessment Course. 3 lectures. Prerequisite: MSL 301, and consent of instructor.

MSL 303 Applied Leadership (3)

Demonstration of proficiency in leading small units. Emphasis on clear and concise oral communications, land navigation, weapons skills, and timely decision-making. Completion of training for the Leader Development and Assessment Course and preparation for attendance at the course. 3 lectures. Prerequisite: MSL 301, MSL 302, and consent of instructor.

MSL 310 Advanced Leadership of Military Exercises (1)

The planning, resourcing and execution of selected Army tactical missions in a field environment, and leading all students enrolled in MSL 110. Total credit limited to 3 units. 1 activity. Prerequisite: MSL 110 or consent of instructor. Recommended: MSL 203 or MSL 212.

MSL 312 Leadership of the Army Physical Fitness Program (1)

The planning, resourcing and execution of the Army Physical Fitness Program, and leading all students enrolled in MSL 112. Total credit limited to 3 units. 1 laboratory. Prerequisite: MSL 112 or instructor consent. Recommended: MSL 203 or MSL 212.

MSL 314 Leadership Development and Assessment Course (6) (CR/NC)

Five 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 provided by the U.S. Army. Held at Fort Lewis, Washington. Credit/No Credit grading only. Prerequisite: MSL 301, MSL 302, MSL 303, and consent of instructor.

MSL 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

MSL 401 Developmental Leadership I (3)

In-depth study and analysis of the duties and responsibilities of an ethical Army officer. Emphasis on honing skills required at follow-on training. Administrative actions and self and subordinate developmental processes utilized by an Army 2nd Lieutenant. 3 lectures. Prerequisite: MSL 301, MSL 302, MSL 303 and consent of instructor.

MSL 402 Developmental Leadership II (3)

Continuation of MSL 401 with a focus on communications and personal development. Continuation of in-depth study and analysis of the duties and responsibilities of an ethical Army officer. Emphasis placed on honing skills required at follow-on training. Administrative actions and self and subordinate developmental processes utilized by an Army 2nd Lieutenant. 3 lectures. Prerequisite: MSL 401 and consent of instructor.

MSL 403 Adaptive Leadership (3)

Beginning of transition from student to commissioned officer. Emphasis on expectations of an Army 2nd Lieutenant. Cultural awareness, effective command climates, terrorism and force protection in the current operational environment, and individual officer skills. 3 lectures. Prerequisite: MSL 401 and MSL 402.

MSL 410 Administration and Evaluation of Exercises in Military Leadership (1)

The supervision and evaluation of the organization, planning, resourcing, and execution of selected Army tactical missions, and mentoring assigned students enrolled in MSL 310. Total credit limited to 3 units. 1 activity. Prerequisite: MSL 303 or MSL 310. Recommended: MSL 314.

MSL 412 Administration and Evaluation of the Army Physical Fitness Program (1)

The supervision and evaluation of the organization, planning, resourcing, and execution of the Army Physical Fitness Program, and mentoring assigned students enrolled in MSL 312. Total credit limited to 3 units. 1 laboratory. Prerequisite: MSL 303 or MSL 312. Recommended: MSL 314.

MSL 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Consent of instructor.

MU–MUSIC**MU 100 Music Fundamentals (4)**

Traditional music notation. Use of treble and bass staff for pitch and rhythm, harmonization using principal triads, major and minor, and common seventh chords. Performance of simple pieces individually and in groups using common classroom instruments. 3 lectures, 1 activity.

MU 101 Introduction to Music Theory (4) GE C3

Introduction to the elements of music and their use by composers and performers. Notation of pitch and rhythm, scales, key signatures, intervals and chords. 3 lectures, 1 activity. Fulfills GE C3.

MU 103 Music Theory I: Diatonic Materials (4)

Introduction to species counterpoint, structure of tonality, four-part writing of root position and inverted triads, dominant seventh chord, phrase structure, harmonic progressions, harmonization of a melody and nonharmonic tones. Composition project. 4 lectures. Prerequisite: MU 101 or permission of instructor.

MU 104 Musicianship I (2)

Introductory sightsinging; rhythmic performance and dictation in simple and compound meters; identification and performance of melodic and harmonic intervals and triads; dictation of major diatonic melodies and basic chord progressions. 2 activities. Prerequisite: MU 101 or consent of instructor. (Music majors may be concurrently enrolled in MU 101 and MU 104.)

MU 105 Music Theory II: Chromatic Materials (4)

Construction and resolution of diatonic seventh chords, secondary dominants, augmented sixth, and Neapolitan chords. Modal mixture and modulation to closely-related keys. Binary, ternary, and variation forms. Introduction to 18th-century counterpoint. Composition project. 4 lectures. Prerequisite: MU 103.

MU 106 Musicianship II (2)

Sightsinging in all forms of the minor mode; rhythmic performance and dictation in compound meters, syncopation and two parts; identification of triad inversions and cadence types; dictation of minor diatonic melodies and triadic chord progressions. 2 activities. Prerequisite: MU 104 or consent of instructor.

MU 108 Musicianship III (2)

Sightsinging in major and minor modes in two or more parts; identification of triadic chord progressions and root position seventh chords; identification of phrase structure; dictation of two-part melodies in major and minor modes. 2 activities. Prerequisite: MU 106 or consent of instructor.

MU 114 Introduction to Composing (4)

Fundamental concepts in music composition. Creative projects. Compositional techniques, development, and structure. Analysis of examples from the literature. 3 lectures, 1 activity. Prerequisite: MU 101 or consent of instructor.

MU 120 Music Appreciation (4) GE C3

Explores the world of music with emphasis on Western tradition. Language of music, the role of music in society. Historical context and major composers from the Middle Ages to the present. 3 lectures, 1 activity. Fulfills GE C3.

MU 121 Introduction to Non-Western Musics (4)

Survey of selected non-Western music cultures. Emphasis on listening and understanding the ensemble type, aesthetic principle, musical style, and performance practice of each. 3 lectures, 1 activity. Prerequisite: Music major, minor, or consent of instructor.

MU 149 Applied Study/Technique (1)

Individual instruction in performance with emphasis on the technical skills needed for the performance of repertoire. Total credit limited to 3 units. The Schedule of Classes will list topic selected. Prerequisite: Consent of instructor.

MU 150 Applied Music (1)

Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 6 units. The Schedule of Classes will list topic selected. Prerequisite: Consent of instructor.

MU 151 Beginning Class Piano (2)

Beginning piano for student with no background in keyboard instruments. Includes fundamentals of notation, keyboard techniques, tone production, sightreading and facility. 1 lecture, 1 activity.

MU 152 Elementary Class Piano (1)

Continuation of MU 151. Piano for students with the ability to play a simple Bach or Mozart Minuet. Total credit limited to 3 units. 1 activity. Prerequisite: MU 151 or consent of instructor. For non-music majors.

MU 153 Intermediate Class Piano (1)

Continuation of MU 152. Students are expected to play at the level of the easier Clementi Sonatinas. Total credit limited to 3 units. 1 activity. Prerequisite: MU 152 or one year of piano instruction. For non-music majors.

MU 154 Beginning Voice (1)

Beginning study of vocal and performance technique for the untrained singer. Includes the beginning study of the vocal mechanism and the fundamentals of notation. 1 activity.

MU 155 Beginning Guitar (1)

Fundamentals of guitar technique and performance. Elements of classical, pop, and folk styles. Basics of staff and chord notations. No previous experience necessary. 1 activity.

MU 161 Piano Skills I (1)

Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody, score-reading. 1 activity. Prerequisite: Music major and consent of instructor.

MU 162 Piano Skills II (1)

Continuation of MU 161. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody, score-reading. 1 activity. Prerequisite: MU 161 or consent of instructor.

MU 163 Piano Skills III (1)

Continuation of MU 162. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody, score-reading. 1 activity. Prerequisite: MU 162 or consent of instructor.

MU 168 Piano Accompanying (1)

Preparation and performance of vocal and instrumental music written with piano accompaniment. Choral rehearsal accompanist techniques. Open to students who are proficient on piano at a collegiate level. Total credit limited to 6 units. 1 activity. Corequisite: MU 253 or piano topic in any of the following courses: MU 150, MU 250, MU 350 or MU 450; or consent of instructor.

MU 170 University Jazz Band (1)

Study and public performance of music written for big band jazz. Limited to those who have had considerable experience playing musical instruments. The band performs concerts on campus and makes at least one tour annually. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 171 Instrumental Ensembles (1)

Open to qualified musicians. Rehearsal and public performances in large and small ensembles. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.

MU 172 Wind Orchestra (1)

Study and public performance of music written for large wind band. Open to all qualified students who perform on woodwind, brass, and percussion instruments. The Schedule of Classes will list topic selected. 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 bands with limited doubling and flexible instrumentation. Open to all students who perform on woodwind, brass and percussion instruments on an advanced collegiate level. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 174 Symphony Orchestra (1)

Preparation and performance of orchestral music including both the standard repertoire and rarely performed works. Open to all qualified students. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor, based on audition.

MU 175 Contemporary Music Ensemble (1)

Open to all instrumentalists who are interested in performing recent classical literature. Limited to students who are proficient on their instrument. Total credit limited to 6 units. 1 activity. Prerequisite: By audition or consent of instructor.

MU 176 Mustang Band (1)

Public performance of music and specially-designed shows written for marching band (woodwinds, brass, percussion, and flag team auxiliary). Limited to those students who have had marching experience with wind and percussion instruments, or flag, rifle or dance lines. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 177 Chamber Winds (1)

Study and public performance of music written for small wind ensembles (10 to 20 players). Open to all students who perform woodwind, brass and percussion instruments on an advanced collegiate level. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.

MU 178 Field Show Marching Skills (1)

Study and application of advanced field show marching techniques used in performance by the Cal Poly Mustang Band and other university bands. Limited to those students who have experience performing on a wind/percussion instrument, or in a marching band flag/dance team auxiliary. Total credit limited to 6 units. 1 activity.

MU 181 PolyPhonics (1)

Study and public performance of music for mixed voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 183 Vocal Ensemble (1)

Open to qualified singers. Rehearsal and performance of specialized vocal music. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.

MU 184 Music Production Workshop (2)

Preparation of a musical theatre production for public presentation. Includes acting and stage management. Total credit limited to 6 units. 2 laboratories. Prerequisite: By audition or consent of instructor.

MU 185 University Singers (1)

Study and public performance of music for large mixed chorus. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 186 Early Music Ensemble (1)

Study and public performance of vocal and instrumental music from 1200 to 1750. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 187 Vocal Jazz Ensemble (1)

Study and performance of vocal jazz, including ensemble performance as well as solo performance and improvisation. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 188 Arab Music Ensemble (1)

Rehearsal and performance of instrumental and vocal repertoire drawn from art and popular music of wide-ranging Arabic-speaking societies and historically related cultures. Accompanying music theories, instrumental techniques, and performance practices, with presentation of seminal works in public concerts. Total credit limited to 6 units. 1 laboratory.

MU 189 Vocal Practicum (1)

Study and implementation of performing techniques used by vocalists in a recital or concert setting. Total credit limited to 6 units. 1 activity. Prerequisite: MU 150, MU 250, MU 350 or MU 450, or consent of instructor.

MU 200 Special Problems for Undergraduates (1-2)

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.

MU 210 Musicianship IV (1)

Continuation of MU 108. Sightsinging with chromatic tones; rhythmic performance in changing meters; chord progressions with seventh chords and secondary dominants; seventh chord inversions; modulation to closely-related keys; identification of binary and ternary forms; and 2-part diatonic dictation. 1 activity. Prerequisite: MU 108 or consent of instructor.

MU 211 Musicianship V (1)

Continuation of MU 210. Sightsinging with chromatic tones; rhythmic performance and dictation in changing and irregular meters; chord progressions with Neapolitan and augmented sixth chords; modulatory progressions and dictations and identification of sonata, rondo, and variation forms. 1 activity. Prerequisite: MU 210 or consent of instructor.

MU 212 Musicianship VI (1)

Continuation of MU 211. Emphasis on previously acquired skills, plus performance and dictation of complex beat divisions; identification of contrapuntal genres; and modulatory dictation in 2 parts. 1 activity. Prerequisite: MU 211 or consent of instructor.

MU 221 Jazz Styles (4)

Survey of Jazz as a significant American art form from 1900 to the present; its historical background and development in the United States; key elements, leading performers, and significant compositions in each style. Emphasis on listening skills. 3 lectures, 1 activity. Fulfills GE C3 and USCP.

GE C3 USCP

MU 229 Music of the 60s: War and Peace (4) GE C3 USCP

Explores wide spectrum of rock, folk and pop styles of the 60s. Relates music to social turmoil and historical trends, including Vietnam War, Civil Rights Movement, American Indian Movement, Chicano Movement, Free Speech Movement. 3 lectures, 1 activity. Fulfills GE C3 and USCP.

MU 249 Applied Study/Technique (1)

Individual instruction in performance with emphasis on the technical skills needed for the performance of repertoire. Total credit limited to 3 units. Prerequisite: Consent of instructor.

MU 250 Applied Music (1)

Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 6 units. The Schedule of Classes will list topic selected. Prerequisite: 3 units of MU 150 and consent of instructor.

MU 251 Diction for Singers (1)

The study of diction as it applies to singing in English, French, German, Italian, Spanish and the International Phonetic Alphabet. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.

MU 252 Intermediate Voice (1)

Vocal and performance technique for experienced singers. Total credit limited to 3 units. 1 activity. Prerequisite: MU 154 or consent of instructor.

MU 253 Advanced Class Piano (1)

Advanced level piano techniques with emphasis on style, interpretation, sightreading, basic performance practices and the solution to general musical problems. Total credit limited to 3 units. 1 activity. Prerequisite: MU 153 or consent of instructor. For non-music majors.

MU 255 Intermediate Guitar (1)

Development of intermediate guitar techniques and performance. Elements of classical, pop, and folk styles. Intermediate skills, reading notes and chord charts. 1 activity. Prerequisite: MU 155 or consent of instructor.

MU 259 Beginning Jazz Improvisation (2)

Development of fundamentals of jazz improvisation including scales, arpeggios, patterns, swing feel, expressiveness, and motifs through in-class performance of written materials and improvisations with play-along recordings. Total credit limited to 6 units. 2 activities. Prerequisite: Facility on a musical instrument or singing ability; MU 101 or consent of instructor.

MU 261 Piano Skills IV (1)

Continuation of MU 163. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, and improvisation of a melody, score-reading. 1 activity. Prerequisite: MU 163 or consent of instructor.

MU 262 Piano Skills V (1)

Continuation of MU 261. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody, score-reading. 1 activity. Prerequisite: MU 261 or consent of instructor.

MU 263 Piano Skills VI (1)

Continuation of MU 262. Completion of this course with a C- or better represents fulfillment of the Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody, score-reading. 1 activity. Prerequisite: MU 262 or consent of instructor.

MU 265 Accelerated Piano Skills (1)

Preparation for Piano Proficiency Examination. For students with an extensive piano repertoire background but needing focused preparation in sightreading, transposition, harmonization of a melody, accompanying, and score reading. Total credit limited to 3 units. 1 activity. Prerequisite: Music major and consent of instructor.

MU 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

MU 301 Counterpoint (4)

Counterpoint as a compositional technique. Modal, tonal, and post-tonal practices. Composition project. 4 lectures. Prerequisite: MU 105.

MU 303 Music Theory III: Advanced Chromaticism (4)

Compositional procedures employed by composers of the Classical and Romantic periods. Chromatic third-related harmony, linear chromaticism, and extended tertian chords. Chromatic and enharmonic modulation to distantly-related keys. Sonata and rondo forms. Composition project. 4 lectures. Prerequisite: MU 105.

MU 305 Music Theory IV: Contemporary Practices (4)

Examination of 20th- and 21st-century compositional practices including impressionism, developments in rhythm, polytonality, non-serial atonality, serialism, timbre and form, neoclassicism, minimalism, and the new eclecticism. Analysis and creative projects. 4 lectures. Prerequisite: MU 303 or permission of instructor.

MU 311 Sound Design: Technologies (4)

Fundamental tools of electroacoustic sound design. Concepts and application of music studio procedure, recording, synthesis, and MIDI. Studio projects. 3 lectures, 1 activity. Prerequisite: MU 101, MU 120 or consent of instructor.

MU 312 Sound Design: Recording (4)

Exploring creative use of recording technology. Analog and digital equipment for recording music. Analysis and creative projects. 3 lectures, 1 activity. Prerequisite: MU 311 or permission of instructor.

MU 320 Music Research and Writing (4)

Methodology for researching, analyzing, and writing about music. Exploration of investigative tools including library resources, periodicals, bibliographic tools, computerized search methods. Performance practice. 4 lectures. Prerequisite: MU 105 and ENGL 134. Recommended: MU 120; or permission of instructor.

MU 324 Music and Society (4)**GE C4**

Exploration into the role of music historically and culturally. Emphasis on deeper understanding and appreciation of the context of music through topics of special interest. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures, 1 activity. Prerequisite: Completion of GE Area A and a foundation course in Area C. Recommended: Junior standing;. Fulfills GE C4 except for Music majors.

MU 325 America's Music (4)**USCP**

Explorations of the many styles of America's music through lectures, readings, sound recordings, musical scores, and performance. Includes "Native American," "folk," "popular," and "fine art" traditions. How American music reflects the different cultural heritages, social contexts, and philosophies of its creators. 4 lectures. Prerequisite: MU 105. Recommended: MU 120. Fulfills USCP.

MU 326 Cultural Concepts and Structures in Music (4)

Exploring the definition, concepts, and structures of music in terms of theory, performance practice, and compositional procedures of selected non-Western cultures. 3 lectures, 1 activity. Prerequisite: MU 121 or consent of instructor.

MU 328 Women in Music (4)**GE C4 USCP**

Survey of women's contributions as composers and performers of western art and popular music; historical overview of the experiences and perception of women as musicians. 3 lectures, 1 activity. Prerequisite: Completion of GE Area A and a foundation course in Area C. Recommended: Junior standing;. Fulfills GE C4 except for Music majors.

MU 331 Music of the Middle Ages and Renaissance (4)

Musical literature, styles, composers, theory, genres and notation of the Middle Ages and Renaissance. Relationship to historical trends. 4 lectures. Prerequisite: MU 320; Recommended: MU 120; or permission of instructor.

MU 332 Music of the Baroque and Early Classic Eras (4)

Survey of the history of western art music from 1600 to 1780. 4 lectures. Prerequisite: MU 320; Recommended: MU 120; or permission of instructor.

MU 335 Survey of Keyboard Literature (4)

Intensive survey of solo piano literature from early keyboard music through contemporary composers; emphasis upon composers' influences, stylistic characteristics, performance practices, and the development of the pianoforte. 4 lectures. Prerequisite: MU 105 or consent of instructor.

MU 336 Jazz History and Theory (4)

Survey of Jazz theoretical techniques. Emphasis upon historical context and development of Jazz through study and analysis of scores and historical performances. 4 lectures. Prerequisite: MU 105.

MU 340 Conducting: Fundamentals (2)

Principles and techniques of conducting with experience in score reading. 2 activities. Prerequisite: MU 105 or consent of instructor.

MU 341 Conducting: Choral (2)

Continuation of MU 340. Emphasis on choral literature. Score reading, rehearsal techniques, and musical details associated with vocal music. 2 activities. Prerequisite: MU 340.

MU 342 Conducting: Instrumental (2)

Continuation of MU 340. Emphasis on band and orchestra literature. Score reading, rehearsal techniques, and musical details associated with instrumental music. 2 activities. Prerequisite: MU 340 and MU 341.

MU 349 Applied Study/Technique (1)

Individual instruction in performance with emphasis on the technical skills needed for the performance of repertoire. Total credit limited to 3 units. The Schedule of Classes will list topic selected. Prerequisite: Consent of instructor.

MU 350 Applied Music (1)

Individual instruction in performance and composition. Total credit limited to 6 units. The Schedule of Classes will list topic selected. Prerequisite: Consent of instructor.

MU 351 Jazz and Popular Music Arranging (2)

Arranging for small and large jazz ensembles. Score and part preparation. 2 activities. Prerequisite: MU 105.

MU 352 Orchestration (4)

Ranges, transposition, technical capabilities, and scoring of vocal ensembles, band, and orchestra instruments. Creative project. 3 lectures, 1 activity. Prerequisite: MU 105.

MU 360 Music for Classroom Teachers (4)

Development of skills for fostering creative music experiences in the classroom. Exploration of various approaches to motivating children musically. Study of folk songs for singing, playing instruments, and learning about music as well as for their ethnic and cultural significance. 3 lectures, 1 activity. Prerequisite: MU 100 or MU 101.

MU 361 Instruments (1)

Fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1 activity. Prerequisite: Junior standing and consent of instructor.

MU 365 Music in the Elementary School (4)

Study and application of Orff, Dalcroze, Kodály, Manhattanville, and Suzuki. Philosophy, objectives and methodologies for implementing an effective school music program. Includes fieldwork. 3 lectures, 1 activity. Prerequisite: MU 105; junior standing.

MU 366 Piano Pedagogy (2)

Survey of elementary, intermediate and advanced teaching methods and literature; private and group instruction; studio policies. 2 activities. Prerequisite: MU 105 or consent of instructor.

MU 368 Piano Accompanying (1)

Preparation and performance of vocal and instrumental music written with piano accompaniment. Choral rehearsal accompanist techniques. Open to students who are proficient on piano at a collegiate level. Total credit limited to 6 units. 1 activity. Prerequisite: Junior standing and MU 168 or consent of instructor.

MU 370 University Jazz Band (1)

Study and public performance of music written for big band jazz. Limited to those who have had considerable experience playing musical instruments. The band performs concerts on campus and makes at least one tour annually. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

MU 371 Instrumental Ensemble (1)

Open to qualified musicians. Rehearsal and public performance in large and small ensembles. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1 activity. Prerequisite: Junior standing and consent of instructor.

MU 372 Wind Orchestra (1)

Study and public performance of music written for large wind band. Open to all qualified students who perform on woodwind, brass and percussion

instruments. The Schedule of Classes will list topic selected. 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 band with limited doubling and flexible instrumentation. Open to all students who perform on woodwind, brass and percussion instruments on an advanced collegiate level. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

MU 374 Symphony Orchestra (1)

Preparation and performance of orchestral music including both the standard repertoire and rarely performed works. Open to all qualified students. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor, based on audition.

MU 375 Contemporary Music Ensemble (1)

Open to all instrumentalists who are interested in performing recent classical literature. Total credit limited to 6 units. 1 activity. Prerequisite: Junior standing; by audition or consent of instructor.

MU 376 Mustang Band (1)

Public performance of music and specially-designed shows written for marching band (woodwinds, brass, percussion, and flag team auxiliary). Limited to those students who have had marching experience with wind and percussion instruments, or flag, rifle or dance lines. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

MU 377 Chamber Winds (1)

Study and public performance of music written for small wind ensembles (10 to 20 players). Open to all students who perform woodwind, brass and percussion instruments on an advanced collegiate level. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor; junior standing.

MU 378 Field Show Marching Skills (1)

Study and application of advanced field show marching techniques used in performance by the Cal Poly Mustang Band and other university bands. Limited to those students who have experience performing on a wind/percussion instrument, or in a marching band flag/dance team auxiliary. Total credit limited to 6 units. 1 activity. Prerequisite: MU 178 or consent of instructor.

MU 381 PolyPhonics (1)

Study and public performance of music for mixed voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

MU 383 Vocal Ensemble (1)

Open to qualified singers. Rehearsal and performance of specialized vocal music. Total credit limited to 6 units. 1 activity. Prerequisite: Junior standing and consent of instructor.

MU 384 Music Production Workshop (2)

Preparation of a musical theatre production for public presentation, including acting and stage management. Total credit limited to 6 units. 2 laboratories. Prerequisite: Junior standing and by audition, or consent of instructor.

MU 385 University Singers (1)

Study and public performance of music for large mixed chorus. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

MU 386 Early Music Ensemble (1)

Study and public performance of vocal and instrumental music from 1200 to 1750. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor; junior standing.

MU 387 Vocal Jazz Ensemble (1)

Study and performance of vocal jazz, including ensemble performance as well as solo performance and improvisation. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

MU 388 Arab Music Ensemble (1)

Rehearsal and performance of instrumental and vocal repertoire drawn from art and popular music of wide-ranging Arabic-speaking societies and historically related cultures. Accompanying music theories, instrumental techniques, and performance practices, with presentation of seminal works in public concerts. Total credit limited to 6 units. 1 laboratory. Prerequisite: MU 188 or consent of instructor.

MU 389 Vocal Practicum (1)

Study and implementation of performing techniques used by vocalists in a recital or concert setting. Total credit limited to 6 units. 1 activity. Prerequisite: MU 150, MU 250, MU 350 or MU 450, or consent of instructor.

MU 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Junior standing and consent of department head.

MU 411 Sound Design: Synthesis (4)

Compositional application of sound synthesis techniques. Realization of computer music. Creative projects. 3 lectures, 1 activity. Prerequisite: MU 312.

MU 412 Sound Design: Composition and Production (4)

Production of electroacoustic music in media. Program analysis, technical planning, composition, and product development. 3 lectures, 1 activity. Prerequisite: MU 312.

MU 431 Music of the Classic and Romantic Eras (4)

Survey of the history of western art music from 1780 to 1900. 4 lectures. Prerequisite: MU 303 and MU 320; Recommended: MU 120; or consent of instructor.

MU 432 Music of the Modern Era (4)

Composers, important works, and significant trends in the Western European and American classical tradition during the 20th and 21st Centuries. 4 lectures. Prerequisite: MU 303 and MU 320. Recommended: MU 305; or consent of instructor.

MU 449 Applied Study/Technique (1)

Individual instruction in performance with emphasis on the technical skills needed for the performance of repertoire. Total credit limited to 3 units. The Schedule of Classes will list topic selected. Prerequisite: Consent of instructor.

MU 450 Applied Music (1)

Individual instruction in performance and composition. Total credit limited to 6 units. The Schedule of Classes will list topic selected. Prerequisite: Consent of instructor.

MU 461 Senior Project (3)

Selection and completion of a project under faculty supervision. Minimum of 90 hours total time. Results presented in a recital, creative work, formal report, or a combination of all three. Prerequisite: Senior standing and consent of department head.

MU 465 Choral Literature and Rehearsal Techniques (4)

Survey of choral literature especially suited for secondary schools. Philosophy and strategy for developing a school program. Musical as well as non-musical techniques for effective rehearsal. 3 lectures, 1 activity. Prerequisite: MU 341, or consent of instructor.

MU 466 Instrumental Literature and Rehearsal Techniques (4)

Survey of instrumental literature especially suited for secondary schools. Philosophy and strategy for developing a school program. Musical as well as non-musical techniques for effective rehearsal. 3 seminars, 1 activity. Prerequisite: MU 342, or consent of instructor.

MU 470 Music History: Selected Advanced Topics (4)

Intensive study of selected topics in music history through the use of readings, recordings, scores, and class presentations. The Schedule of Classes will list title selected. Total credit limited to 8 units. 3 lectures, 1 activity. Prerequisite: MU 331, MU 332, MU 431, MU 432, or consent of instructor.

NR–NATURAL RESOURCES**NR 140 Careers in Forestry and Environmental Management (1) (CR/NC)**

Analysis and development of career goals in natural resources. Acquainting students with potential career options and preparation of academic plans at Cal Poly. Credit/No Credit grading. 1 activity.

NR 141 Introduction to Forest Ecosystem Management (3)

Fundamentals of forestry including basic silviculture, forest protection, measurement and policy. Integrated resource management of forest lands for water production, forage, recreation, wildlife, and timber. 3 lectures. Recommended corequisite: NR 140.

NR 142 Environmental Management (3)

Environmental management as a process within functioning societies seeking a harmonious balance between human activities and intrinsic behavior of the natural environment. Major components of the natural environment and the political and social activities that impact that environment. 3 lectures. Recommended corequisite: NR 140.

NR 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. *Crosslisted as NR/RPTA 203.*

NR 204 Wildland Fire Control (3)

Fire control techniques used on various wildland fuels. Elementary fire physics, fuels, weather, fire behavior, tactics and fire suppression techniques, line construction, “mop-up”, fire line safety, air operations and fire organization. Meets basic wildland fire fighter certification requirements for the USDA Forest Service. Partially meets California Department of Forestry Firefighter I requirements. 2 lectures, 1 laboratory.

NR 208 Dendrology (4)

Identification, classification, silvical characteristics, distribution, environmental requirements and economic importance of woody plants in shrub, woodland, and forest ecosystems of the United States. Emphasis on species located in the Pacific Coastal, Sierran, and Cascade ecosystems. 2 lectures, 2 laboratories. Recommended prerequisite: BOT 121.

NR 215 Land and Resource Measurements (2)

Introduction to land and resource measurement technology and methods – field instruments, property description, map and photograph reconciliation, data accuracy and precision. Trigonometric functions and fundamental identities especially as applied to natural resources applications. Course may be offered at Swanton Pacific Ranch during week prior to beginning of fall quarter, or weekend field trips. 1 lecture, 1 laboratory.

NR 220 Forest Resources Enterprise Project (1–4) (CR/NC)

Selection and completion of a forest management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Corporation. Degree credit limited to 8 units. Credit/No Credit grading only. Recommended prerequisite: NR 141 or equivalent.

NR 247 Forest Surveying (2)

Use and care of tapes, staff compass, abney levels, total stations, and GPS receivers. Keeping field notes, measurements by tape. Closed and open traverse by compass and total stations. Turning angles and determining directions of lines. Map reading and public land description. GPS measurements. Weekend field trips required. 1 lecture, 1 laboratory. Prerequisite: NR 215. *Crosslisted as BRAE/NR 247.*

NR 260 Forest Practices and Environmental Protection (4)

Relationships between forest ecosystem management, forest practices, harvesting methods, timber harvest planning, components of forest harvesting, harvesting effects; cost analysis of harvesting methods; safety management; value-added forest utilization; environmental protection; and road location. Overnight or weekend field trips required. 3 lectures, 1 laboratory. Recommended prerequisite: NR 141, NR 247.

NR 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

NR 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 18 units. Credit/No Credit grading only. Prerequisite: Enrollment limited to those qualified to compete in intercollegiate forestry activities and consent of instructor.

NR 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. Use of forestry and natural resource examples. 1 lecture, 1 laboratory. Prerequisite: Consent of instructor. *Crosslisted as NR/RPTA 300.*

NR 306 Natural Resource Ecology and Habitat Management (4)

Resource ecology and management implications in the major ecosystems of North America. Importance of maintaining the natural dynamics of energy flow and nutrient cycles at the community and ecosystem level to sustain uses and values. Humanity's role as a principal factor of change of the resources in natural systems. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Areas B2 and B4.

NR 307 Fire Ecology (3)

Effects of wildland fires on shrub, woodland, and forest environments to include fuels, plants, soil, water, wildlife, and air. Emphasis on western U.S. forest and shrub ecosystems. 2 lectures, 1 laboratory. Prerequisite: Completion of GE Areas B2 and B4.

NR 308 Fire and Society (4)**GE D5**

Prehistorical and historical record of human use of and attitude toward fire. Mythology and religion of fire. Traditional, cultural and ethnic variations and their influence on modern U.S. institutions involved in managing fire. 3 lectures, 1 activity. Prerequisite: Completion of GE Area A3 and one lower division course in GE Area D. *Crosslisted as ES/NR 308*. Fulfills GE D5 except for Comparative Ethnic Studies majors.

NR 311 Environmental Measurements and Interpretation (4)

Measurement and interpretation of the biological, physical and social values of the natural elements of our environment; organization and presentation of interpretive materials by oral and written communication. 3 lectures, 1 laboratory. Prerequisite: NR 306 or BIO 325.

NR 312 Technology of Wildland Fire Management (4)**GE Area F**

Models and technology to solve complex land management problems. Historic, current and future perspectives of wildland fire in California. Sustainability and ecosystem health. Assumptions and limitations of fire behavior and suppression models. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B2 or B3. Fulfills GE Area F.

NR 315 Measurements and Sampling in Forested Environments (4)

Principles and methods of sampling and measurement for forest and natural resource quantities and qualities. Modeling and estimation for tree volumes, stand structure and composition, and related forest vegetation. Applications in sampling, statistical and inventory techniques. 2 lectures, 2 laboratories. Overnight, weekend field laboratories required. Prerequisite: STAT 217/218, BRAE/NR 247; recommended: MATH 161 or MATH 221 or equivalent.

NR 317 The World of Spatial Data and Geographic Information Technology (4)**GE Area F**

Basic foundation for understanding the world through geographic information and tools available to utilize spatial data. Application of Geographic Information Systems (GIS) and related technologies, including their scientific basis of operation. Not open to students with credit in NR 318. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B2. *Crosslisted as GEOG/LA/NR 317*. Fulfills GE Area F.

NR 318 Applications in GIS (3)

ARC/INFO and ArcView Geographic Information System (GIS) computer software to explore environmental, natural resource, social and economic issues using spatial data. Develop and apply data base and software management competencies. 1 lecture, 2 laboratories. Prerequisite: Junior standing or consent of instructor. *Crosslisted as LA/NR 318*.

NR 319 Natural Resource Ecology, Theories and Applications (4)**GE B5**

Scope and nature of "ecology" in modern society, including resource terminology and classifications systems; dynamics of natural systems (energy exchange and cycles); man's role as a principle agent of change; environmental impacts; historical perspective including people (ethnicity); and the future environment. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Area B2. *Crosslisted as HNRS/NR 319*. Fulfills GE B5.

NR 320 Watershed Management and Restoration (4)

Hydrologic cycle concepts and measurement. Analysis and measurement of watershed processes. Watershed management including restoration, erosion, and review of forest practice rules. Saturday and/or weekend field trip required. 3 lectures, 1 laboratory. Prerequisite: SS 121, NR/LA 318. Recommended: NR 306.

NR 321 Water Systems Technology, Issues and Impacts (4)**GE Area F**

Sustainable strategies and technologies to enhance freshwater supplies and marine habitats. Systems treated include artificial wetlands, stormwater, drinking water, agricultural and industrial waste water. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B2. Fulfills GE Area F.

NR 323 Human Dimensions in Natural Resources Management (4)**GE D5**

Social, economic, political and ecological conditions and institutions that influence decisions affecting the environment; examination of human-caused environmental impacts and how they in turn influence social institutions. 4 lectures. Prerequisite: Completion of GE Areas A3 and D1. Fulfills GE D5 except for Forestry and Natural Resources majors.

NR 326 Natural Resources Economics and Valuation (4)

Theory of efficient use of renewable and nonrenewable natural resources, including methods for attaching value to marketable and non-market natural resources. Environmental economic theories and techniques to address allocation of water, timber, wildlife/fisheries, open space, and recreation. 3 lectures, 1 activity. Prerequisite: MATH 161 or MATH 221 or equivalent. Recommended: GE Area D2 (ECON 201 recommended), AGB 212.

NR 335 Conflict Management in Natural Resources (4)

Application of behavioral science principles and techniques in the management of natural resource systems. Management of internal and external human resource issues and concerns in natural resources organizations is emphasized. 3 lectures, 1 laboratory. Prerequisite: NR 141 or NR 142; recommended: PSY 201 or PSY 202.

NR 339 Internship in Forest and Natural Resources (1–12) (CR/NC)

Selected students will spend up to 12 weeks with an approved firm or agency engaged in forest or natural resources management. Applying and developing managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading. Prerequisite: Consent of instructor.

NR 340 Wildland Fire Management (3)

Wildland fuels, fire weather, and fire danger ratings in chaparral, grassland, and forested areas. Advanced modeling of surface and crown fire behavior. Fire management strategies and implications, policies and objectives of fire management organizations. Saturday field trips may be required. 3 lectures. Prerequisite: NR 204.

NR 350 Urban Forestry (3)

Establishment and management of municipal forests, wildland-urban interface, wildlife habitat, and pollution abatement. Management of forest areas requiring special attention because of heavy recreational use, fire hazard, watershed, and societal values. Full-day field trips may be required. 2 lectures, 1 laboratory. Prerequisite: NR 208 or consent of instructor.

NR 351 Introduction to Emergency Management in California (3)

Emergency management emphasizing the Standardized Emergency Management System (SEMS) and Emergency Operations Center (EOC) operations. Earthquake hazard used as the case to explore potential wide geographic impacts, multiple secondary hazards, and multidisciplinary problem-solving methods in natural disasters faced by local governments and communities. 2 lectures, 1 activity. Prerequisite: Completion of GE Area B3 or D. *Crosslisted as CRP/DMHS/NR 351*.

NR 352 Terrorism: Understanding the Threat (3)

Theories, procedures, and practices to prepare field responders, first level governmental supervisors and managers in appropriate local emergency operations centers' response to a terrorist incident. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as DMHS/NR 352*.

NR 353 Introduction to Crisis Communications and the Media (3)

Theories, practices and procedures to educate public and private officials on methods and practices used to communicate with the media in time of local or national disasters or crises. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as DMHS/NR 353*.

NR 360 Ethnicity and the Land (4)**GE C4 USCP**

Comparative study of how race and culture shape landscapes, and how social hierarchies allocate the use of natural resources and the burdens of environmental pollution. 4 lectures. Prerequisite: Completion of GE Area A and one lower division course in Area C. Recommended: One Ethnic Studies course and an introductory Natural Resources course; junior standing. *Crosslisted as ES/NR 360*. Fulfills GE C4 except for Comparative Ethnic Studies majors. Fulfills USCP.

NR 362 Survey and Management of Mediterranean Ecosystems (4)

Woody vegetation found in worldwide Mediterranean ecosystems. Distribution, historical development and uses of these ecosystems. Emphasis on chaparral management techniques and effects of management on fire, water production,

biomass potential. 3 lectures, 1 laboratory. Prerequisite: NR 306 or BIO 325 or consent of instructor.

NR 365 Silviculture and Vegetation Management (4)

Applied forest ecology and prescriptions for achieving forest ecosystem management; dynamic relations among trees, biological communities, environmental factors, and land use. Vegetation manipulation and reforestation methods. Overnight and/or weekend field trips required. 3 lectures, 1 laboratory. Prerequisite: NR 208 and NR 315.

NR 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.

NR 401 Disaster Recovery (3)

Strategies and procedures for public sector management of recovery from disasters. Understanding the role of, and relationship between, federal, state and local agencies to provide assistance to individuals and communities in the post-disaster environment. Issues in the recovery process. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as CRP/DMHS/NR 401.*

NR 402 Forest Health (4)

Impact and losses to forested areas caused by physical and biotic agents (such as insects and diseases) other than fire; relation of direct and indirect control practices to forest management. Saturday field trips required. 3 lectures, 1 laboratory. Prerequisite: NR 208, and NR 306 or BIO 325, or consent of instructor.

NR 404 Environmental Law (3)

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: Junior standing. *Crosslisted as CRP/NR 404.*

NR 405 Managing Sustained Operations (3)

Methods and techniques for managing Emergency Management Operations Centers in order to ensure support to local government efforts in rebuilding after a disaster. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as DMHS/NR 405.*

NR 408 Water Resource Law and Policy (3)

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: Junior standing. *Crosslisted as CRP/NR 408.*

NR 412 Forest and Natural Resources Senior Assessment Project (3)

Principles and practices of integrated sampling and inventory of natural resource values in terrestrial ecosystems, culminating in a student project report. 2 lectures, 1 laboratory. Prerequisite: NR 326 and completion of GE Area A3 or consent of instructor.

NR 414 Sustainable Forest Management (4)

Biophysical, economic, social and political influences on optimal forest management for purposes of providing sustained yields of goods and services. Growth and yield modeling; forest investment analysis; sustainable forest production; harvest schedule modeling. Day field trip required. 3 lectures, 1 laboratory. Prerequisite: NR 326, NR 365.

NR 416 Environmental Impact Analysis and Management (4)

National Environmental Policy and California Environmental Quality Acts as applied to environmental and natural resource management problems and projects. Intent, purpose and history of the laws; differences between laws identified. Request for proposals and preparation of environmental assessment documents covered. 3 lectures, 1 laboratory. Prerequisite: NR 306 or BIO 325 or equivalent, and NR 335 or consent of instructor.

NR 418 Applied GIS (3)

Acquisition, organization and analysis of spatial data from diverse sources using Geographic Information System (GIS) software. GIS modeling applications and validation techniques used in development and preparation of client-driven projects. 1 lecture, 2 activities. Prerequisite: NR/LA 318.

NR 420 Advanced Watershed Hydrology (4)

Sources of streamflow and processes by which watersheds undergo change from natural and anthropogenic processes. Fluvial processes, sediment transport and channel restoration techniques. Influences of forest and range management

on water resources including water quality and analytical techniques. Weekend field trips required. 3 lectures, 1 laboratory. Prerequisite: NR 320 or equivalent or graduate standing.

NR 421 Wetlands (4)

The formation, characteristics, and functions of wetlands. Genesis of hydric soils. Plant adaptations to saturated soils. Wetlands as wildlife habitat. Policies and social issues associated with wetlands. The procedures of wetland delineations. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or BIO 162, CHEM 111 or CHEM 127, and SS 121 or SS 131. Recommended: BOT 313, NR 306 or BIO 325. *Crosslisted as BIO/NR/SS 421.*

NR 425 Applied Resource Analysis and Assessment (4)

Environmental impacts in responses to resource management, projects, programs and activities. Preparation, implementation, and coordination of environmental plans. Criteria for measurements, interpretation, and evaluation. Resource inventories, analysis, evaluation, synthesis, environmental assessment writing and preparation. 3 lectures, 1 laboratory. Prerequisite: NR 416.

NR 432 Disaster Operations Planning (3)

Developing emergency operations plans in support of the local, state and federal emergency management community needs. Major aspects and necessary elements of emergency planning required in a multi-hazard emergency operations plan. 3 lectures. Prerequisite: NR/CRP/DMHS 351. *Crosslisted as DMHS/NR 432.*

NR 434 Wood Properties, Products, and Sustainable Uses (4)

Principles of wood properties, green building practices, sustainable and efficient use of renewable wood resources including methods for using wood as an energy source. Field trips required. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Area B.

NR 435 Natural Resources Policy Analysis (4)

Policy process approach to understanding the efforts to resolve natural resource problems in the public and private sector. Principles and techniques used to analyze the effects of environmental policies. Analysis of major federal and state environmental laws. 4 lectures. Prerequisite: NR 326. Recommended: NR 335.

NR 450 Community Forestry (3)

Development and management of the urban/wildland interface. Socio-economic problems related to forest tree establishment, care, and removal utilization. International implications also covered. Weekend or full-day field trips required. 2 seminars, 1 laboratory. Prerequisite: NR 208 or consent of instructor.

NR 455 Wildland-Urban Interface Fire Protection (3)

Biophysical and socioeconomic issues affecting wildland fire management in urbanized landscapes. Fire risk assessment. Pre-fire prevention, mitigation, and preparation, during-fire response, and post-fire recovery actions by agencies and residents. 2 lectures, 1 laboratory. Prerequisite: NR 340 or consent of instructor.

NR 461, 462 Senior Project I, II (3) (3)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 180 hours total time.

NR 465 Ecosystem Management (4)

Capstone course that integrates biophysical, economic and socio-political sciences. Principles, concepts and techniques designed to utilize resources while sustaining ecosystem health within acceptable limits of change. Ecosystem assessment, planning, management and monitoring project. 3 lectures, 1 laboratory. Prerequisite: NR 326 and NR 416 or consent of instructor.

NR 466 Enhanced Exercise Design in Disaster Management (3)

Design, development, evaluation and follow-up of emergency management exercises. Performance based education and skills training for emergency management personnel. 2 lectures, 1 activity. Prerequisite: CRP/DMHS/NR 351. *Crosslisted as CRP/DMHS/NR 466.*

NR 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Consent of instructor.

NR 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Junior standing or consent of instructor.

NR 472 Leadership Practice (1)

Leadership styles used in the natural resources management and recreation administration professions. Study and practice in setting goals and objectives; developing, evaluating and implementing an entrepreneurial project plan; decision making and problem-solving. Total credit limited to 4 units. 1 laboratory. Prerequisite: Junior standing or consent of instructor. *Crosslisted as NR/RPTA 472.*

NR 475 Sustainable Forest and Environmental Practices (15)

Typical modules related to sustainable resource management: ecosystem sampling and inventory methods, photo interpretation, hydrologic resources, road condition, project impact analysis, best management practices. Topics covered vary from term to term depending on the priority for learning modules. Residency at Swanton Pacific and extended field trips required. 10 lectures, 5 activities. Prerequisite: Consent of instructor. *Crosslisted as HNRS/NR 475.*

NR 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: Consent of instructor.

NR 502 Resource Conservation (3)

Conservation, planning and administration for broad treatment of land, water, mineral, forest, range, and wildlife resources. 3 seminars. Prerequisite: Consent of instructor.

NR 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: Consent or instructor.

NR 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: Consent of instructor.

NR 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. Environmental education programs such as Project Learning Tree. 3 seminars. Prerequisite: Consent of instructor.

NR 530 Social Systems in Natural Resources Management (3)

Theories and methods for incorporating community in the management of forest resources. Approaches to conflict resolution between resource owners and community stakeholders using tools such as GIS. 2 lectures, 1 laboratory. Prerequisite: Consent of instructor.

NR 532 Applications in Biometrics and Econometrics (4)

Parametric and semi-parametric statistical methods in modeling biological and economic phenomena. Biometric modeling of stand growth and inventory. Econometric modeling of market and environmental values. 3 lectures, 1 laboratory. Prerequisite: One course in undergraduate statistics, graduate standing, or consent of instructor.

NR 534 Forest Ecosystem Modeling (3)

Methods and modeling approaches used in quantifying ecological processes and conditions associated with forested ecosystems, such as fire behavior, hydrologic processes, terrestrial and aquatic habitat condition using GIS and other models. The Schedule of Classes will list topic selected; sections not repeatable. 2 lectures, 1 laboratory. Prerequisite: One course in undergraduate statistics, graduate standing, or consent of instructor.

NR 539 Graduate Internship in Forest Resources(1–9)

Application of theory to the solution of problems of forest resources or related businesses in the field. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the

firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

NR 570 Selected Topics in Forest Resources (1–4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1–4 seminars. Prerequisite: Consent of instructor.

NR 571 Selected Topics in Forest Resources Laboratory (1–4)

Directed group laboratory of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1–4 laboratories. Prerequisite: Consent of instructor.

NR 575 Applications in Advanced Watershed Hydrology (2)

Techniques and applications in watershed hydrology to real-world projects. Projects could include water quality or quantity assessments, water quality or channel morphology monitoring, and structural and non-structural enhancements for channel and upland watersheds, culminating in a final report and presentation. 2 laboratories. Prerequisite: Consent of instructor. Recommended: NR 420.

NR 581 Graduate Seminar in Forestry and Environmental Sciences (3)

Student study and presentation of selected developments, trends and problems in the field of forest and natural resources. 3 seminars. Prerequisite: Consent of instructor.

NR 599 Thesis (1–9)

Individual research in forest or natural resources management under the general supervision of faculty, leading to a graduate thesis. Degree credit limited to 9 units. Prerequisite: Consent of instructor.

PEM–PHYSICAL EDUCATION: MEN PEW–PHYSICAL EDUCATION: WOMEN

(See also KINE–Kinesiology)

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 282 Baseball
PEM 183 Basketball	PEM 283 Basketball
PEM 184 Cross Country	PEM 284 Cross Country
PEM 185 Football	PEM 285 Football
PEM 189 Soccer	PEM 289 Soccer
PEM 191 Swimming	PEM 291 Swimming
PEM 192 Tennis	PEM 292 Tennis
PEM 193 Track and Field	PEM 293 Track and Field
PEM 195 Golf	PEM 296 Wrestling
PEM 196 Wrestling	

Women

PEW 183 Basketball	PEW 283 Basketball
PEW 184 Cross Country	PEW 284 Cross Country
PEW 189 Soccer	PEW 289 Soccer
PEW 190 Softball	PEW 290 Softball
PEW 191 Swimming	PEW 291 Swimming
PEW 192 Tennis	PEW 292 Tennis
PEW 193 Track and Field	PEW 293 Track and Field
PEW 194 Volleyball	PEW 294 Volleyball
PEW 195 Golf	

Former ACTIVITY COURSES – See KINE–Kinesiology

PROFESSIONAL ACTIVITIES – See KINE–Kinesiology

ACADEMIC COURSES – See KINE–Kinesiology

PHIL–PHILOSOPHY**PHIL 101 Introduction to Philosophy (4)**

Foundational methods and central issues in contemporary philosophy including logic, epistemology, metaphysics and ethics. Required of all philosophy majors. Open to all majors and philosophy minors. 4 lectures. NOTE: This is not a GE course and will not count for GE credit.

- PHIL 126 Logic and Argumentative Writing (4)** **GE A3**
Principles of argument analysis, evaluation and construction. Deductive and inductive reasoning, including analogical arguments, universal and statistical generalizations, and causal inferences. Principles of organizing and writing argumentative essays. Moral dimensions of rational discourse. 4 lectures. Prerequisite: Completion of GE Area A1 with a C- or better, or consent of instructor. Fulfills GE A3.
- PHIL 230 Philosophical Classics: Knowledge and Reality (4)** **GE C2**
Critical examination of primary philosophical texts, from the ancient and modern periods, with focus on the nature of reality, and the sources and limits of human knowledge. 4 lectures. Prerequisite: Completion of GE Area A. *Crosslisted as HNRS/PHIL 230.* Fulfills GE C2.
- PHIL 231 Philosophical Classics: Ethics and Political Philosophy (4)** **GE C2**
Readings from primary philosophical texts, from the ancient and modern periods, with focus on the identification, evaluation and contemporary relevance of the central ethical and political themes and arguments presented in them. 4 lectures. Prerequisite: Completion of GE Area A. *Crosslisted as HNRS/PHIL 231.* Fulfills GE C2.
- PHIL 241, 242 Symbolic Logic I, II (4) (4)**
The nature of deductive logical systems. Methods of notation, translation and proof in sentential and predicate calculi including truth-trees and natural deduction systems. Introduction to meta-theory. 4 lectures. **PHIL 241** prerequisite: Completion of GE Area A3. **PHIL 242** prerequisite: PHIL 241 with a grade of C- or better or consent of instructor.
- PHIL 270 Selected Topics (1–4)**
Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.
- PHIL 311 Greek Philosophy (4)** **GE C4**
Beginnings of Western philosophy and science. The Presocratics, Socrates, Plato, and Aristotle. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 312 Medieval Philosophy (4)** **GE C4**
Development of Western philosophy from Augustine to Ockham, including Anselm, Abelard, Roger Bacon, Bonaventure, Aquinas, and Duns Scotus. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 313 Early Modern Rationalism (4)** **GE C4**
Development of Western philosophy from the late Renaissance through Leibniz, with special emphasis upon the epistemology and metaphysics of the Continental Rationalists. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 314 Early Modern Empiricism (4)** **GE C4**
Development of Western philosophy from the Renaissance through Mill, with special emphasis on British Empiricism. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 315 Kant and 19th Century Philosophy (4)** **GE C4**
Primary issues and concepts found in German philosophy from 1780 to 1900, with emphasis on Kant, Hegel, and Nietzsche. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 316 20th Century European Philosophy (4)** **GE C4**
Recent movements within the Continental tradition, including French and German existentialism, phenomenology, and post-metaphysical philosophy. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 317 History of Analytic Philosophy (4)** **GE C4**
Major developments within 20th century British and American philosophy, with focus chiefly around Analytic philosophy. Other schools, such as Pragmatism, may be included, as may some philosophers outside of Britain and America whose work was influential in those countries. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 320 Asian Philosophy (4)** **GE C4**
Philosophies developed in India, South Asia, China and Japan, including the logical and epistemological presuppositions of the Six Schools of Hindu metaphysics, Buddhist philosophy, Confucian moral philosophy, Taoist metaphysics and social ecology. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 321 Philosophy of Science (4)** **GE C4**
The rational foundations of inquiry and explanation in the physical, biological and social sciences. Justification of scientific claims, the difference between science and pseudoscience, the relationship between science and other fields of investigation. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 322 Philosophy of Technology (4)** **GE C4**
Analyses of the philosophical foundations and implications of technology. Technology and the human condition, technology and philosophical ethics, technology and political philosophy, technology and the metaphysics of human nature, and the relationship between science and technology. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 331 Ethics (4)** **GE C4**
Analyses of various traditional and contemporary positions on the difference between right and wrong, if there is one. Theories of metaethics and normative ethics including the divine command theory, relativism, intuitionism, noncognitivism, virtue ethics, egoism, utilitarianism and duty-based ethics. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 332 History of Ethics (4)** **GE C4**
The history of moral thought from Homer and the Pre-Socratics to the 20th century, and focus on theories of moral goodness and rightness of action. Related issues and areas of thought, e.g. metaphysics, theology, science, politics, psychology freedom/determinism to be considered, where they shed light on moral thought. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 333 Political Philosophy (4)** **GE C4**
Analyses of the philosophical foundations of political ideologies, including theories of political authority, legitimacy, obligation, and rights, and of the proper function of the state, and the relation of these theories to issues in metaphysics, theory of knowledge, and ethics. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 334 Philosophy of Law (4)** **GE C4**
Normative and analytic questions about law. Nature of law and legal systems. Justification of law. Moral obligation to obey the law. Nature and justification of punishment. Guilt and legal responsibility. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 335 Social Ethics (4)** **GE C4 USCP**
Examination of contemporary moral problems, solutions to these problems, and the arguments for these solutions, with emphasis on two or more of the following sample problem areas: abortion, suicide and euthanasia, capital punishment, family ethics, race relations, social justice, war, women's issues. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors. Fulfills USCP.
- PHIL 336 Feminist Ethics, Gender and Society (4)** **GE C4 USCP**
Critical examination of the relations between gender, ethnicity, society and ethics from feminist perspectives, with special attention paid to problems in contemporary applied ethics. Joint focus on theory and application. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors. Fulfills USCP.
- PHIL 337 Business Ethics (4)** **GE C4**
Critical examination of ethical problems that arise in business. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.
- PHIL 339 Biomedical Ethics (4)** **GE C4**
Critical examination of problems in biomedical ethics, proposed solutions to these problems, and the arguments for such solutions. Emphasis on two or more

of the following sample problem areas: concepts of health and disease, human experimentation, informed consent, behavior control, genetic intervention, new birth technologies, euthanasia and physician-assisted dying. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.

PHIL 340 Environmental Ethics (4) **GE C4**
Analyses of various positions on the moral status of nonhuman entities and problems such as the treatment of animals, wilderness preservation, population, pollution and global warming. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.

PHIL 341 Professional Ethics (4) **GE C4**
Moral problems as they arise in professions such as law, medicine, engineering, research and education: deception, paternalism, confidentiality, discrimination and others. Consideration of various professional codes of ethics. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.

PHIL 342 Philosophy of Religion (4) **GE C4**
Inquiry into the rational and nonrational bases of religious claims. Arguments for and against the existence of God. Discussion of miracles, revelation, the definition of God, the problem of evil, the relation of faith and reason, the nature of religious experience, the verification of religious claims. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.

PHIL 350 Aesthetics (4) **GE C4**
Critical examination of philosophical views of art from both a historical and contemporary perspective. Treatment of theories from Plato and Aristotle through those of the twentieth century. Discussion of the problems raised by modern art. The relation between aesthetic values and metaphysics, epistemology, ethics and politics. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4 except for Philosophy majors.

PHIL 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

PHIL 411 Metaphysics (4)
Traditional and current ideas and arguments about substance, the relation of universals to particulars, space and time, events, causation and necessity, the self and free will. 4 lectures. Prerequisite: Junior standing and completion of GE Area C2.

PHIL 412 Epistemology (4)
Analysis of the concept of knowledge. Development of competing theories of epistemic justification and truth. Inquiry into relationship between knowledge, belief, justification and truth. Examination of skepticism. 4 lectures. Prerequisite: Junior standing and completion of GE Area C2.

PHIL 420 Philosophy of Biology (4)
Philosophical implications and assumptions of evolutionary theory, the problem of reduction, feminist critiques, demarcation issues and the differences between biology and other sciences. Ethical and social issues, including Creationism and “intelligent design” theories, eugenics, sociobiology, and ecology. 4 lectures. Prerequisite: Junior standing and completion of GE Area C2.

PHIL 421 Philosophy of Space, Time and Matter (4)
Investigation of the philosophical foundations and interpretation of relativity theory and elementary quantum mechanics. Emphasis on philosophical issues relevant to contemporary philosophy of science such as scientific realism. Some discussion of very recent theories of space, time, and matter. 4 lectures. Prerequisite: Junior standing and completion of GE Area C2.

PHIL 422 Philosophy of Mind (4)
Classic and current work in the problems and issues of the nature and unity of the self, consciousness, mental representations, and action, and of the relation of philosophy of mind to psychology, linguistics and computer science. 4 lectures. Prerequisite: Junior standing and completion of GE Area C2.

PHIL 423 Philosophy of Language (4)
Traditional and contemporary philosophical issues that arise from the structure of language. Relevant concepts include: syntax, semantics, pragmatics, meaning, reference, truth, identity, thought, reality. Important distinctions: use/

mention, relations/properties of relations, sentences/statements-/propositions. 4 lectures. Prerequisite: Junior standing and completion of GE Area C2.

PHIL 429 Special Topics in the History of Philosophy (4)
Advanced discussion of selected topics in the history of philosophy. Examination and analysis of important philosophical movements (e.g., positivism, postmodernism) or alternatively, of particular philosophers or philosophical works of exceptional importance (e.g., David Hume; Kant’s *Critique of Pure Reason*). The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Junior standing and completion of GE Area C2.

PHIL 439 Selected Problems in Ethics and Political Philosophy (4)
Advanced discussion of selected topics in ethics and political philosophy. Examination and analysis of significant ethical or political theories (e.g., utilitarianism, contractarianism) or alternatively, of particular philosophers or philosophical works of exceptional importance (e.g., John Stuart Mill; John Rawls’ *A Theory of Justice*). The Schedule of Classes will list topic selected. 4 lectures. Prerequisite: Junior standing and completion of GE Area C2.

PHIL 449 Selected Topics in Recent Philosophy (4)
Advanced discussion of selected topics in recent philosophy. Examination and analysis of important recent movements in central philosophical areas (e.g., metaphysics, epistemology, philosophy of science, philosophy of language, philosophy of mind) or, alternatively, of particular philosophers or philosophical works of exceptional recent importance. The Schedule of Classes will list topic selected. Total credit limited to 12 units credit; may be repeated in same term. 4 lectures. Prerequisite: Junior standing and completion of GE Area C2.

PHIL 460, 461 Senior Project I, II (2) (2) (460: CR/NC)
Selection, development and completion of a project under faculty supervision. Results presented in a formal thesis. Minimum of 60 hours per quarter. PHIL 460 is graded on a CR/NC basis. Work in PHIL 461 is given a letter grade. **PHIL 460** prerequisite: PHIL 225, senior standing, and consent of instructor. Philosophy majors only. **PHIL 461** prerequisite: PHIL 460. Student must also receive a passing score on the senior examination in order to enroll in PHIL 461.

PHIL 470 Selected Advanced Topics (1–4)
Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Consent of instructor.

PHYS–PHYSICS

PHYS 104 Introductory Physics (4) **GE B3**
Elementary introduction to mechanics, gases, liquids and solids, heat, vibrations and waves, light, electricity and magnetism. Intended to provide non-science students with an understanding of basic physical concepts. Not open to students who have credit in a college physics course. 4 lectures. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104. Fulfills GE B3.

PHYS 107 Introduction to Meteorology (4) **GE B3**
Physics of Earth’s atmosphere. Topics include the physical basis for temperature, wind generation, atmospheric circulation, humidity, adiabatic processes, cloud formation, cyclone development, precipitation, and storm growth. Other topics include the variety of storms and their effects, satellite imaging, and air pollution and its possible effect on global temperature change. 4 lectures. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104. Fulfills GE B3.

PHYS 111 Contemporary Physics for Nonscientists (4) **GE B3**
Exploration of the key concepts of quantum mechanics and Einstein’s special and general theories of relativity. Particle-wave duality, Heisenberg’s uncertainty principle, Schrodinger’s cat, warped spacetime, black holes. 4 lectures. Fulfills GE B3.

PHYS 115 Physics of Sound and Music (4) **GE B3**
Fundamental physical principals of sound production in musical instruments; woodwind, brass, strings, piano and percussion. Generation and interference of mechanical and sound waves; overtone series, musical scales and Fourier spectra of complex waves. Electronic sound recording and production. Hearing and voice. Auditorium and room acoustics. 4 lectures. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104. Fulfills GE B3.

PHYS 118 Introductory College Physics (4)

Introductory course in physics emphasizing motion, force, torque, momentum, and energy. Applications to human motion and metabolism. Primarily for students in kinesiology. Not open to students with credit in PHYS 121 or PHYS 131 or PHYS 141. 4 lectures. Prerequisite: MATH 118 and high school trigonometry, or MATH 119.

PHYS 121 College Physics I (4)**GE B3 & B4**

Introductory course in mechanics emphasizing motion, force, and energy. Not open to students having a grade of C- or better in PHYS 131 or PHYS 141. 3 lectures, 1 laboratory. Prerequisite: MATH 118 and high school trigonometry, or MATH 119. Fulfills GE B3 & B4.

PHYS 122 College Physics II (4)**GE B3 & B4**

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 118, PHYS 121, PHYS 131, or PHYS 141. Fulfills GE B3 & B4.

PHYS 123 College Physics III (4)

Continuation of PHYS 121 and 122. Electrostatics, electric current, magnetic fields and induction. Elements of modern physics. Not open for credit to students having a grade of C- or better in PHYS 133. 3 lectures, 1 laboratory. Prerequisite: PHYS 118, PHYS 121, PHYS 131, or PHYS 141. Recommended: PHYS 122.

PHYS 131 General Physics I (4)**GE B3 & B4**

Fundamental principles of mechanics. Vectors, particle kinematics. Equilibrium of a rigid body. Work and energy, linear momentum, rotational kinematics and dynamics. Primarily for engineering students, and for students majoring in the physical sciences. Not open to students with credit in PHYS 141. 3 lectures, 1 laboratory. Prerequisite: MATH 141 with grade C- or better, or consent of instructor, and MATH 142 or MATH 182 (or concurrent enrollment). Recommended: high school physics. For ME and AERO students only. *Crosslisted as HNRS/PHYS 131.* Fulfills GE B3 & B4.

PHYS 132 General Physics II (4)**GE B3 & B4**

Oscillations, waves in elastic media, sound waves. Temperature, heat and the first law of thermodynamics. Kinetic theory of matter, second law of thermodynamics. Geometrical and physical optics. 3 lectures, 1 laboratory. Prerequisite: PHYS 131 or HNRS 131 or PHYS 141. *Crosslisted as HNRS/PHYS 132.* Fulfills GE B3 & B4.

PHYS 133 General Physics III (4)**GE B3 & B4**

Charge and matter, electric field, electric potential, dielectrics, capacitance, current and resistance, electromotive force and circuits, magnetic fields, magnetic field of a moving charge, induced emf. 3 lectures, 1 laboratory. Prerequisite: PHYS 131 or HNRS 131 or PHYS 141, and MATH 142. Fulfills GE B3 & B4.

PHYS 141 General Physics IA (4)**GE B3**

Fundamental principles of mechanics. Vectors, particle kinematics. Equilibrium of a rigid body. Work and energy, linear momentum, rotational kinematics and dynamics. Primarily for engineering and science students. Not open to students with credit in PHYS 131. 4 lectures. Prerequisite: MATH 141 with grade C- or better, or consent of instructor, and MATH 142 or MATH 182 (or concurrent enrollment). Recommended: High school physics. *Crosslisted as HNRS 134/PHYS 141.* Fulfills GE B3.

PHYS 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

PHYS 201 Learning Center Tutor (1) (CR/NC)

Act as a tutor in the Physics Learning Center. Help students with problem solving techniques and introductory physics course material. Total credit limited to 3 units, with a maximum of 1 unit per quarter. Credit/No Credit grading only. Prerequisite: PHYS 133 and consent of instructor.

PHYS 202 Physics on the Computer (4)

Introduction to using computers for solving problems in physics: differential equations, matrix manipulations, simulations and numerical techniques, nonlinear dynamics. 4 lectures. Prerequisite: PHYS 133 and MATH 241.

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, and concurrent enrollment in PHYS 256.

PHYS 211 Modern Physics I (4)

Special relativity, fundamental principles of quantum mechanics, emphasizing the modern description of atomic phenomena. Kinetic theory, wave particle duality, Bohr theory, Schrodinger equation, elementary atomic structure. 4 lectures. Prerequisite: PHYS 132 and PHYS 133 and MATH 241.

PHYS 212 Modern Physics II (4)

Applications of quantum physics to atoms, nuclei, and elementary particles. Quantum statistics, principles of the laser. Topics in solid state physics such as the free electron theory of metals, bonding in solids and energy bands. Nuclear structure and nuclear energy. 4 lectures. Prerequisite: PHYS 211.

PHYS 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 enrollment in PHYS 206.

PHYS 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

PHYS 301 Thermal Physics I (4)

Thermodynamics and statistical mechanics. Entropy, temperature, ensembles, partition functions, chemical potential, free energy. Selected applications including paramagnetism, ideal gas, Fermi-Dirac and Bose-Einstein distributions. 4 lectures. Prerequisite: PHYS 211.

PHYS 302 Classical Mechanics I (4)

Laws of motion, kinematics and dynamics of a particle. Work and energy. Linear and angular momentum. Use of numerical methods for solving problems. Oscillatory motion (damped and forced oscillation). Coupled oscillators. Newton's Law of gravity, orbital motion, and central force problems. 4 lectures. Prerequisite: PHYS 131 or PHYS 141, MATH 242 or MATH 244.

PHYS 303 Classical Mechanics II (3)

Dynamics of a rigid body. Three-dimensional motion of a rigid body. Introduction to Lagrange's and Hamilton's equations. 3 lectures. Prerequisite: PHYS 302.

PHYS 310 Physics of Energy (3)

Physics and mathematics applied to broad energy topics. Efficient usage, transportation, solar energy, nuclear fission and fusion. Plasma, hydrogen economy, fuel cells, wind wave, tidal, and geothermal energy. Transmission, storage, fossils. National planning, and energy economics. 3 lectures. Prerequisite: PHYS 132.

PHYS 313 Introduction to Atmospheric Physics (3)

Properties of the atmosphere, atmospheric motions, solar and terrestrial radiation. Emphasis on conservation laws of momentum, energy and mass applied to understanding the Earth's atmospheric motions. 3 lectures. Prerequisite: PHYS 132 or PHYS 122, and MATH 241. Recommended: MATH 304.

PHYS 315 Introduction to Lasers and Laser Applications (3)

Interaction of radiation with matter, theory of laser action, characteristics and modification of laser output, types of lasers. Holography and other applications. 3 lectures. Prerequisite: PHYS 133, or PHYS 123 and MATH 143. Recommended: PHYS 211.

PHYS 317 Special Theory of Relativity (3)

Fundamental experiments and basic postulates of special relativity. Simultaneity, length and time measurements. Lorentz transformations. Four-Vectors. Space-time diagrams. Relativistic mechanics and electromagnetism. 3 lectures. Prerequisite: PHYS 211.

PHYS 322 Vibrations and Waves (3)

Introduction to vibrations and waves and their applications. Harmonic oscillator, waves, complex notation, superposition, interference, coherence, Fourier analysis. Applications may include sound, optics, quantum mechanics, and electromagnetic radiation. 3 lectures. Prerequisite: PHYS 132, MATH 242 or MATH 244. Recommended: MATH 344.

PHYS 323 Optics (4)

Geometric optics, lens systems, aberration, physical optics and polarization. 3 lectures, 1 laboratory. Prerequisite: PHYS 133, MATH 241. Recommended: PHYS 322.

PHYS 340 Quantum Physics Laboratory I (2)

Experimental studies of the quantum properties of atoms and nuclei. Measurements of fundamental constants. Statistics and data analysis. 1 lecture, 1 laboratory. Prerequisite: PHYS 212 and PHYS 256.

PHYS 341, 342 Quantum Physics Laboratory II, III (2) (1)

Advanced experimental studies of quantum properties of atoms and nuclei. Interactions with radiation, particles and fields. Courses must be taken in numerical order. PHYS 341: 2 laboratories; PHYS 342: 1 laboratory. Prerequisite: PHYS 340.

PHYS 357 Advanced Instrumentation in Experimental Physics (3)

Advanced analog and digital electronics, computer interfacing to experiments, robotics. 2 lectures, 1 laboratory. Prerequisite: PHYS 206 and PHYS 256.

PHYS 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigations, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

PHYS 401 Thermal Physics II (3)

Additional topics in thermodynamics and statistical physics, including chemical equilibrium, phase transitions, transport processes, and cryogenics. 3 lectures. Prerequisite: PHYS 301.

PHYS 403 Nuclear and Particle Physics (3)

Advanced nuclear physics topics. The two-nucleon problem at low energy. The deuteron. Subnuclear particles and their structure. Elementary particles. Symmetries and conservation laws. Parity, charge conjugation and time reversal invariance. Hadronic interactions. The weak interaction. 3 lectures. Prerequisite: PHYS 212 and PHYS 405.

PHYS 405 Quantum Mechanics I (4)

Wave nature of matter and the basic postulates of quantum mechanics. The wave function, operators, and their interpretation. Schroedinger's equation and its solutions in one and more dimensions. The hydrogen atom and the periodic table. 4 lectures. Prerequisite: PHYS 211, MATH 242 or MATH 244. Recommended: PHYS 212, PHYS 322, MATH 344.

PHYS 406 Quantum Mechanics II (3)

Angular momentum operators and problems in three dimensions including the hydrogen atom. The elements of matrix mechanics and spin wave functions. Perturbation theory. 3 lectures. Prerequisite: PHYS 405.

PHYS 408 Electromagnetic Fields and Waves I (4)

Electric and magnetic field theory using vector analysis. Electric fields, dielectric materials, magnetic fields, induced emf, magnetic materials, Maxwell's equations, wave equation. 4 lectures. Prerequisite: MATH 304.

PHYS 409 Electromagnetic Fields and Waves II (3)

Wave equation, plane electromagnetic waves, guided waves. Dipole radiation, radiation from an accelerated charge. Special relativity. 3 lectures. Prerequisite: PHYS 408. Recommended: PHYS 322.

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, MATH 241 and MATH 244.

PHYS 412 Solid State Physics (3)**GE B6 with PHYS 452**

Properties of solids including the structural, mechanical, thermal, and electronic properties, energy band theory and the properties of metals and semiconductors. 3 lectures. Prerequisite: PHYS 211 or MATE 340, MATH 244. Fulfills GE B6 with PHYS 452.

PHYS 413 Advanced Topics in Solid State Physics (3)

Semiconducting devices, including junction and field-effect transistors, LED's, and diode lasers. Magnetic properties of solids. Superconductivity, including discussion of high-temperature superconductors. Other topics of current interest in solid state physics. 3 lectures. Prerequisite: PHYS 412.

PHYS 417 Nonlinear Dynamical Systems (4)**GE B6**

Analysis of linear and nonlinear dynamical systems with emphasis on geometrical methods and visualization techniques. Fixed points, phase plane

analysis, bifurcations and limit cycles. Laboratory component includes data acquisition and analysis using computers, numerical simulations of dynamical systems, and analysis of discrete systems. 3 lectures, 1 laboratory. Prerequisite: MATH 242 or MATH 244. Recommended: Junior standing. Fulfills GE B6.

PHYS 422 Polymer Electronics Laboratory (1)

Experimental procedures in polymer electronics. Investigation of the characteristics of a polymer electronic device. 1 laboratory. Prerequisite: EE 347 or MATE 340 or CHEM 319 or PHYS 340. *Crosslisted as EE/PHYS 422.*

PHYS 423 Advanced Optics (4)

Advanced topics of modern optics. May include: fiber optics, Fourier optics, quantum optics, lasers, holography, non-linear optics. 3 lectures, 1 laboratory. Prerequisite: PHYS 323.

PHYS 424 Theoretical Physics (3)

Contour integration in the complex plane, properties of the delta function, properties of some common functions of theoretical physics, Green's function techniques for solving differential equations. 3 lectures. Prerequisite: PHYS 133, MATH 304, MATH 344.

PHYS 452 Solid State Physics Laboratory (1) GE B6 with PHYS 412

Selected experiments on X-ray diffraction, Hall effect, optical absorption, thermo-electric effect, photovoltaic cells, diode characteristics, and superconductivity. 1 laboratory. Prerequisite or concurrent: PHYS 412. Fulfills GE B6 with PHYS 412.

PHYS 461, 462 Senior Project I, II (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Consent of instructor.

PHYS 463, 464 Senior Project - Laboratory Research I, II (2) (2)

Selection and completion of a laboratory research project under faculty supervision. Projects typical of problems which graduates will encounter in industry or graduate school. Project results are presented in a formal report. Minimum 120 hours total time. 2 laboratories. Prerequisite: Consent of instructor.

PHYS 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

PHYS 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

PHYS 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 12 units; major credit limited to 2 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 12 units; major credit limited to 2 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

POLS–POLITICAL SCIENCE**POLS 111 California Constitution and Government (1)**

Basic aspects of California state government. Satisfies GE D1 for students who have passed both AP US Government and US History exams, or transfer students who have received advice in writing from the Office of the Registrar to take POLS 111. 1 lecture.

POLS 112 American and California Government (4)**GE D1**

Study of governmental institutions, politics, issues and political behavior in the United States and California in constitutional, historical, social and cultural

perspectives. Meets the U.S. government and California state/local government requirement. 4 lectures. Fulfills GE D1.

POLS 180 Political Inquiry (4)

Introduction to the scope, language, concepts and approaches employed in political science and the social sciences. Includes emphasis on basic methodological and research strategies for assessing political issues, events, the dynamics of political change and philosophy of science. 4 lectures.

POLS 225 Introduction to International Relations (4)

Introduction to the basic concepts, issues, and theories surrounding the study of international politics. Changes in the nature of conflict, power, and national interests in the post-Cold War era. Role of states, non-governmental actors, and international organizations in the global arena. 4 lectures.

POLS 229 Introduction to Comparative Politics (4)

Introduction to basic concepts, issues, methodology, and theories in comparative politics. Major issues/theories include electoral laws and party systems, parliamentary and presidential institutions, socialization, democratization, corporatism and pluralism, religious and cultural impacts on politics. Topics explored through politics of countries and regions throughout the world. 4 lectures.

POLS 230 Basic Concepts of Political Thought (4)

Introduction to political theory. Focuses on concepts like: authority, liberty, equality, law, justice, community, rights, citizenship, property, class conflict, and constitutionalism. Readings from major thinkers, such as Plato, Aristotle, Augustine, Aquinas, Machiavelli, Locke, Hobbes, Rousseau, Marx, Nietzsche, Rawls, and others. 4 lectures.

POLS 245 Judicial Process (4)

The nature of the legal system. Topics may include: private and public law, civil and criminal law, trial and appellate courts, criminal procedure, judges, attorneys, and juries. 4 lectures.

POLS 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

POLS 285 Model United Nations (4)

Introduction to the United Nations and major issues that confront it. Preparation for participation in collegiate Model United Nations conferences. Rules of procedure and debate, preparation of country position papers, and resolution writing. 4 lectures. Prerequisite: One course in POLS or consent of instructor.

POLS 295 Foundations of Mock Trial (4)

Introduction to evidence, trial procedure, objections, and witness examination. Preparation for intercollegiate mock trial competitions (held in winter and spring). Extensive hands-on experience in researching, preparing, and arguing a legal case. 4 lectures. Prerequisite: Completion of GE Area D1 and consent of instructor.

POLS 308 Political Violence and Conflict Resolution (4)

Causes, methods, and consequences of non-state groups that use violent means to pursue revolutionary, separatist, or ideological goals both domestically and internationally. Dynamics of ethnic conflict, terrorist movements, paramilitary groups, insurgencies, and narco-trafficking. Processes of conflict resolution in divided societies through military responses, negotiated settlements, democracy, and peacekeeping missions. 4 lectures. Prerequisite: POLS 225 or POLS 229, or consent of instructor.

POLS 310 Politics of Ethnicity and Gender (4) USCP

Analysis of factors that affect the changing role of women and major ethnic groups in American politics. Examination of the social construction of difference, exploring how gender, race, and class are shaped by social, cultural, and political contexts. 4 lectures. Prerequisite: Completion of Area D1. Recommended: POLS 112. Fulfills USCP.

POLS 315 The American Presidency (4)

Nature and problems of contemporary presidential leadership emphasizing the impact of bureaucracy, Congress, public opinion, the courts, interest groups, and the party system upon the presidency and national policy making. 4 lectures. Prerequisite: Completion of Area D1. Recommended: POLS 112.

POLS 316 Political Participation (4)

Role of political participation as manifested through political parties and interest groups in a democracy. Degree of consensus and conflict in present day political participation including influence on public policies. 4 lectures. Prerequisite: Completion of Area D1. Recommended: POLS 112.

POLS 317 Campaigns and Elections (4)

Origins and dimensions of public opinion. Focus on contemporary political campaigns and elections in the U.S. Impact of political ideology, mass media, high technology, pressure groups on electoral outcomes. Voting behavior and other forms of political participation in the U.S. 4 lectures. Prerequisite: Completion of Area D1. Recommended: POLS 112.

POLS 319 United States Congress (4)

Theory and practice of representative government in the United States. Organization, procedures and consequences of the legislative process in Congress and state legislatures. 4 lectures. Prerequisite: Completion of Area D1. Recommended: POLS 112.

POLS 320 Comparative Political Analysis (4)

Survey of theories and methods in the field of comparative politics. Recognition of how history structures current politics. Application of abstract principles to contemporary or historical problems to illustrate the practical uses of comparative analysis. Evaluation of assorted issues to compare culturalist, institutionalist, and rationalist approaches. 4 lectures. Prerequisite: POLS 225 or POLS 229, or consent of instructor.

POLS 321 Comparative Political Culture (4)

Survey of major concepts and theories of political culture and relationships among culture, politics, and society. Cultural influences of Christianity, Confucianism, Islam, and contemporary democratic, civic culture. The role of political culture in the industrialization process and post-colonial and post-communist transitions. 4 lectures. Prerequisite: POLS 229, or consent of instructor.

POLS 322 International Political Activism (4)

Concepts, theories, and themes of collective activism in international politics from a comparative approach. Mobilization, organization, and implementation of domestic and transnational social movements in Europe, Latin America, Asia, and Africa, and their political and historical significance. 4 lectures. Prerequisite: POLS 225 or POLS 229, or consent of instructor.

POLS 324 International Relations Theory (4)

Survey of theoretical approaches to the study of international political processes and problems. Foreign policies and politics in relations between states. Conflicts and adjustments. Analyses of selected problems to elucidate differences between realist, liberal, socialist, constructivist, and other theories. 4 lectures. Prerequisite: POLS 225 or POLS 229, or consent of instructor.

POLS 325 Global Political Issues (4)

GE D5

Concepts and theories in international relations and contemporary global issues. Application of principles of international relations to political issues and subjects which affect our lives. 4 lectures. Prerequisite: Completion of GE Area A, one course from D1 (POLS 112 recommended) and one course from either D2 or D3. Recommended: Junior standing. Fulfills GE D5 except for Political Science majors.

POLS 328 Politics of Developing Areas (4)

A detailed survey of the domestic politics of developing countries from a comparative perspective. Assessment of theories of development with appropriate examples taken from particular areas and countries. Repeatable to 8 units with different subtitles (e.g., "Latin America," "East Asia," "Africa"). The Schedule of Classes will list topic selected. 4 lectures. Prerequisite: POLS 225 or POLS 229, or consent of instructor.

POLS 329 Ancient and Medieval Political Thought (4)

Political theory from ancient Greece, ancient Rome, and the Medieval period. Readings from major authors, such as Plato, Aristotle, Augustine, Aquinas, and others. 4 lectures. Prerequisite: POLS 230 or consent of instructor.

POLS 330 Modern Political Thought (4)

Theories of political participation and the relationship between the individual and the state as developed in the works of influential thinkers such as Locke, Rousseau, Mill and Marx. 4 lectures. Prerequisite: POLS 230, or consent of instructor.

POLS 331 Contemporary Political Thought (4)

Ideas of major contemporary political thinkers, such as Wolff, Singer, Rawls, Strauss, MacKinnon, Beauvoir, Dewey, Walzer and others in historical context, compared and contrasted. 4 lectures. Prerequisite: POLS 230 or consent of instructor.

POLS 333 World Food Systems (4) GE Area F

Integrated, interdisciplinary study of the technologies of global food production, environmental and social issues related to the application of those technologies, and moral and ethical issues associated with global food production and distribution. Emphasis on the politics of change. 4 lectures. Prerequisite: Junior standing and completion of GE Area B, or consent of instructor. *Crosslisted as POLS/UNIV 333.* Fulfills GE Area F.

POLS 334 Jurisprudence (4)

Normative and analytical problems concerning law. Nature of law and legal systems including liberty and justice. Topics may include the connection between law and morality, feminist and critical race perspectives, crime and punishment, and economic analysis of the law. 4 lectures. Prerequisite: POLS 112 and POLS 230, or consent of instructor.

POLS 338 Critical Issues in American Politics (4) GE D5

Examination of significant social, legal, economic and political issues that face the country and how the basic institutions of government—national, state, local—are responding to them; assessment of policies to correct these problems. 4 lectures. Prerequisite: Completion of GE Area A, one course from D1 (POLS 112 recommended) and one course from either D2 or D3. Recommended: Junior standing. Fulfills GE D5 except for Political Science majors.

POLS 339 Authoritarian and Democratic Rule (4) GE D5

A comparative examination of governing institutions used throughout the world. Emphasis on the diversity of governmental designs found within both authoritarian and democratic regimes. 4 lectures. Prerequisite: Completion of GE Area A, one course from D1 (POLS 112 recommended) and one course from either D2 or D3. Recommended: Junior standing. Fulfills GE D5 except for Political Science majors.

POLS 340 American Judicial Politics (4)

Empirical aspects of the decision making of federal and state courts, with an emphasis on understanding how interactions between the courts and other political factors shape judicial behavior. For Law and Society minors and POLS majors with pre-law concentration. 4 lectures. Prerequisite: POLS 112 or consent of instructor.

POLS 341 American Constitutional Law (4)

United States Supreme Court decisions in the areas of separation of powers, judicial review, commerce clause, federalism, due process. 4 lectures. Prerequisite: POLS 112, or consent of instructor.

POLS 343 Civil Rights in America (4) USCP

Case-based examination of discrimination based on race, ethnic, gender, and sexual orientation in the United States. Emphasis on the Supreme Court's interpretation of the Equal Protection Clause. 4 lectures. Prerequisite: POLS 112, or consent of instructor. Fulfills USCP.

POLS 344 Civil Liberties (4)

Role of Supreme Court as interpreter of civil liberties. Topics may include freedom of expression and religion, search and seizure, due process of law. 4 lectures. Prerequisite: POLS 112, or consent of instructor.

POLS 346 Politics in Literature (4)

Political concepts and values examined, based on literary sources such as plays and novels. Topics may include: power, justice, violence and social responsibility. 4 lectures. Prerequisite: POLS 112 or consent of instructor.

POLS 347 Politics and Popular Culture (4)

Intersection of politics and mass media. How political actors use popular culture to establish issue agendas, convey political concepts, symbolism, rhetoric and values. 4 lectures. Prerequisite: POLS 112 or consent of instructor.

POLS 348 Early American Political Thought (4) GE D5

The central political ideas of America's leading thinkers from the arrival of the *Mayflower* to the Civil War. Selections may include readings of American political ideas from Winthrop, Paine, Publius, Hamilton, de Tocqueville, Douglass, Calhoun, Thoreau, and Lincoln, among others. 4 lectures. Prerequisite: Completion of GE Area A, one course from D1 (POLS 112 recommended) and one course from either D2 or D3. Recommended: Junior standing. Fulfills GE D5 except for Political Science majors.

POLS 349 Contemporary American Political Thought (4) GE D5

The central political ideas of America's leading thinkers from the Civil War to the present. 4 lectures. Prerequisite: Completion of GE Area A, one course from D1 (POLS 112 recommended) and one course from either D2 or D3. Recommended: Junior standing. Fulfills GE D5 except for Political Science majors.

POLS 351 Public Administration (4)

Development of the management functions in government. Survey of administrative concepts and cases. Attention given to national, state and local administrative systems. Case studies and simulations. 4 lectures. Prerequisite: Completion of GE D1. Recommended: POLS 112.

POLS 359 Research Design (4)

Methodology and research design used in qualitative and quantitative analysis. Examination of multiple methods used to analyze political phenomena in the political science discipline. 4 lectures. Prerequisite: STAT 217 or STAT 221.

POLS 361 Quantitative Methodology (4)

Survey of quantitative methodology in political science, up to and including multiple regression. Laboratory computer instruction to facilitate understanding of quantitative approaches to political research. 3 seminars, 1 activity. Prerequisite: POLS 359, or consent of instructor.

POLS 375 California Politics (4)

Political culture, processes, behavior, institutions, public policy and distribution of power in California state and substate governments. 4 lectures. Prerequisite: Completion of GE D1. Recommended: POLS 112.

POLS 380 Religion and Politics in the Israeli-Palestinian Conflict (4)

The root causes of the Israeli-Palestinian conflict and its current manifestation. Possibilities for solutions from the perspectives of religious studies and political science. 4 lectures. Prerequisite: Completion of GE Area A. Recommended: Completion of one class in POLS or RELS. *Crosslisted as POLS/RELS 380.*

POLS 381 Peace and War (4)

Dynamics of interstate peace and war. Topics include: military strategy, the military-industrial complex, arms races and disarmament, diplomacy, deterrence and pre-emption, collective security and alliance behavior, civil-military relations, post-conflict reconstruction, and the role of international law and organizations. 4 lectures. Prerequisite: POLS 225 or POLS 229, or consent of instructor.

POLS 382 Comparative Foreign Policy (4)

Systematic analysis of the international and domestic pressures leading different states to take particular foreign policy stances, with appropriate examples taken from different regions of the world. Discussion of contemporary foreign policy issues and responses. 4 lectures. Prerequisite: POLS 225 or POLS 229, or consent of instructor.

POLS 383 Politics of the European Union (4)

History and development of the European Union in the context of theories of regional integration. Overview of institutional and policymaking machinery of the EU. Current issues facing member states. Impact of EU on US interests and world politics more generally. 4 lectures. Prerequisite: POLS 225 or POLS 229, or consent of instructor.

POLS 385 Advanced Model United Nations (2) (CR/NC)

Preparation for participation in collegiate Model United Nations conferences. Rules of procedure and debate, preparation of country position papers, and resolution writing. Discussion of current issues of concern to the United Nations. Credit/No Credit grading only. Total credit limited to 6 units. 2 lectures. Prerequisite: POLS 285 or consent of instructor.

POLS 386 Government Internship (2–12) (CR/NC)

Supervised work experience in a government or related public agency. Intern will function as an employee subject to all the duties and responsibilities of employees engaged in comparable work. 30 hours of work experience per unit of credit. Total credit limited to 12 units. Credit/No Credit grading. Prerequisite: Consent of instructor. Recommended preparation: Junior standing with a minimum 2.5 GPA.

POLS 395 Advanced Mock Trial (2) (CR/NC)

Advanced preparation for participation in intercollegiate mock trial competitions. Emphasis on advanced topics and techniques related to evidence, trial procedure, objections, and witness examination. Extensive hands-on practice in arguing a legal case. Credit/No Credit grading only. Total credit limited to 4 units. 2 lectures. Prerequisite: Consent of instructor.

POLS 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research, study, or survey of selected problems. Total credit limited to 4 units. Prerequisite: Consent of department chair.

POLS 419 Social Movements and Political Protest (4)

Selected U.S. social movements, including abolitionism, feminism, civil rights, gay rights, the Christian right, and environmentalism. Political opportunities and constraints that impact collective political action, and effects of grassroots struggles for justice in U.S. politics and society. 4 lectures. Prerequisite: Completion of GE D1. Recommended: POLS 112.

POLS 420 Contemporary U.S. Foreign Policy (4)

Formulation and conduct of U.S. foreign policy. Analysis of the theory and elements of U.S. strategy, such as diplomacy, propaganda, economic operations, trade, Executive-Congressional relations, public opinion and military strategies. 4 lectures. Prerequisite: POLS 225 or POLS 229, or consent of instructor.

POLS 426 International Organizations and Law (4)

Transnational politics and strategies supporting and opposing different dimensions of globalization. Topics include international law and the use of force, challenges to the primacy of the nation-state, and movement toward a global culture as expressed in the development of human rights law. 4 lectures. Prerequisite: POLS 225 or POLS 229, or consent of instructor.

POLS 427 Politics of the Global Economy (4)

Political conflicts surrounding the trading, financial, and security structures of the international economy. Motivations, resources, and responses of states, international organizations, multinational corporations and other nonstate actors as they address economic, political, environmental, and security issues within these structures. Desirability and inevitability of globalization. 3 lectures and a research paper. Prerequisite: POLS 225, completion of GE D2, or consent of instructor.

POLS 428 Issues and Topics in Comparative Politics (4)

Selected topics and issues in the field of comparative politics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: POLS 229 or consent of instructor.

POLS 429 Issues and Topics in International Relations (4)

Selected topics and issues in the field of international relations. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: POLS 225 or consent of instructor.

POLS 430 Advanced Topics in Political Theory (4)

In-depth examination of a theme or thinker in political theory. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: POLS 230 or consent of instructor.

POLS 431 Issues and Topics in American Politics (4)

Selected topics and issues in the field of American politics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: POLS 112 and junior standing, or consent of instructor.

POLS 451 Technology and Public Policy (4)

Technological assessment and impact analysis in areas such as business, communications, transportation, health technologies, military and other new technologies. Exploration of political influences shaping modern science and technology policy. Case studies on contemporary problems stemming from the relationship between technology and politics. 3 lectures and a research paper. Prerequisite: Completion of GE D1. Recommended: POLS 112.

POLS 456 Politics and Economic Policy (4)

Goals of economic policy, based on efficiency, equity, and other values. Theories of market failure and government regulation. Influence of electoral calculations, bureaucracy, and interest group pressures on government approaches to address market failures. Government intervention in the marketplace, and intervention by economic interests into politics, and how this challenges democracy 3 lectures and a research paper. Prerequisite: Completion of GE D1. Recommended: POLS 112.

POLS 459 The Politics of Poverty (4)

Analysis of the politics and policies associated with the American welfare state, focusing particularly on welfare and homelessness policies. Questions addressed concerning the causes of poverty and how social policy responds to poverty. 4 lectures. Prerequisite: Completion of GE D1. Recommended: POLS 112.

POLS 461, 462 Senior Project I, II (2) (2)

Selection and completion of a project under faculty supervision. Project results presented in a formal paper. Prerequisite: POLS 359, POLS 361, and senior standing.

POLS 470 Selected Advanced Topics (1–4)

Directed courses on timely issues and topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1–4 lectures. Prerequisite: POLS 112 and junior standing, or consent of instructor.

POLS 471 Urban Politics (4)

Theoretical approaches, concepts, and politics associated with urban governments. Urban power structures, the relationship between urban society and politics, and inter-governmental relations. 3 lectures and a research paper. Prerequisite: POLS 112, or consent of instructor.

POLS 481 Senior Project Seminar (4)

Selection, preparation and completion of senior project, focusing on current developments in the field of political science, with primary attention to American politics, public policy, international relations, or public administration. Project results presented in a formal paper. 3 seminars and a research paper. Prerequisite: Senior standing (completion of 135 quarter hours), completion of required core courses and concentration.

POLS 500 Independent Study (1–4)

Individual research, studies, or surveys under the supervision of the faculty. Total credit limited to 4 units. Prerequisite: Graduate standing with minimum of 12 units.

POLS 510 Research Design (4)

Policy research problem definition, framing hypotheses, literature review, sampling, measurement, and approaches to analysis. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

POLS 515 Public Policy (4)

Public policy making and contemporary policy issues, including markets; regulation; criminal justice; housing; environment; poverty; health care and education. 4 lectures. Prerequisite: Graduate standing, or consent of instructor.

POLS 516 Public Finance (4)

Economic and political factors affecting federal, state and local governments. Intergovernmental relations and policy considerations in finance, debt management and tax administration. 4 lectures. Prerequisite: POLS 515, or consent of instructor.

POLS 517 Organizational Theory (4)

Major theoretical approaches, concepts, case studies, and debates related to organizational theory. Emphasis on applications of concepts to public and non-profit organizations. 4 lectures. Prerequisite: POLS 515, or consent of instructor.

POLS 518 Public Policy Analysis (5)

Analysis of the social, economic, environmental, political contexts of public policy decisions. Public policy issues and use of concepts and tools related to

monitoring and assessment with particular emphasis on qualitative methods. 4 lectures, 1 activity. Prerequisite: POLS 560 or consent of instructor.

POLS 540 Leadership and Management in Public Policy (4)

An exploration of the changing notion of leadership in public policy. Focus on understanding and developing leadership capacity within the complex inter-organizational structure in which the student works. For graduate students. 4 seminars. Prerequisite: POLS 515 or consent of instructor.

POLS 550 Regulatory and Economic Policy (4)

Theory, politics, and applications of government regulatory and economic policy, and skills and experience necessary to use this knowledge in applied policy making situations. 4 seminars. Prerequisite: POLS 515 or consent of instructor.

POLS 560 Quantitative Methods (5)

Social science methodology focusing on research design and quantitative methods used in policy and political research: multi-regression, non-linear techniques, diagnostics and time series. Advanced computer packages used to analyze challenging data sets. 4 lectures, 1 activity. Prerequisite: Graduate standing or consent of instructor.

POLS 568 Topics and Issues in Public Policy (4)

Selected advanced topics applicable to public policy problems. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 seminars and a research project. Prerequisite: POLS 515 or consent of instructor.

POLS 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing or consent of instructor.

POLS 586 Policy Internship (4-8) (CR/NC)

Supervised work experience in a government or related public agency. Intern will function as an employee engaged in comparable work. Credit/No Credit grading only. Total credit limited to 8 units. Prerequisite: Completion of 12 units in the Master of Public Policy Program, and consent of instructor.

POLS 590 Graduate Seminar (4)

Seminar designed as a culminating component to the Master of Public Policy Program. Individual research under the supervision of the faculty within a small discussion environment, leading to a graduate project or paper that demonstrates practical mastery of the MPP curriculum. Total credit limited to 8 units. 4 seminars. Prerequisite: POLS 560 or consent of instructor.

POLS 595 Directed Readings for MPP Comprehensive Exams (2) (CR/NC)

Directed readings for Master of Public Policy (MPP) comprehensive exams. Regular consultation between advisor and student. Credit/No Credit grading only. 2 seminars. Prerequisite: POLS 590.

PPSC-PLANT PROTECTION SCIENCE

PPSC 110 People, Pests and Plagues (4) GE B2 & B4

Introduction to the science of entomology, focusing on insect identification, biology, ecology, and interactions with humans. Insect pest and beneficial species, and their role in shaping how we live, work and eat. Not open for degree credit to students majoring in AEPS, CRSC, FRSC, EHS nor WVIT (viticulture concentration). 3 lectures, 1 activity. Fulfills GE B2 & B4.

PPSC 311 Agricultural Entomology (4)

The science of entomology as it relates to insects of importance in agriculture. Focus on the biology, ecology and identification of insects and mites important to California horticulture, field crops and landscapes. 3 lectures, 1 laboratory. Prerequisite: CHEM 110 or CHEM 111; BOT 121 or HCS 120.

PPSC 321 Weed Biology and Management (4)

Weed ecology, biology, and implications for management. Identification of weedy and invasive plant species in annual agricultural, perennial semi-managed, range, aquatic, and forest ecosystems, to elucidate weaknesses and strengths in order to facilitate vegetation management. Organic, cultural, biological, mechanical, and chemical methods and their integrated (IPM) uses. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or HCS 120.

PPSC 327 Vertebrate Pest Management (4)

Vertebrate pests injurious to crops, livestock, forest products, wildlife, stored products and humans. Life habits, identification, control methods, and

materials. Related laws and regulations. 3 lectures, 1 laboratory. Prerequisite: Junior standing.

PPSC 405 Advanced Weed Management (4)

Planning, design and implementation of long-term sustainable weed management programs. Analysis of traditional and new technologies for weed management based on their impact on agriculture, society and the environment. 3 lectures, 1 laboratory. Prerequisite: PPSC 321.

PPSC 414 Grape Pest Management (4)

Comprehensive survey of major grape pests including diseases, insects, weeds, vertebrates, and nematodes. Identification and biology of grape pests and natural enemies, monitoring, and integrated pest management (IPM) strategies, including cultural, biological, and chemical controls. Guest lectures. Total credit limited to 8 units. 3 lectures, 1 activity. Prerequisite: PPSC 311, BOT 323, FRSC 231.

PPSC 421 Plant-Pest Interactions (4)

Plant biochemical and physical defenses to herbivorous insects, plant pathogens and weeds, and the evolutionary and genetic basis thereof. Effects of environmental manipulations, and other cultural controls on pest populations, and the use of induced resistance materials. Not open to students with credit in PPSC 521. 3 lectures, 1 laboratory. Prerequisite: BOT 323 or BOT 324, and PPSC 311 or ZOO 335.

PPSC 427 Disease and Pest Control Systems for Ornamental Plants (4)

Recognition, prevention and control of diseases, insect/mite pests and weeds that impact commercial ornamental plantings. Integrated pest management strategies presented including biological, cultural, and safe and proper pesticidal controls. Laboratory emphasizes monitoring, problem solving and application of appropriate pest control measures. 3 lectures, 1 laboratory. Prerequisite: BOT 323 or BOT 324, and HCS 120 and PPSC 311 and PPSC 321.

PPSC 431 Insect Pest Management (4)

Principles of insect and mite pest management, including integrated pest management (IPM), applications of ecological theory to pest management, cultural, biological and chemical controls, pesticide resistance management, insect and mite monitoring, biotechnology applications, pesticide laws and regulations, pest control advisor and qualified applicator licensing and certification. One field trip required. 3 lectures, 1 laboratory. Prerequisite: PPSC 311.

PPSC 441 Biological Control for Pest Management (4)

Control of arthropods, weeds and vertebrates to include history of biocontrol; biology of beneficial arthropods; methods of introduction, augmentation and conservation; and case studies. Identification of beneficial arthropods to appropriate taxonomic level. Technology, laws and regulations governing use of biocontrol agents. Field trips to insectaries, quarantine facilities and/or crop production areas. 3 lectures, 1 laboratory. Prerequisite: PPSC 311.

PPSC 511 Ecological Biometrics (4)

General survey of current analytical methodology available to ecological researchers to evaluate effects and assess the underlying mechanisms that drive natural and cultivated ecosystems. Methodology includes general linear models, ordination, survival analysis, multivariate analyses, and computer simulations. Student research used as a basis for instruction. Total credit limited to 8 units. 3 seminars, 1 activity. Prerequisite: STAT 218 or STAT 512, or consent of instructor. *Crosslisted as HCS/PPSC 511.*

PPSC 521 Plant-Pest Interactions (4)

Plant biochemical and physical defenses to herbivorous insects, plant pathogens and weeds, and the evolutionary and genetic basis thereof, with particular focus on the master's thesis. Effects of environmental manipulations, and other cultural controls on pest populations, and the use of induced resistance materials. Not open to students with credit in PPSC 421. 3 lectures, 1 laboratory. Prerequisite: BOT 323 or BOT 324, and PPSC 311 or ZOO 335, and graduate standing.

PPSC 599 Thesis in Plant Protection Science (1-9)

Systematic research of a topic in plant protection science, including weed science, entomology, plant pathology, nematology or vertebrate management. Thesis to describe the problem and its significance, methodology, results, data analysis, discussion and conclusion. Enrollment required every quarter in which facilities are used or advisement received. Degree credit limited to 6 units. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

PSC—PHYSICAL SCIENCE

PSC 101 The Physical Environment: Matter and Energy (4) GE B3 & B4

Introduction to the basic principles of physical science and application of these principles in modern society. Objects at rest and in motion, energy and power, fluids, heat, light, and sound. 3 lectures, 1 laboratory. Fulfills GE B3 & B4.

PSC 102 The Physical Environment: Atoms and Molecules (4)

Introduction to the basic principles of the atomic, molecular, and sub-atomic behavior of matter, and applications of these principles in modern society. Electricity and magnetism, electrical nature of matter, organic and inorganic chemistry, modern physics, the nucleus. 3 lectures, 1 laboratory. Prerequisite: PSC 101.

PSC 103 The Physical Environment: Earth (4) GE B3

Introduction to the basic principles of the earth sciences, and applications of these principles in modern society. Structure and formation of the Earth, earthquakes, weather, and oceanography. 3 lectures, 1 laboratory. Prerequisite: PSC 101. Recommended: PSC 102. Fulfills GE B3.

PSC 201 Introduction to Physical Oceanography (4) GE B5

Ocean origin, evolution, and sea floor features. Sediments; sea water; the ocean and our climate. Ocean surface and deep currents; waves and tides; coastal ocean. Marine life, food production, organisms, environments and lifestyles. Coastal development, pollution and food. Ocean resources and law. 4 lectures. Fulfills GE B5.

PSC 307 Nuclear Weapons in the Post-9/11 World (4) GE Area F

Technology and basic science of fission/fusion weapons, uranium/plutonium, nuclear reactors, offensive/defensive missile systems, command/control, verification, weapon effects, nuclear testing. Historical context of Cold War and proliferation, recent events, global norms, arms control treaties. 3 lectures, 1 seminar. Prerequisite: Junior standing and completion of GE Area B. Fulfills GE Area F.

PSC 320 Energy, Society and the Environment (4) GE Area F

Science and technology of current and future energy sources along with associated environmental problems and societal response. Energy production, consumption, efficient usage, fossil fuels, nuclear, solar, other renewables. Risks, benefits, planning, economics. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Area B. Fulfills GE Area F.

PSC 424 Organizing and Teaching Science (4)

Techniques, aims and objectives in the teaching of physical and life sciences at the secondary level. Selection and organization of teaching material, including strategies for English language learners (ELL) and special needs students. Evaluation of results. 4 lectures. Prerequisite: Admission to the Single Subject Credential Program. *Crosslisted as BIO/PSC 424.*

PSC 461 Senior Project (2)

Selection and completion of a project under faculty supervision. Project results are presented in a formal report. Minimum of 60 hours total time.

PSY—PSYCHOLOGY

PSY 103 Pairing and Marriage (4)

Functional approach to contemporary dating and pairing patterns with emphasis on developing communication during the early developmental stage of the paired relationships. 4 lectures.

PSY 104 Effective Study Techniques (3) (CR/NC)

Provides adequate instruction and practice in specific study skills such as note-taking, time-planning, memory, concentration, reading, test taking, self monitoring, and use of personal resources. Credit/No Credit grading only. 2 lectures, 1 activity.

PSY 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, study or survey of selected problems in consultation and with prior approval of instructor. Written report required. Total credit limited to 4 units. Prerequisite: PSY 201 or PSY 202 and consent of department head.

PSY 201 General Psychology (4) GE D4

Introduction to the psychological study of human beings. Applications and research in area such as psychobiology, perception, learning, motivation, consciousness, memory and cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology and

psychotherapy. A student may enroll for credit in either PSY 201 or PSY 202, but not both. 4 lectures. Fulfills GE D4.

PSY 202 General Psychology (4) GE D4

Introduction to the psychological study of human beings. Applications and research in area such as psychobiology, perception, learning, motivation, consciousness, memory and cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology and psychotherapy. A student may enroll for credit in either PSY 201 or PSY 202, but not both. 3 lectures, 1 discussion. Fulfills GE D4.

PSY 204 Tutor Training and Certification (2) (CR/NC)

Group study/tutorial certification program. Prepares students for certification with the College Reading and Learning Association (CRLA) tutor program. Emphasis on effective group study/tutorial strategies and techniques, communication skills, multicultural issues and disability awareness. Credit/No Credit grading only. 1 lecture, 1 activity.

PSY 205 Human Sexuality (3) (CR/NC)

Understanding development of personal sexuality. Sexual identity, biological aspects of sexuality, homosexuality, intimate relationships, communication, sexually transmitted diseases, sexual dysfunction, family planning, abortion. Emphasis on maintaining psychological and physical wellness. Credit/No Credit grading only. 3 lectures.

PSY 212 Interpersonal Communication (4)

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. *Crosslisted as COMS/PSY 212.*

PSY 251 Laboratory in Group Activities (1-3) (CR/NC)

Skills and techniques of solving problems in large and small groups. Conducting and reporting meetings. Analyses of leadership dynamics in campus organizations. Credit/No Credit grading only. Total credit limited to 6 units. 1-3 activities.

PSY 252 Social Psychology (4)

How attitudes, beliefs, and behavior are affected by the social situation. Gender roles, prejudice, aggression, altruism, attitudes and persuasion, liking and loving, and group behavior. Use of social psychology to understand diversity issues, reduce racism and sexism and international conflict, improve relationships, and communicate persuasively. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 254 Family Psychology (4)

Introduction to research and theory on family relationships and behavior across the lifespan. Contextual influences, diversity of family forms, and topics such as love, mate selection, marital quality, parenting, gender, household work, divorce, and remarriage. 4 lectures. Prerequisite: PSY 201 or PSY 202. *Crosslisted as CD/PSY 254.*

PSY 256 Developmental Psychology (4)

Introduction to the scientific study of development with emphasis on the lifespan, from infancy to old age. Basic research and concepts in understanding social, emotional, cognitive, contextual, and diversity influences on development. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

PSY 301 Psychology of Personal Development (4)

Application of developmental psychology to self awareness. Includes communication skills, self modification skills and examination of life goals and values. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 302 Behavior in Organizations (4)

Characteristics of functioning organizations and their effects on individuals. Psychological issues relevant to the maintenance of the organization. Motivation, leadership, group phenomena, communication, decision-making, attitudes, personnel selection and organizational change. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 305 Personality (4)

Personality theories and research. Assessment, dynamics, and development of personality. Trait, behavioral, social learning, cognitive, humanistic,

psychoanalytic and biological approaches. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 306 Adolescence (4)

Psychological analysis of the years from prepubescence to young adulthood. Current research on behavior and development during adolescence with emphasis on physical, affective, cognitive, sociocultural, historical, family, peer and school aspects of life during the post-child, pre-adult years. 4 lectures. Prerequisite: CD 207 or PSY 256. *Crosslisted as CD/PSY 306.*

PSY 309 Psychology of Consciousness (4)

Characteristics and functions of selected, qualitatively unique patterns of consciousness such as hypnosis, meditation, dreaming, drug experiences and parapsychological phenomena, with particular emphasis on adaptive and maladaptive expressions of these states of consciousness. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 310 Psychology of Death (4)

Psychological aspects of death, loss and grief, including scientific findings, person-culture transactions and expressions in the arts and humanities. Personal exploration and interdisciplinary application of psychology to issues such as death anxiety, dying processes, funerals, immortality beliefs, suicide, and grieving. 4 lectures. Prerequisite: PSY 201 or PSY 202, or consent of instructor.

PSY 311 Environmental Psychology (4)

GE D5

Interrelationship between behavior and the built and natural environments. Evaluating and understanding environments, environmental stress, and the human aspects of environmental problems. 4 lectures. Prerequisite: Completion of GE Areas A and D4 (PSY 201 or PSY 202 recommended). Recommended: Junior standing. Fulfills GE D5 except for Psychology and Child Development majors.

PSY 314 Psychology of Women (4)

The lives of women from a psychological perspective. Topics include gender similarities and differences; masculinity, femininity, and androgyny; women's mental and physical health; female sexuality; women's roles in the workplace and the home; and harassment and violence against women. 4 lectures. Prerequisite: PSY 201 or PSY 202. *Crosslisted as PSY/WGS 314.*

PSY 315 Psychology of Men (4)

Central issues in male psychology including stereotypes, gender differences, sex-roles and their development, sex and role typing, male sexuality and models of masculinity. Health, mental and emotional disorders of men, and aging. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 317 Psychology of Stress (4)

Examines the relationship between stress and psychological and physical well-being. Research on the psychological factors influencing stress as well as a description and critical evaluation of methods of stress reduction. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 318 Psychology of Aging (4)

GE D5

Psychological and physiological aging in the context of the culture. Theories and research relating to the issues of stability and both positive and negative changes in perception, learning, memory, intelligence, personality, identity, motivation, sexuality, family relationships, career. Disorders, institutionalization, death and bereavement. 4 lectures. Prerequisite: Completion of Area A; any two lower-division GE Area D courses (PSY 201 or PSY 202 recommended). Recommended: Junior standing. Fulfills GE D5 except for Psychology and Child Development majors.

PSY 319 Motivation and Emotion (4)

Examination of the mechanistic and cognitive-based theories of motivation and emotion. Practical applications of each theory covered in an attempt to understand certain personal and societal behaviors. Research evaluating each theory and diversity consideration. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 323 The Helping Relationship (4)

Basic skills and approaches common to helping relationships with children, adults, and families. Examines theoretical, empirical, and practical applications of helping. Differentiation between professional, paraprofessional, and nonprofessional helping relationships. 2 lectures, 2 activities. Prerequisite: Junior standing, completion of one USCP course, Psychology and Child Development majors only, or consent of instructor.

PSY 325 Introduction to Positive Psychology (4)

Scientific study of the enhancement of strengths and optimal functioning in humans. Basic research, assessment and helping concepts in understanding

optimal functioning within diverse populations. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 329 Research Methods in Psychology (4)

Introduction to research methods used in psychology and other behavioral sciences. Topics include the logic and ethics of research; experimental, correlational, and survey methodology; library search strategies; basic statistical procedures; and the format of the research report. 3 lectures, 1 activity. Prerequisite: PSY 201 or PSY 202, STAT 217 or STAT 251 or STAT 252, or consent of instructor.

PSY 330 Behavioral Effects of Psychoactive Drugs (4)

Pharmacokinetic, pharmacodynamic and behavioral effects of psychoactive drugs. Social and psychological issues related to drug use and misuse. 4 lectures. Prerequisite: Completion of GE D4.

PSY 333 Quantitative Research Methods for the Behavioral Sciences (3)

Thorough introduction to the quantitative aspects of empirical research. Using SPSS statistical software, students will learn how to choose, conduct, and interpret analyses of research data from different behavioral science disciplines. 2 lectures, 1 activity. Prerequisite: PSY 329, and STAT 217 or STAT 251, or consent of instructor.

PSY 339 Psychology of Religion (4)

Major psychological perspectives on religion, faith, and religious experience. Objective and subjective approaches to the study of religion as related to prayer, meditation, social attitudes, behavior, mental health, mysticism, religious orientation, and personal development. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 340 Biopsychology (4)

GE B5

Relationship between physiological and behavioral processes such as learning and memory, language, sleep, and abnormal behavior. Information processing, biochemistry, and structural organization at the cellular and nervous system levels. 4 lectures. Prerequisite: PSY 201 or PSY 202. Fulfills GE B5.

PSY 350 Teamwork (4)

Group dynamics applied to teams. Topics include team development, basic team processes, conflict management, decision making, leadership, problem solving, and the impacts of diversity and culture on teams. Focus on effective use of teams in the workplace. Not open to students with credit for PSY 351. 4 lectures. Prerequisite: Completion of GE D4.

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. Not open to students with credit for PSY 350. 2 lectures, 2 activities. Prerequisite: PSY 252 or PSY 323.

PSY 352 Conflict Resolution: Violent and Nonviolent (4)

GE D5

Psychological, situational, political, and cultural determinants of violence and nonviolence in interpersonal, intergroup, and international conflict. Self-assessment of conflict resolution attitudes, competencies, and behaviors. Negotiation, mediation, and other approaches to conflict management. Educational and structural approaches to violence prevention. 4 lectures. Prerequisite: Completion of GE Area A, PSY 201 or PSY 202, and one course from D3. Junior standing. Fulfills GE D5 except for Psychology and Child Development majors.

PSY 359 Applied Psychology Research Methods (4)

Methods of testing hypotheses and evaluating social interventions in real-world settings. Interview, survey, correlation, field experimental, and quasi-experimental methods. Program evaluation. Experience with data collection and computer analysis. 3 lectures, 1 activity. Prerequisite: PSY 329.

PSY 360 Applied Social Psychology (4)

Applications of social psychology to education, business and industry, environmental problems, interpersonal and intergroup relations, health and welfare, mass communication, judicial systems, and politics. Analysis of social and organizational problems, methods of intervention, and program evaluation. 4 seminars. Prerequisite: PSY 252.

PSY 366 Experimental Psychology (4)

Research methodology and experimental design. Application of descriptive and inferential statistics to data from various content areas including development, animal and human learning, memory, cognition, and psychophysical processes. 3 lectures, 1 laboratory. Prerequisite: PSY 329, junior standing or consent of instructor.

PSY 370 Introduction to Clinical and Counseling Psychology (4)

Introduction to the fields of clinical and counseling psychology. History, education and training, theories, assessment, diagnosis, and treatment. Introduction to diverse settings, ethical principles, legal guidelines, credentialing and employment opportunities. 4 lectures. Prerequisite: PSY 201 or PSY 202 and at least one other PSY course.

PSY 375 Forensic Psychology (4)

Application and practice of psychology in both the civil and criminal justice systems. Examination of police and investigative psychology, correctional psychology, expert witness testimony, psychological evaluations for the courts, understanding aggression. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 390 Career Planning (2) (CR/NC)

Individual career and graduate school planning. Current employment issues for college graduates such as career profiles, trends and work environments. Credit/No Credit grading only. 2 seminars. Prerequisite: Junior standing or consent of instructor. *Crosslisted as CD/PSY 390.*

PSY 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, study or survey of selected problems in consultation and with prior approval of instructor. Written report required. Total credit limited to 4 units. Prerequisite: PSY 201 or PSY 202.

PSY 401 Special Problems: Experiential Learning (2-4) (CR/NC)

Supervised experience in various community, governmental, educational, or research settings. Especially designed for individuals in applied settings requiring additional hours or a pre-fieldwork training experience. Applied psychological, developmental, or educational experiences determined by participating institution, supervising faculty member, and student. Cannot be substituted for PSY 448, PSY 449, PSY 453, or PSY 454. Credit/No Credit grading only. Total credit limited to 4 units. Prerequisite: Psychology major or gerontology minor, junior standing, and consent of instructor.

PSY 405 Abnormal Psychology (4)

Normal and abnormal behavior in everyday life. Anxiety, somatoform, dissociative, mood, childhood, personality, psychotic, cognitive, eating, and substance use disorders and their treatment. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 410 History and Systems of Psychology (4)

Survey of the philosophical and scientific roots of modern psychology, pioneer laboratories, systems, and schools of psychology, the refining of experimental methods, and applications of psychology in testing and psychological services. Examination of contributions by women and minorities in psychology. 4 seminars. Prerequisite: PSY 201 or PSY 202, PSY 305, PSY 458 or consent of instructor.

PSY 413 Parent-Child Relationships (4)

Application of major theories to understanding of parent-child relations. Examination of primary prevention strategies and programs. Review of current research and evaluation of literature on parent-child interactions. 4 lectures. Prerequisite: PSY 256, junior standing.

PSY 419 Self and Identity (4)

Concepts, theories, and research related to the development of the self across the lifespan. Examination of the influence of temperament, culture, individuation, self-esteem, self-awareness, roles and identity on maturity. 4 seminars. Prerequisite: PSY 256 or PSY 305 and senior standing.

PSY 420 Social and Emotional Development (4)

Analysis of the development of social interaction and emotional processes across the lifespan. Research and theories on such behaviors as attachment and love, empathy and altruism, competition and aggression, peer relations and cooperation. 4 seminars. Prerequisite: PSY 256 or consent of instructor.

PSY 421 Language and Cognitive Development (4)

Examination of significant processes in the development of cognition across the lifespan. Theory and research regarding Piagetian theory, information processing, problem solving, creativity, and language development. Educational and counseling applications. 4 seminars. Prerequisite: PSY 201 or PSY 202.

PSY 422 Lifespan Sexuality (4)

Sexual interest, activity, and functioning from birth through the late adult years. Influence of sexual roles, attitudes, and adaptation during the life span. Sexual practices in our society. Therapies for enhancing a comfortable sexuality. 4 lectures. Prerequisite: PSY 201 or PSY 202, or PSY 205, and junior standing.

PSY 430 Sensation and Perception (4)

Principles of sensory systems, psychophysics, attention and the perception of color, shape, movement, space, and time. Survey of the development of perception through the lifespan. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 431 Assessing Children's Development and Environments (4)

Current developmental and environmental assessments used in childcare and educational settings and in research. Practice using, creating, and evaluating child assessments. 3 lectures, 1 activity. Prerequisite: CD 304 and CD 305 or two of the following: PSY 419, PSY 420, PSY 421, CD 329 or PSY 329. *Crosslisted as CD/PSY 431.*

PSY 432 Psychological Testing (4)

Theory and practice of psychological measurement and testing. Principles of test construction, administration, and interpretation. Survey of common testing domains such as intelligence, scholastic aptitude and achievement, and personality. 4 lectures. Prerequisite: PSY 201 or PSY 202, junior standing.

PSY 444 The Atypical Infant (4)

Exploration of issues pertinent to the development of atypical infants. Relationship of theory and research to intervention efforts with handicapped, developmentally delayed infants, and other at-risk infants. 3 seminars, 1 activity. Prerequisite: Junior standing, PSY 256, and EDUC 440 or consent of instructor. *Crosslisted as EDUC/PSY 444.*

PSY 448, 449 Research Internship I, II (5) (5) (CR/NC)

Faculty-supervised research experience on various topics in psychology. Student apprenticeship with a department faculty member to conduct research. Responsibilities include some or all of the following: collecting data, entering and/or analyzing data, electronic literature search, report writing. Credit/No Credit grading only. Prerequisite: PSY 329, PSY 333, Psychology and Child Development majors only, junior standing, and consent of instructor. Recommended: PSY 366.

PSY 450 Family Intervention (4)

Basic elements of marriage and family therapy and crisis intervention. Emphasis on concepts, goals, and techniques of various family therapy approaches and family crisis intervention. 4 lectures. Prerequisite: PSY 254, or graduate standing.

PSY 453, 454 Supervised Fieldwork I, II (5) (5) (CR/NC)

Supervised fieldwork experience in various community, governmental, and educational settings. Applied psychological, developmental, or educational experiences determined by participating institution, supervising faculty member, and student. Credit/No Credit grading only. Prerequisite: PSY 323, Psychology and Child Development majors only, junior standing, and consent of instructor.

PSY 456 Behavioral Disorders in Children (4)

Applications of psychological principles to childhood behavioral disorders. Aggression, delinquency, stress reactions, motivational, perceptual-attentional deficiencies, psychoses, anxiety disorders, biological dysfunctions, and retarded social and cognitive development. 4 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

PSY 457 Memory and Cognition (4)

Principles and theories of memory and cognition including processes; models of perception, attention and memory; concept formation; language; intelligence; problem-solving and decision making; creativity; applications to areas such as law, artificial intelligence, and education. 4 lectures. Prerequisite: PSY 201 or PSY 202, PSY 329 or consent of instructor.

PSY 458 Learning (4)

Theoretical and philosophical foundations of the experimental analysis of behavior. Principles of classical and operant conditioning including aversive control of behavior through punishment and avoidance learning and the theoretical basis for behavior therapy techniques and applications of learning principles in education and health settings. 4 lectures. Prerequisite: PSY 201 or PSY 202, junior standing.

PSY 459 Lifespan Theories (4)

Comparative study of theories that have been offered as explanations for lifespan development. Controversial issues, evaluations and applications of theories. Emphasis on biological, psychological, and social aspects of lifespan development. 4 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

PSY 460 Child Abuse and Neglect (4)

Issues in child maltreatment, including definitions and forms, causes, consequences, assessment, reporting, treatment, and prevention. Possible links

among research, intervention, and public policy will be emphasized. 4 seminars. Prerequisite: PSY 201 or PSY 202 and junior standing.

PSY 461 Senior Project Seminar (1) (CR/NC)

Discussion of occupational and graduate school opportunities and of current issues in psychology for the purpose of defining professional objectives and individual projects for PSY 462. Senior project progress reports with class critique. Credit/No Credit grading only. 1 seminar. Prerequisite: Senior standing; PSY 329. Psychology and Child Development majors only.

PSY 462 Senior Project (3)

Design and completion of a faculty-supervised project in psychology. The project must be presented in a formal, written report. Minimum of 90 hours total time. Prerequisite: PSY 461. Psychology and Child Development majors only.

PSY 465 Cross-Cultural Issues in Psychology (4)

Psychological, cultural, ecological and behavioral influences on human development in different cultural settings. Focuses on from one to three different cultures outside the U.S. in any given quarter. 4 seminars. Prerequisite: PSY 201 or PSY 202 and junior standing.

PSY 470 Selected Advanced Topics (4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Junior standing and consent of instructor.

PSY 472 Multicultural Psychology and Diversity (4) USCP

The impact of culture, ethnicity, and race on human behavior within the framework of psychological theory and research. Emphasis on ethnic minority groups within the U.S. including: African Americans, Native Americans, Asian Americans/Pacific Islanders, and Latino/a Americans. Not open to students in MS Psychology program. 4 seminars. Prerequisite: PSY 201 or PSY 202 and junior standing.

PSY 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

PSY 494 Psychology of Technological Change (4)

Examines the impact of technological change on the psychological and social characteristics of people and organizations. Identifies personal, social and organizational factors which provide obstacles and opportunities for technological change. Survey of methods of reducing the negative impact of change. 4 seminars. Prerequisite: PSY 201 or PSY 202 and senior standing.

PSY 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

PSY 500 Individual Study (1-6)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: Consent of department head, graduate major advisor and supervising faculty member.

PSY 504 Psychopharmacology (4)

Advanced course in brain-behavior relationships. Neuropathology of brain disorders including the neurochemical etiology and treatment of mental illness and chemical dependency. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

PSY 555 Counseling and Communication (4)

Overview of the counseling profession, history, philosophy, theory, and ethics. Emphasis on developing interviewing, assessment and communication skills. Required practicum. 3 seminars, 1 activity. Prerequisite: Graduate standing and PSY 560, or consent of instructor.

PSY 556 Multicultural Counseling and Psychology (4)

Psychological, cultural, and ecological analysis of the experiences and histories of various cultural groups within the United States. Development of personal self-awareness of multicultural issues and culturally relevant counseling skills. 3 seminars, 1 activity. Prerequisite: Graduate standing and PSY 555, PSY 560.

PSY 560 Individual Therapy: Theory and Application (4)

Counseling theories and concepts applied to individuals. Develop skills in interviewing, assessment, intervention selection, termination and crisis intervention. Ethics and law included. 3 seminars, 1 activity. Prerequisite: Graduate standing and PSY 305, or consent of instructor,.

PSY 564 Ethics and the Law: MF Therapy (4)

Ethical, legal and case management issues related to individual, child, family and group therapy. Client rights and professional orientation to ethical standards and state regulation of clinical practice. 4 seminars. Prerequisite: Graduate standing and PSY 560, PSY 450 or consent of instructor.

PSY 565 Diagnosis and Treatment: Psychopathology (4)

Assessment of mental status. Diagnostic and statistical Manual of Mental Disorders, treatment planning, treatment case documentation and research applied to client psychopathology. 3 seminars, 1 activity. Prerequisite: Graduate standing and PSY 560, PSY 405, or consent of instructor.

PSY 566 Group Therapy: Theory and Application (4)

Group therapy theory, leadership and research applied to client assessment, screening, treatment selection, evaluation and termination. Ethics, law included. 2 seminars, 2 activity. Prerequisite: Graduate standing and PSY 560, or consent of instructor.

PSY 568 Advanced Psychotherapies (4)

Theory and application of advanced approaches in psychotherapy, including: cognitive-behavioral therapies, psychodynamic therapies and humanistic/existential therapies. The Schedule of Classes will list therapy selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing and PSY 555, PSY 560, PSY 565 or consent of instructor.

PSY 569 Counseling Clinic Practicum (3) (CR/NC)

Applied experience and instruction in assessment, diagnosis, treatment planning and treatment of individuals, couples, families and children under direct supervision of faculty in program clinic. Weekly meetings. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Graduate standing and PSY 450, PSY 555, PSY 560, PSY 565, or consent of instructor.

PSY 570 Selected Topics in Psychology and Human Development (4)

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors. The Schedule of Classes will list title selected. Total credit limited to 8 units. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

PSY 571 Family Therapy: Theory and Application (4)

Theory and application of process, structural and systems approaches to family and couple therapy. Assessment, diagnosis, treatment and follow-up of family and couple therapy with required supervised activities. Ethics and law related to family therapy. 3 seminars, 1 activity. Prerequisite: Graduate standing and PSY 450, PSY 555 or consent of instructor.

PSY 572 Child and Adolescent Therapy: Theory and Application (4)

Assessment, diagnosis, treatment planning and therapeutic modalities appropriate for children and adolescents. Seven hours of instruction in abuse and neglect of children with relevant ethics and law. Effective parenting approaches and integration of family treatment. 3 seminars, 1 activity. Prerequisite: Graduate standing and PSY 405, PSY 456, PSY 555, PSY 560 or consent of instructor.

PSY 573 Field Experience: Counseling (6) (CR/NC)

Practical application of guidance services and counseling in public schools, colleges and community settings. Weekly seminars with university staff included. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: PSY 569 and consent of M.S. program committee.

PSY 574 Psychological Assessment (4)

Administration, scoring and interpretation of psychological tests. Reliability and validity of psychological measures. Ethical and cultural issues in testing. 4 seminars. Prerequisite: Graduate standing.

PSY 575 Gender, Couple and Sexual Dysfunction Therapy (4)

Antecedents to sex-role identity, gender aware therapy, couple therapy, treatment of spousal abuse, assessment, diagnosis, treatment of sexual

dysfunction. 4 seminars. Prerequisite: Graduate standing and PSY 450, PSY 560.

PSY 576 Traineeship: Marital and Family Counseling (4) (CR/NC)

Supervised experience in applied psychotherapeutic techniques, assessment, diagnosis and treatment of individual, marital, family and child relationship problems. Total credit limited to 16 units. Credit/No Credit grading only. Weekly seminar with on-site and university supervisors. Prerequisite: PSY 569, PSY 564 and consent of M.S. program committee.

PSY 585 Research Methods for Counseling Psychology (4)

Research methods relevant to practitioners in counseling psychology and human services. Basic understanding of descriptive and inferential statistics as well as applications related to these topics. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

PSY 588 Substance Abuse (4)

Etiological, assessment, diagnostic, and treatment models of chemical dependency. Comparison of disease/medical, psychodynamic, cognitive/behavioral, humanistic, existential, and sociocultural approaches. Differential diagnosis, comorbidity with other conditions, and associated factors. 4 seminars. Prerequisite: Graduate standing and PSY 560, PSY 565, PSY 574, or consent of instructor.

PSY 599 Thesis (4)

Completion of a thesis pertinent to the fields of psychology and human services. Prerequisite: PSY 585.

RELS-RELIGIOUS STUDIES

RELS 201 Religion, Dialogue, and Society (4) GE D3

The way in which interactions between religious traditions shape society at various levels. Case studies drawn from eastern and western religious traditions during the ancient and modern periods. 4 lectures. Fulfills GE D3.

RELS 205 Jesus (4)

Exploration and analysis of the person of Jesus. Includes examination of our sources of knowledge about him, his self-understanding, and various interpretations of him in historical, comparative, and contemporary settings. 4 lectures.

RELS 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

RELS 301 Religions of Asia (4) GE C4

Comparative study of the religions of Asia, particularly Hinduism, Buddhism, and the religions of China. Topics include historical continuities/discontinuities, worldviews, sacred texts, practices, responses to modernity, the place of women across the traditions. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4.

RELS 302 Monotheisms: Judaism, Christianity, and Islam (4) GE C4

The monotheistic traditions of Christianity and Islam, with focus on their origins from Judaism. Topics include: Jewish history, the Hebrew Bible, the Christian New Testament, formation of the Church, the Quran and Mohammad. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4.

RELS 304 Judaism (4) GE C4

Origins, beliefs and practices of Judaism and central themes in the Hebrew Bible. The development of Judaism in the post-biblical and Talmudic period. Jewish philosophy, life, rituals and customs. The emergence of modern Judaism, Zionism and post-Holocaust philosophy. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4.

RELS 306 Hinduism (4) GE C4

Origins, beliefs and practices of Hinduism from the *Veda* and the *Upanishads* through the teachings of the *Bhagavad Gita* and the *Puranas*. Modern Hindu institutions, saints and sages, and social philosophy contrasted with the ancient. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4.

RELS 307 Buddhism (4) GE C4

Buddhist origins, viewpoints and practices will be seen in their development in India, Tibet, China, Japan, South Asia and America. The life of Buddha, Gautama, the rise of Theravada, Mahayana and Tantra. Encounters with Shinto

and Confucianism. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4.

RELS 310 Christianity (4) GE C4

The development of the Christian religion from the story of Jesus, the New Testament, Church formation, the role of St. Paul, dissenting ideas, Protestant and Catholic views, and contemporary issues of conscience, such as the Social Gospel and liberation theologies. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4.

RELS 311 Islam (4) GE C4

The development of Islamic civilization from the inspiration of the Qur'an and the Prophet Muhammad and the Sunni-Shi'i split to contemporary political and social issues. Emphasis of Sufi literature, art, architecture, and philosophies of Islam. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4.

RELS 344 Religious Studies: The Making of a Discipline (4) GE D5

Examination of religion from an academic perspective by surveying the various historical approaches employed within the discipline of religious studies to collect, analyze, and interpret religious phenomena cross-culturally. 4 lectures. Pre-requisite: Completion of GE Area A, and D3 or D4. Recommended: Junior standing. Fulfills GE D5.

RELS 370 Religion, Gender and Society (4) GE C4 USCP

Critical examination of religious ideas and institutions in America in relation to gender, race and politics. Focus on women and religion, the religious experience of minorities, and on politics. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. *Crosslisted as RELS/WGS 370*. Fulfills GE C4 and USCP.

RELS 372 Spiritual Extremism: Asceticism, Mysticism, and Madness (4) GE C4

Shaping influence of ascetics, mystics and the insane on global religious traditions. Topics may include the relationship between spiritual extremists and society, cultural construction of holiness and insanity, and literary depictions of spiritual extremists. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4.

RELS 374 Religion and Violence (4) GE C4

Historical and contemporary case studies of how various religions have condoned, motivated and justified violence. The place of sacrifice, martyrdom, self-injury and forced conversion in religious doctrines. Representations of religious violence in the media. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4.

RELS 378 Religion and Contemporary Values (4) GE C4

Descriptive analysis of how diverse religious traditions construct moral decisions about a variety of contemporary issues including sexuality, ecology, and justice. Challenges for religious value systems in secular and pluralistic societies. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. Fulfills GE C4.

RELS 380 Religion and Politics in the Israeli-Palestinian Conflict (4)

The root causes of the Israeli-Palestinian conflict and its current manifestation. Possibilities for solutions from the perspectives of religious studies and political science. 4 lectures. Prerequisite: Completion of GE Area A. Recommended: Completion of one class in POLS or RELS. *Crosslisted as POLS/RELS 380*.

RELS 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 and instructor.

RELS 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Consent of instructor.

RPTA-RECREATION, PARKS, and TOURISM ADMINISTRATION

RPTA 101 Introduction to Recreation, Parks and Tourism (4)

History, philosophy, theory, and organization of recreation and leisure services. Exploration of the recreation, parks, and tourism profession; emphasis upon functions, areas, facilities, clientele, and career opportunities. 4 lectures. Prerequisite: RPTA or FNR majors only.

RPTA 110 Career Planning in Recreation, Parks and Tourism (1) (CR/NC)

Development and application of philosophy, learning strategies, and problem solving for career planning in recreation, parks, and tourism. Credit/No Credit grading only. 1 activity. Prerequisite: RPTA majors only.

RPTA 112 Parks and Outdoor Recreation (4)

Introduction to park and outdoor recreation systems. History, philosophy, policy and principles of outdoor recreation, wilderness, park management, environmental education, outdoor education, and natural resources recreation at the local, regional, national, and international levels. Field visits. 3 lectures, 1 activity.

RPTA 127 Leisure Behavior (4)

Sociological, psychological, and cultural aspects of leisure behavior. Needs, motivations, constraints, values and benefits explored. 4 lectures. Prerequisite: RPTA majors only.

RPTA 160 Introduction to Sport Management (4)

Introduction to the philosophy, organization, issues and career paths of sport management. Emphasis on ethical decision-making and career opportunities in youth, interscholastic, intercollegiate, professional, and international sport. 4 lectures. Prerequisite: Sophomore standing.

RPTA 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. *Crosslisted as NR/RPTA 203.*

RPTA 205 Leadership and Facilitation (4)

Recreation, parks, and tourism leadership with small and large groups. Skills, knowledge, and abilities required of effective leaders in leisure organizations and settings. 3 lectures, 1 activity. Prerequisite: RPTA or FNR majors only, sophomore standing or consent of instructor.

RPTA 210 Introduction to Program Design (4)

Methods of program planning, organization, implementation and evaluation in public and private settings. Interrelationship of needs and interests of people, physical settings, and activity content. Emphasis on program construction and scheduling in recreation, parks, and tourism services. 3 lectures, 1 activity. Not open to students with credit in RPTA 260. Prerequisite: RPTA or FNR majors only, sophomore standing or consent of instructor.

RPTA 214 Introduction to Travel and Tourism (4)

History and development of travel and tourism. Examination of different sectors of the tourism industry. Supply and demand for tourism products and services. Effects of tourism on individual cultures and the natural environment. Travel motivations. Field visits required. 4 lectures. Corequisite: RPTA 210 or RPTA 260, or consent of instructor.

RPTA 252 Therapeutic Recreation and Special Populations (4)

Introduction to special populations and therapeutic recreation. Specialized leadership and communication techniques. Modification requirements for programs, areas, facilities, equipment, and supplies. Exploration of disability rights issues, including legislation which impacts the delivery of recreation and leisure services. 3 lectures, 1 activity. Prerequisite: RPTA majors only, sophomore standing or consent of instructor.

RPTA 260 Recreational Sport Programming (4)

Philosophy, foundations, policy and techniques underlying recreational sport programs in public, private and commercial settings. Methods of program planning, organization, implementation and evaluation with emphasis on program construction and scheduling. 3 lectures, 1 activity. Not open to students with credit in RPTA 210. Prerequisite: RPTA or FNR majors only, sophomore standing or consent of instructor.

RPTA 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

RPTA 275 Challenge Course Facilitation (2)

Techniques and models used in challenge course leadership and facilitation. Emphasis on facilitation styles, challenge course terminology, facilitation models, safety guidelines, and industry best practices. 2 seminars. Prerequisite: RPTA 205 or consent of instructor.

RPTA 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. Use of forestry and natural resource examples. 1 lecture, 1 laboratory. Prerequisite: Consent of instructor. *Crosslisted as NR/RPTA 300.*

RPTA 302 Environmental and Wilderness Education (4)

Education and teaching techniques that apply to learning experiences in an outdoor environment. Impact of natural resource usage that affects sociological, biological and physical resources. Educational strategies for presenting environmental learning to grades K-12 in selected environments. 3 lectures, 1 activity. Prerequisite: RPTA 210 or RPTA 260 with C- or better, junior standing or consent of instructor.

RPTA 313 Sustainable Tourism (4)

Investigation of tourism industry from a sustainable tourism perspective. Ecotourism, agri-tourism, rural tourism, sustainable tourism development, and adventure travel. Emphasis on tourism that sustains social, cultural, heritage, and natural environments while generating economic development. 3 lectures, 1 laboratory. Prerequisite: RPTA 210 or RPTA 260 with C- or better, junior standing or consent of instructor.

RPTA 314 Sustainable Travel and Tourism Planning (4)

The planning and development of tourism destinations, agencies, and services from a sustainable development perspective. Emphasis on the economic, social and environmental impacts of tourism. Examination of alternative forms of tourism. Emphasis on sustainable tourism. Travel research and planning models. Field visits required. 3 lectures, 1 laboratory. Prerequisite: RPTA 210 or RPTA 260, RPTA 214 with C- or better, junior standing or consent of instructor.

RPTA 316 Hotel and Lodging Management (4)

History, economics, and significance of hotel and lodging management. Career opportunities in the hospitality industry. Emphasis on the examination of the technical operations integral to hotel and resort management. Areas of study include: hotel, resort, and lodging operations; front office operations; food, beverage and restaurant operations; housekeeping and engineering; sales; and staff management and classification system statewide, nationally, and internationally. Field visits required; students may be required to provide own transportation. 3 lectures, 1 activity. Prerequisite: RPTA 214 or consent of instructor.

RPTA 317 Conventions and Meeting Management (4)

Role of conventions and meeting management in the area of tourism. Factors involved in meeting planning for small and large groups to include committees, amenities, logistics of operations and evaluation. Field visits required. 3 lectures, 1 activity. Prerequisite: RPTA 210 or RPTA 260 with C- or better, junior standing or consent of instructor.

RPTA 320 Special Event Planning (4)

Major trends and successful practices in festival and event planning. Emphasis on conceptualization, analysis, and planning considerations of small to large-scale community events. Exploration of event management field as a profession. 3 lectures, 1 activity. Prerequisite: RPTA 210 or RPTA 260, junior standing or consent of instructor.

RPTA 321 Visitor Services in Recreation, Parks, and Tourism (1-4)

Management issues in meeting the needs of recreation, parks, and tourism organizations. Topics to include customer satisfaction, service quality, visitor management, customer service skills and procedures, and creating a customer focused organization. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 1-4 seminars. Prerequisite: RPTA 210 or RPTA 260, junior standing or consent of instructor.

RPTA 325 Outdoor and Adventure Leadership (4)

Theoretical principles and experience in leadership, judgment, and decision-making in outdoor and adventure settings. Total credit limited to 8 units. The Schedule of Classes will list topic selected. 3 lectures, 1 activity. Prerequisite: RPTA 205, junior standing or consent of instructor.

RPTA 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: RPTA 210 or RPTA 260 with C- or better and consent of instructor.

RPTA 342 Legal Aspects of Recreation, Parks and Tourism (4)

Legislative and legal aspects of public, private, commercial, and non-profit recreation, parks, and tourism agencies. Emphasis on risk management, liability, insurance, and negligence. Understanding of legal foundations and the legislative process. 4 lectures. Prerequisite: RPTA 210 or RPTA 260 with C- or better, junior standing or consent of instructor.

RPTA 350 Recreation Areas and Facilities Management (4)

Management of recreation areas and facilities: clientele considerations, facility and outdoor area site planning; day-to-day operations of common recreation areas and facilities. Agency visitation required. 3 lectures, 1 laboratory. Prerequisite: RPTA 210 or RPTA 260 with C- or better, junior standing or consent of instructor.

RPTA 360 Assessment and Evaluation of Recreation, Parks and Tourism (4)

Evaluation of recreation, parks, and tourism programs using a variety of research methodologies. Needs assessment, program evaluation, research design, and decision making based on data analysis. 3 lectures, 1 laboratory. Prerequisite: RPTA 210 or RPTA 260 with C- or better or consent of instructor, STAT 217 or STAT 218 or STAT 251 or STAT 252, junior standing. Recommended: CSC 110 or CSC 113.

RPTA 375 Leisure and Community Resources (4)

Investigation of community development principles, costs and benefits related to leisure, recreation, parks, and tourism. Emphasis on leisure, recreation, park and tourism resources, cultural and social dynamics, economic viability, quality of life, and environmental issues. 4 lectures. Prerequisite: Completion of GE Areas A1, A2, A3.

RPTA 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: RPTA 210 or RPTA 260 with C- or better and consent of instructor.

RPTA 405 Recreation, Parks and Tourism Management (4)

The study, analysis, and practice of management processes as they are applied to recreation organizations: planning, organizing, motivating, and controlling. Emphasis upon application of theories, practices and case studies in specific recreation settings. 4 lectures. Prerequisite: RPTA 205, RPTA 210 or RPTA 260, senior standing or consent of instructor.

RPTA 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: NR 112 or consent of instructor.

RPTA 412 Tourism and Outdoor Applications Seminar (2-4)

Selected topics on aspects of the tourism field. The Schedule of Classes will list topic selected. Field visits may be required. Total credit limited to 12 units, repeatable in same term. 2-4 seminars. Prerequisite: RPTA 210 or RPTA 260, or consent of instructor.

RPTA 413 Tourism and Protected Area Management (4)

Practices of tourism and recreation management in protected areas. History and principles of protected areas. Social, cultural, economic, and environmental benefits of and risks to protected areas and communities. Environmental stewardship in tourism and recreation management worldwide. 3 lectures, 1 laboratory. Prerequisite: RPTA 210 or RPTA 260, or consent of instructor.

RPTA 414 Commercial Recreation Enterprise (4)

Development of the domains of commercial recreation and related services. Role of entrepreneurial activity. Procedures for creating and managing a socially responsible commercial leisure service. 4 lectures. Prerequisite: BUS 212, BUS 346, RPTA 210 or RPTA 260 with C- or better, or consent of instructor, and senior standing.

RPTA 415 Adventure Programming and Planning (4)

Exploration of the history, benefits, characteristics, goals, models, and applications of adventure programs. Emphasis on wilderness and outdoor programs, adventure tourism, inclusive programs, adventure education, planning, management, and implementation. 3 lectures, 1 activity. Prerequisite: RPTA 210 or RPTA 260, or consent of instructor.

RPTA 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: RPTA 112 or consent of instructor.

RPTA 420 Festival and Event Management (4)

Management strategies and practices for small to large scale community festivals and events. Emphasis on sponsorship, marketing, staffing, production, and budgeting. 4 lectures. Prerequisite: RPTA 210 or RPTA 260, junior standing, or consent of instructor.

RPTA 424 Financing Recreation, Parks and Tourism Services (4)

Financing leisure products and services in public, private, commercial and voluntary settings. Emphasis on sources and methods of financing; operational/financial cost analysis; forecasting, budgeting, pricing and fiscal master planning through use of computer technology. 4 lectures. Prerequisite: BUS 212, RPTA 360 with C- or better, or consent of instructor, senior standing. Recommended: ENGL 310.

RPTA 430 Sports Field Construction and Management (4)

Construction and maintenance of sports fields. Basic agronomics including sports field construction, sports turf establishment and maintenance, environmental issues, and personnel management. 3 lectures, 1 laboratory. Prerequisite: EHS 343, and junior standing. *Crosslisted as EHS/RPTA 430.*

RPTA 450 Resource and Grant Development (4)

Principles of all aspects of grantsmanship; researching grant funding resources from both the private and public sector, preparing the grant proposal, and grant administration. Field visits required. 4 lectures. Prerequisite: Junior standing.

RPTA 460 Research in Recreation, Parks and Tourism (4)

Research design, literature review, questionnaire and interview schedule construction, sampling methods, data array and analysis, and computer applications. Selection of senior project topic and proposal development. 3 lectures, 1 laboratory. Prerequisite: STAT 217 or STAT 218 or STAT 251 or STAT 252, RPTA 360 with C- or better or consent of instructor, ENGL 310, senior standing.

RPTA 461 Senior Project (3)

Completion, under faculty supervision, of an investigative project typical of problems which graduates must solve in their fields of employment. Required minimum of 90 hours. Analytical, formal report is required. Prerequisite: Senior standing and completion of RPTA 460 with C- or better or consent of instructor.

RPTA 463 Pre-Internship Seminar (1) (CR/NC)

Exploration of internship opportunities and practices. Internship selection process and procedures introduced. Recommended enrollment two quarters prior to RPTA 465. Credit/No Credit grading only. 1 seminar. Prerequisite: RPTA majors only and senior standing.

RPTA 465 Internship (6) (CR/NC)

400 hours of full-time concentration-specific practical work experience over a ten-week period in an approved agency. Comprehensive involvement in agency program. Credit/No Credit grading only. Prerequisite: Minimum GPA of 2.0; 1,000 verified hours of advisor-approved paid and/or volunteer experience subsequent to high school; completion of all university coursework other than Internship; approval of Internship Coordinator.

RPTA 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Consent of instructor.

RPTA 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to graduate and undergraduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

RPTA 472 Leadership Practice (1)

Leadership styles used in the natural resources management and recreation administration professions. Study and practice in setting goals and objectives; developing, evaluating and implementing an entrepreneurial project plan; decision making and problem-solving. Total credit limited to 4 units. 1 laboratory. Prerequisite: Junior standing or consent of instructor. *Crosslisted as NR/RPTA 472.*

RPTA 500 Individual Study (1–6)

Advanced independent study planned and completed under the direction of a member of the department faculty. Total credit limited to 6 units. Prerequisite: Graduate standing and consent of department head.

RPTA 502 Current Issues in Recreation, Parks, and Tourism (4)

Societal issues that influence the management and delivery of recreation, parks, and tourism services. Critical investigation of current research and trends. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

RPTA 527 Leisure Behavior and Theory (4)

Theories of recreation and leisure; conceptual and theoretical foundations of leisure; the role of leisure behavior in modern day society. The Schedule of Classes will list topic selected. Constructs that contribute to contemporary understanding of leisure behavior. Connection of theories to individual research. Total credit limited to 8 units. 4 lectures. Prerequisite: Graduate standing.

RPTA 539 Graduate Internship in Recreation, Parks and Tourism (1–9)

Application of theory to the solution of problems of recreation, parks and tourism or related businesses in the field. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

RPTA 570 Selected Topics in Recreation, Parks and Tourism (1–4)

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1–4 seminars. Prerequisite: Graduate standing or consent of instructor.

RPTA 571 Selected Advanced Laboratory in Recreation, Parks and Tourism (1–4)

Directed group laboratory of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1–4 laboratories. Prerequisite: Graduate standing and consent of instructor.

RPTA 581 Graduate Seminar in Recreation, Parks and Tourism (1)

Group study of selected developments, trends and problems in the field of recreation, parks and tourism. Total credit limited to 4 units. 1 seminar. Prerequisite: Graduate standing.

RPTA 599 Thesis in Recreation, Parks and Tourism (1-9)

Individual research in recreation, parks and tourism management under the general supervision of faculty, leading to a graduate thesis. Degree credit limited to 9 units. Students must enroll each quarter advisement is received. Prerequisite: Graduate standing and consent of instructor.

SCM—COLLEGE OF SCIENCE AND MATHEMATICS

SCM 100 Orientation to the College of Science and Mathematics (2) (CR/NC)

Application of learning strategies, problem-solving methodologies, academic planning and career selection for students in the science and mathematics disciplines. Concurrent enrollment in specific orientation or content course is desirable. Credit/No Credit grading only. 1 lecture, 1 activity.

SCM 101 Introduction to the Health Professions (1) (CR/NC)

Preparation for a health professions career and examination of various health professions. Emphasis on planning and developing an individual pre-health plan, including academic course selection, obtaining appropriate experiences/activities, and review of the elements of a strong application. Intended for freshmen and sophomores. Credit/No Credit grading only. 1 lecture.

SCM 150 Supplemental Instruction Discussion (1) (CR/NC)

Facilitated study and discussion of theory, concepts, and applications of content material from selected courses. Credit/No Credit grading only. Total credit limited to 8 units. 1 laboratory. Prerequisite: Concurrent enrollment in the designated section of the associated course.

SCM 201 Orientation to Biotechnology (1) (CR/NC)

Introduction to the diversity of fields in biotechnology. Applications in agriculture, nutrition, medicine and environmental problems. Credit/No Credit grading only. 1 activity. Prerequisite: Completion of a course with a BIO, BOT or MCRO prefix and a course with a CHEM prefix.

SCM 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

SCM 300 Early Field Experience, Science/Mathematics (4) (CR/NC)

Historical, philosophical, and social foundations of public science and mathematics education. Public school curriculum and professional education dispositions. Structured observation and participation in K-12 public schools with attention to instructional practices for diverse learners. Credit/No Credit grading only. 2 lectures, 2 activities. Prerequisite: Sophomore standing. For Math majors or Science and Engineering majors only.

SCM 302 The Learn By Doing Lab Teaching Practicum (2) (CR/NC)

Early teaching experience in an informal science/technology/engineering/mathematics (STEM) teaching and learning environment. Principles of inquiry-driven STEM education, lesson design, implementation and assessment. Intended for undergraduates exploring STEM teaching as a career. Total credit limited to 4 units. Credit/No Credit grading only. 1 seminar, 1 laboratory. Prerequisite: Completion of GE Area B and consent of instructor. *Crosslisted as ENGR 322/SCM 302.*

SCM 320 Technology in London (4)**GE Area F**

Impact of one or two technologies in modern London. How they developed from the scientific/industrial revolution, as seen through London museums and industries. How solutions to modern problems are dependent on available technology. Specific technology chosen by instructor. 2 lectures, 2 activities. Prerequisite: Junior standing and completion of GE Area B. Concurrent enrollment in London Study Program. Fulfills GE Area F.

SCM 325 Genetic Engineering Technology (4)**GE Area F**

Introduction to the methodology and techniques used in genetic engineering. Applications in agriculture, nutrition, medicine and environmental problems. Potential benefits and problems, including the underlying ethical questions. Not open to students with credit in CHEM 373. 4 lectures. Prerequisite: Completion of GE Area B2 and B3, including a chemistry course. Recommended: Junior standing. Fulfills GE Area F.

SCM 330 Ocean Discovery through Technology (4)**GE Area F**

Introduction to marine science and current issues in marine science. Investigation of emerging technologies that provide new understanding of the ocean, including sensors and sensor platforms such as ships, satellites, and underwater vehicles. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Area B. Fulfills GE Area F.

SCM 335 Nuclear Science and Society (4)**GE Area F**

Impact of nuclear phenomena on energy production, warfare, health and medicine, and the environment. Scientific and public policy aspects of reactor design, nuclear accidents, disposal of radioactive waste, nuclear medicine, food irradiation, nuclear weapons, and fusion as potential energy source. 4 lectures. Prerequisite: Junior standing and completion of GE Area B. Fulfills GE Area F.

SCM 350 The Global Environment (4)**GE Area F**

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Areas A and B. *Crosslisted as AG/BUS/EDES/ENGR/HUM/SCM/UNIV 350.* Fulfills GE Area F.

SCM 363 Health Professions Internships (2) (CR/NC)

Structured experiences for pre-health students, such as County Health Agency internships designed to promote understanding of social and public purpose of chosen professions, or internships designed to provide observational experiences in a modern clinical setting. The Schedule of Classes will list topic selected. Limited space availability. Application process for enrollment. Total credit limited to 12 units; a maximum of 6 units may be applied toward degree requirement. Credit/No Credit grading only. Prerequisite: Sophomore standing; must have been enrolled at Cal Poly for at least two quarters; consent of instructor.

SCM 401 Advanced Undergraduate Research (1-3) (CR/NC)

Laboratory research under faculty supervision. Credit/No Credit grading only. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor. 4 units may be applied to approved chemistry electives. *Crosslisted as SCM/CHEM 401.*

SCM 451 Ethics in the Sciences (3)

The practice, performance and application of science from the standpoint of ethics. Includes issues involving plagiarism, data handling, fraud, safety and selected applications in specific science careers. Models for the analysis and resolution of ethical dilemmas are presented. 3 seminars. Prerequisite: Junior standing.

SCM 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

SCM 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

SCM 491 Science Student Teaching Workshop (1) (CR/NC)

Facilitated discussions of successful pedagogical tools used in secondary science education, laboratory activities geared towards teaching California science standards, and issues facing students pursuing the public school teaching profession. Open to students in a secondary science credential program. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity. Corequisite: EDUC 469 or EDUC 479

SCM 593 Advanced Science Topics for Teachers (1-4) (CR/NC)

Science topics for credentialed and pre-service teachers. Content, hands-on activities geared towards California science standards. Development of inquiry-based lessons and skills for integration of language, literacy and technology into the science curriculum. The Schedule of Classes will list topic selected. Total credit limited to 12 units; repeatable same term. 1-4 seminars. Prerequisite: Multiple Subject or Single Subject teaching credential or consent of instructor.

SOC–SOCIOLOGY**SOC 110 Comparative Societies (4)****GE D3**

Introduction to sociological theory and methods, emphasizing a comparative analysis of social institutions of contemporary societies in major world regions, including the family, religion, politics, and the economy. Direct comparisons made between American social institutions and those of other societies, their histories, social problems and social change. 4 lectures. Fulfills GE D3.

SOC 111 Social Problems (4)

An introduction to sociology with an emphasis on problems inherent in selected social institutions. Instruction in social analysis, including theories of social problems, how those problems are studied, and a survey of possible solutions. 4 lectures.

SOC 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.

SOC 218 International Political Economy (4)**GE D2**

Principles of international political economy in their social and cultural context. Sociological perspectives on the historical development of the world system and the current patterns of global inequality. Comparison of the political economy of major nations and their relation to the overall world system. 4 lectures. Fulfills GE D2.

SOC 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

SOC 301 Social Work and Social Welfare Institutions (4)

Introduction to the field of social welfare. Development of social work and social welfare services; major issues in social service policy. Scope and diversity of specific programs in the social services. Analysis of current programs and the recipients of welfare services. 4 lectures. Prerequisite: SOC 110. Recommended: Junior standing.

SOC 305 Social Change and Social Movements (4)

Description and analysis of social change in contemporary societies as they relate to major revolutionary changes historically and in the present. Analysis of

variables producing social change, social movements, and political violence, including terrorism. Impact on society. 4 lectures. Prerequisite: Junior standing, or consent of instructor. Recommended: SOC 110, SOC 111.

SOC 306 Sociology of the Family (4)

Description and analysis of family relationships; role of family in society, effects of society on family economy, structure and change. Other topics include courtship, marriage, parenting, divorce and alternative family forms. 4 lectures. Prerequisite: SOC 110. Recommended: Junior standing.

SOC 309 The World System and Its Problems (4)

Analysis of the historical background, structure, and dynamics of the world system; examines such issues as the origins of Third World poverty, colonialism, the changes in the world's dominant economic powers, the fall of communism, the growing economic competition between Europe, North America, and Asia; and possible strategies for the economic development of the Third World. 4 lectures. Prerequisite: SOC 110. Recommended: Junior standing.

SOC 310 Self, Organizations and Society (4)

Analysis of the interactions relating to the development of self. Examination of the reciprocal interactions between biology, personal environment, and society. 4 lectures. Prerequisite: Junior standing or consent of instructor.

SOC 311 Sociology of Gender (4)

Description and analysis of the impact of gender definitions on men and women in society. Special attention is given to the learning process; the creation and perpetuation of gender stereotypes and the way these affect individual life chances and social structure, explored in the areas of work, education, family and abusive relationships. Focus on media presentation of gender and effects of ethnicity and class. 4 lectures. Prerequisite: Junior standing. *Crosslisted as SOC/WGS 311.*

SOC 313 Urban Sociology (4)

Description of the context of urban development; analysis of various forces generating urbanization. Investigation of urban models and spatial relationships; urban processes; and problems. 4 lectures. Prerequisite: SOC 110. Recommended: Junior standing.

SOC 315 Global Race and Ethnic Relations (4)**GE D5**

Diverse structures of unequal relationships among racial and ethnic groups in several countries including the United States. Theories about sources of economic and social discrimination and colonialism. Focus on the concept of ethnicity. Evaluation methods to restructure race and ethnic relations. International case histories. 4 lectures. Prerequisite: Completion of GE Areas A and D3. Recommended: Junior standing. Fulfills GE D5 except for Social Sciences majors.

SOC 316 American Ethnic Minorities (4)**USCP**

Exploration of the issues and problems facing the four major ethnic minorities in American society: Native Americans, Afro-Americans, Hispanics and Asian Americans. Dynamics of intergroup relations focusing on the concepts of ethnocentrism, stereotyping, pluralism and assimilation. Sources and manifestations of economic and social discrimination patterns and how they affect the individual's life course. 4 lectures. Prerequisite: Junior standing. Fulfills USCP.

SOC 323 Social Stratification (4)

Social class and the distribution of income, wealth, status and power in society, with emphasis on contemporary United States; social mobility; race, gender, and ethnic inequalities; political power and the nature of welfare; the nature, causes and solutions to poverty. A comparative perspective also taken with a focus on Japan and Europe. 4 lectures. Prerequisite: Junior standing or consent of instructor.

SOC 326 Sociology of the Life Cycle (4)**GE D5**

Change and continuity of the self through the life course. Impact of aging on the physical, emotional, intellectual and social aspects of well being, and how this knowledge can be applied to enhance the quality of life. 4 lectures. Prerequisite: Completion of GE Areas A and D3. Recommended: Junior standing. Fulfills GE D5 except for Social Sciences majors.

SOC 350 Social Organization of Modern Japan (4)

Social and cultural features of modern Japan. Japanese group processes. Investigation of contemporary Japanese institutions: family, education, mass media, industry, politics, including an overview of popular culture. 4 lectures. Prerequisite: Junior standing or consent of instructor.

SOC 354 Qualitative Research Methods (4)

Qualitative data collection for social research. The relationship among theory research and hypothesis testing. Data collection techniques, including content analysis, face to face interviews, and ethnographic methods. 3 lectures, 1 activity. Prerequisite: STAT 217 or STAT 221 with a C- or better and two sociology courses, or consent of instructor.

SOC 355 Quantitative Research Methods (4)

The basics of how to do quantitative social research. Includes topics on data collection techniques such as surveys, experiments, and the use of existing data. Also includes topics on univariate, bivariate, and multivariate analysis and the use of SPSS for data analysis. 3 lectures, 1 activity. Prerequisite: STAT 221 or STAT 217. Junior standing.

SOC 377 Sociology of Religion (4)**GE D5**

Religion from a sociological perspective. Topics may include the nature of religious experience, the role of religion in politics, economics, and social change, and the role that social forces have in influencing religious beliefs and practices. 4 lectures. Prerequisite: Junior standing; completion of GE Area A, and two courses from two categories in Area D. Fulfills GE D5 except for Social Sciences majors.

SOC 395 Sociology of Complex Organizations (4)

Bureaucracies and informal organizations from a sociological perspective. Organizational networks within and between organizations, relationship between organizations and their environment, and organizational socialization and career patterns, and gender and race or ethnic differences in organizational patterns. 4 lectures. Prerequisite: Junior standing or consent of instructor.

SOC 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.

SOC 402 Crime and Violence (4)

Criminal behavior of individuals and groups; special categories include drug use, sex offenders, property crime, syndicated crime, interpersonal violence, and white-collar criminality. Legal definitions of crime and their implications, theories of causation, the sources of criminological data, and possible responses to the problems posed by criminal behavior. 4 lectures. Prerequisite: Junior standing or consent of instructor.

SOC 406 Juvenile Delinquency (4)

Sociological examination of juvenile delinquency as a social and legal concept, covering the nature, volume and social distribution of juvenile crime; the formal structure of juvenile justice; and how justice for juveniles is applied in practice. 4 lectures. Prerequisite: One course in sociology.

SOC 412 Criminal Justice (4)

Approaches to the control and rehabilitation of adult and juvenile offenders; philosophy of treatment strategies; history and analysis of probation, imprisonment, parole and preventive programs. 4 lectures. Prerequisite: Junior standing or consent of instructor.

SOC 413 Methods of Social Work (4)

Skills, values and knowledge emphasized in social work. The generic perspective. Methods in social case work, group work, community organization, and social action. Alternative models. Settings of social work practice. Discussion of case material and professional literature. Case work management. Traditional and innovative therapy techniques. 4 seminars. Prerequisite: SOC 301 and junior standing.

SOC 421 Social Theory (4)

Concepts and theories in sociology. Development and history of social theory in the classical period. Development of the predominant perspectives in sociology: positivist/functionalist, conflict, symbolic interactionist. Importance of theories for understanding of present social arrangements and problems. 4 lectures. Prerequisite: SOC 111 or consent of instructor.

SOC 422 Contemporary Social Theory (4)

Concepts and theories in sociology. Paradigms and sociology of knowledge. Modern perspectives. Importance of theories for understanding of present social arrangements and problems. 4 lectures. Prerequisite: SOC 421 or consent of instructor.

SOC 431 Population, Migration and the Environment (4)

Description and analysis of basic population processes including fertility, mortality, and migration and the environment. Emphasis on understanding the

significance of today's growth rates for the future, especially in relationship to resources and standards of living. 4 lectures. Prerequisite: SOC 111 or consent of instructor.

SOC 440 Internship (4-8) (CR/NC)

Supervised training, research, and work in public and private organizations. Credit/No Credit grading only. Total credit limited to 18 units. Prerequisite: Senior standing and/or consent of instructor.

SOC 461, 462 Senior Project I, II (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing or consent of instructor.

SOC 470 Selected Advanced Topics in Sociology (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

SOCS-SOCIAL SCIENCES**SOCS 200 Special Problems for Undergraduates (1-4)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

SOCS 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

SOCS 440 Internship (4-8) (CR/NC)

Supervised training, research, and work in public and private organizations. Credit/No Credit grading only. Total credit limited to 18 units. Prerequisite: Senior standing and/or consent of instructor.

SOCS 461, 462 Senior Project I, II (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing or consent of instructor.

SOCS 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 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. Major credit limited to 4 units; total credit limited to 12 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. Major credit limited to 4 units; total credit limited to 24 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. Major credit limited to 4 units; total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

SPAN–SPANISH

SPAN 101, 102, 103 Elementary Spanish I, II, III (4) (4) (4)

For beginners. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and basic conversation using the communicative approach. Laboratory drill required. Language taught in its cultural context. Credit not available for students who have completed SPAN 104 or SPAN 111. To be taken in numerical sequence. 3 lectures, 1 activity. **SPAN 102** prerequisite: SPAN 101 or appropriate score on placement exam or consent of instructor. **SPAN 103** prerequisite: SPAN 102 or appropriate score on placement exam or consent of instructor.

SPAN 104 Intensive Elementary Spanish (12)

Class practice in pronunciation, syntax, reading, writing, and conversation. Offered in summer only. Laboratory drill required. Not open to students who have credit in SPAN 101, SPAN 102 and/or SPAN 103. 9 lectures, 3 activities.

SPAN 111 Elementary Hispanic Language and Culture (4) USCP

Inductive Spanish grammar with special focus on vocabulary and culture from American agribusiness and the Hispanic cultures of the United States and Latin America. Not open to students who have credit in SPAN 101. 3 lectures, 1 activity. Fulfills USCP.

SPAN 121, 122 Fundamentals of Spanish I, II (4) (4)

Review of Spanish grammar and practice in writing and oral expression within a cultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

SPAN 121 prerequisite: SPAN 103 or appropriate score on placement exam or consent of instructor. **SPAN 122** prerequisite: SPAN 121 or appropriate score on placement exam or consent of instructor.

SPAN 123 Spanish for Heritage Speakers (4) USCP

Focus on the grammatical, cultural and linguistic needs of Spanish speakers in the United States who have not had formal study of the language. Emphasis on morphological, lexical and cultural understanding of the Spanish language. Designed to prepare students for upper-division Spanish coursework in language and culture. Students with credit in SPAN 122 cannot take SPAN 123. 3 lectures, 1 activity. Prerequisite: SPAN 121, placement exam or consent of instructor. Fulfills USCP.

SPAN 124 Composition in Spanish (4)

Practice of essay writing in Spanish with particular attention to the process of writing. Analysis of word usage, sentence development and structure, and review of grammar, spelling and accentuation. Practice in writing descriptions, narration, reports, opinions and expositions. 3 lectures, 1 activity. Prerequisite: SPAN 122 or SPAN 123 or appropriate score on placement exam or consent of instructor.

SPAN 125 Intensive Fundamentals of Spanish (8)

Review of grammar and practice in written and oral expression based on social and cultural values. 6 lectures, 2 activities. Prerequisite: SPAN 103 or SPAN 104 or permission of instructor.

SPAN 205 Introduction to Spanish Linguistics (4)

Introduction to the scientific study of the Spanish language with an overview of theoretical and applied linguistics and special emphasis on Spanish phonetics and phonology. 3 lectures, 1 activity. Prerequisite: SPAN 124.

SPAN 233 Introduction to Hispanic Readings (4) GE C1

Selected readings from major Hispanic authors that show the Hispanic literary tradition from the Middle Ages to the present in Spain, Latin America, and of Latino(a) writers in the United States. 4 lectures. Prerequisite: Completion of GE Area A, and SPAN 124. Fulfills GE C1.

SPAN 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

SPAN 301 Advanced Composition in Spanish (4)

Oral and written development of structural grammar, syntax, and complex components of Spanish. Vocabulary expansion and idiomatic construction. Written composition. Translations to examine linguistic and semantic differences. 4 lectures. Prerequisite: SPAN 124.

SPAN 302 Advanced Conversation and Composition in Spanish (4)

Formal discussion and writing of selected cultural ideas from the Spanish-speaking world. Focus on individual and group presentations and in-class writing and speaking assignments that assist students in acquiring enhanced

vocabulary and ability to use critical thinking skills in Spanish. Taught in Spanish. 3 lectures, 1 activity. Prerequisite: SPAN 124.

SPAN 303 Introduction to English-Spanish Translation (4)

Developing basic knowledge, skills, theories and techniques required for translation both from Spanish to English and from English to Spanish. Translating news articles, legal documents, commercial advertisements, formal letters, and literary works. Conducted in Spanish. 4 lectures. Prerequisite: Completion of GE Area A, and SPAN 205 or SPAN 301 or SPAN 302, or consent of instructor.

SPAN 305 Significant Writers in Spanish (4) GE C4

Critical analysis and oral discussion of poetry, essays, novels and plays by selected Hispanic writers. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Area A and SPAN 233. Recommended: Junior standing. Fulfills GE C4 except for Modern Languages and Literatures majors.

SPAN 340 Chicano/a Authors (4) GE C4 USCP

Introduction to Chicano/a literary accomplishments to facilitate appreciation of Chicano/a literary aesthetics and increase understanding of Chicano/a cultural values and lifestyles. 4 lectures. Prerequisite: Completion of GE Area A and SPAN 233. Recommended: Junior standing. Fulfills GE C4 except for Modern Languages and Literatures majors. Fulfills USCP.

SPAN 350 Hispanic Literature in English Translation (4) GE C4

Selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding Hispanic writers. Lecture in English. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Area A and SPAN 233. Recommended: Junior standing. Fulfills GE C4 except for Modern Languages and Literatures majors.

SPAN 351 Latino/a Writers in the United States (4) GE C4 USCP

Analysis and exploration of the major themes of Latino(a) literature in the United States today. Emphasis on Chicano(a), Puerto Rican, Cuban American and other Caribbean writers. Focus on novel writers who are not as well known or read in traditional Latino(a) courses. All readings and discussions in English. 4 lectures. Prerequisite: Completion of GE Area A, one course in Area C. Recommended: Junior standing. Fulfills GE C4 except for Modern Languages and Literatures majors. Fulfills USCP.

SPAN 390 Introduction to Creative Writing in Spanish (4)

Directed practice with writing narrative, poetry and/or drama writing in Spanish. An examination of plot, character and theme development. Crafting of creative literature for potential publication. Conducted in Spanish. 4 lectures. Prerequisite: SPAN 301; junior standing or consent of instructor.

SPAN 402 Advanced Linguistics in Spanish (4)

The more relevant aspects of Spanish linguistics today. Topics may include morphology, semantics, syntax, phonetics, phonology, theoretical linguistics, history of the language, and teaching methodology and applied linguistics in Spanish. Conducted completely in Spanish. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: SPAN 205.

SPAN 410 Advanced Literature in Spanish (4)

In-depth study of literature in Spanish. Specific genre, literary period, authorial group, or country. Chicano(a)/Latino(a) literature, Latin American literature, and Spanish literature. Conducted in Spanish. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: SPAN 233 or consent of instructor.

SPAN 416 Don Quixote (4)

Intensive reading of Cervantes' novel, *Don Quixote* (Part 1, 1605 and Part 2, 1615) in the context of Cervantes' life and the history and social context of Spanish renaissance and baroque culture. Course taught in Spanish. 4 lectures. Prerequisite: SPAN 233 or equivalent, or consent of instructor.

SPAN 470 Selected Advanced Topics (4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Consent of instructor.

SS–SOIL SCIENCE

SS 110 Orientation in Earth and Soil Sciences (1) (CR/NC)

Understanding the depth and breadth of earth and soil sciences. Examine potential career opportunities. Introduction to both student and professional organizations. Credit/No Credit grading only. 1 activity. *Crosslisted as ERSC/SS 110.*

SS 121 Introductory Soil Science (4)

GE B5

Biological, chemical, physical and genetic properties of soils. Application of scientific principles to solving land use, water management, and soil conservation problems. Interpretation of soils data for making environmental decisions, applying management practices, and sustainable food production. 3 lectures, 1 laboratory. Prerequisite: College chemistry and passing score on ELM examination, or an ELM exemption, or credit in MATH 104. Fulfills GE B5.

SS 131 Soils in Environmental and Agricultural Systems (4)

Soils' ecological functions; soil and the water cycle; soil in production of food, fiber, and forest materials; techniques and reports of soil analyses with agricultural and environmental applications; soil quality; introductory overview of soils and civilizations. Not open to students with credit in SS 121. 3 lectures, 1 activity.

SS 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 12 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor. *Crosslisted as ERSC/SS 200.*

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 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 lectures. Prerequisite: Consent of instructor. *Crosslisted as ERSC/SS 270.*

SS 301 Earth Sciences/Soils Science Practicum (1-2) (CR/NC)

Supervised practice in technical, educational, professional, and operational applications related to earth sciences or soil science. Students participate in faculty-supervised group or individual activities that support educational and professional goals. Credit/No Credit grading only. Total credit limited to 12 units. 1-2 activities. Prerequisite: SS 110 or SS 121. *Crosslisted as ERSC/SS 301.*

SS 310 Urban Soils (4)

Management and manipulation of soils in urban environments. Measurement and interpretation of morphological, physical and chemical properties. Selection and treatment of soil materials for interior and exterior plantings. 3 lectures, 1 laboratory. Prerequisite: SS 121.

SS 321 Soil Morphology (4)

Identification of soil morphological and site properties. Correlation of soil physical and chemical properties with soil taxonomy and land use. Techniques of interpretations for agriculture, forest lands, wetlands, range lands and urban development. 3 lectures, 1 laboratory. Prerequisite: SS 121.

SS 322 Soil Plant Relationships (4)

Investigation and evaluation of the nutrient supplying ability of soils. Conditions and transformations involved in the transfer of mineral nutrients from soils to plants. Effects of cultural treatments on soil fertility. Diagnostic techniques and data interpretation in soil and plant analysis. 3 lectures, 1 laboratory. Prerequisite: SS 221, CHEM 111 or CHEM 128.

SS 339 Earth Sciences/Soil Science Internship (1–12) (CR/NC)

Selected students will spend up to 12 weeks with an approved firm or agency engaged in work and study related to their major. A detailed written proposal and written interim and final reports required. One unit of credit may be allowed for each full week of internship. Credit/No Credit grading. Prerequisite: Consent of instructor. *Crosslisted as ERSC/SS 339.*

SS 345 Soil Interpretations and Management (4)

Calculate, graph, and interpret physical, chemical, and microbiological data from soils and reports. Apply laboratory results to field conditions. Debate efficacy of soil management and environmental practices considering social, economic and political implications of soil science. 2 lectures, 2 activities.

Prerequisite: SS 121, CHEM 129, MATH 119 or MATH 141, PHYS 121 or PHYS 131, or consent of instructor.

SS 400 Special Problems for Advanced Undergraduates (2–4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 12 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor. *Crosslisted as ERSC/SS 400.*

SS 421 Wetlands (4)

The formation, characteristics, and functions of wetlands. Genesis of hydric soils. Plant adaptations to saturated soils. Wetlands as wildlife habitat. Policies and social issues associated with wetlands. The procedures of wetland delineations. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or BIO 162, CHEM 111 or CHEM 127, and SS 121 or SS 131. Recommended: BOT 313, NR 306 or BIO 325. *Crosslisted as BIO/NR/SS 421.*

SS 422 Soil Microbiology and Biochemistry (4)

Biochemical activities, ecology and environmental implications of soil organisms. Effects on the formation, characteristics, and productivity of soils. Methods of studying soil organisms. 3 lectures, 1 laboratory. Prerequisite: SS 221, CHEM 313, or consent of instructor.

SS 423 Soil and Water Chemistry (5)

Chemical processes governing weathering, soil mineral formation and stability, common solubility equilibria. Use of chemical principles to explain surface chemical properties of soils and environmental problems in water and soil chemical systems. Preparation of professional quality reports based on laboratory data and library research. 3 lectures, 1 laboratory, 1 activity. Prerequisite: ERSC 223, CHEM 129, CHEM 212/312 or CHEM 216/316, MATH 118 or MATH 141.

SS 431 Soil Resource Inventory (4)

Development and production of soil surveys for interpretive purposes. Use of soil taxonomy and land classification systems to evaluate land for best management practices. 2 lectures, 2 laboratories. Prerequisite: ERSC 223, SS 321.

SS 432 Soil Physics (5)

Matter and energy in soils, with emphasis on properties and behavior of solids, water, air, and heat. Applications to agriculture, forestry, range management, engineering, and environmental sciences. Preparation of professional reports based on laboratory data and library research. 3 lectures, 1 laboratory, 1 activity. Prerequisite: SS 121, PHYS 121 or PHYS 141, CHEM 128, MATH 118 or MATH 141, or consent of instructor.

SS 433 Land Use Planning (3)

Development of plans and practices for management of agricultural, recreational and urban land use by evaluating the soil capabilities through the use of Soil Survey Reports. 2 lectures, 1 laboratory. Prerequisite: SS 121.

SS 440 Forest and Range Soils (4)

Ecosystem approach to chemical, biological, physical and mechanical properties of forest and range soils. Site quality, nutrient cycling, erosion and mass movement, fire effects. Preparation of soil management reports similar to those required by various land management organizations. Overnight field trips. 3 lectures, 1 laboratory. Prerequisite: SS 121, SS 321 or consent of instructor.

SS 442 Soil Vadose Zone Remediation (4)

Redox transformations and removal or immobilization of inorganic pollutants. Microbial degradation and elimination of organic contaminants. Monitoring and predicting management strategies for vadose zone enhancement. Reclamation of disturbed lands. 3 lectures, 1 activity. Prerequisite: CHEM 212/312 or CHEM 216/316, GEOL 201, SS 121 or consent of instructor.

SS 444 Soil Judging (2)

Morphological description of soils in the field. Taxonomic determination of classifications and interpretive properties from soil descriptions. Participation in collegiate soil judging contests. Total credit limited to 12 units. 1 lecture, 1 laboratory. Prerequisite: SS 321 or consent of instructor.

SS 453 Tropical Soils (4)

Nature and properties of soils occurring in the tropics, their origin, morphology, classification, fertility, management and conservation. Examination of social implications in international agriculture. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 111 or CHEM 128.

SS 461 Senior Project I (1)

Senior project topic selection and contract development with project advisor. Statement of problems, subproblems, assumptions, objectives, hypothesis, methods of analysis and statistical design. Development of literature review and

budget of time and finances. Proper format and presentation of tabular and graphic information. 1 activity. Prerequisite: MATH 118 or MATH 141, STAT 218 or CRSC 411.

SS 462 Senior Project II (3)

Implementation of materials and methods. Collection, analysis and interpretation of data. Completion of formal written report under advisor supervision. Minimum 90 hours. Prerequisite: SS 461.

SS 463 Undergraduate 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. Prerequisite: SS 461.

SS 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 lectures. Prerequisite: Consent of instructor. *Crosslisted as ERSC/SS 470.*

SS 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor. *Crosslisted as ERSC/SS 471.*

SS 500 Individual Study in Soil Science (1–6)

Advanced independent study planned and completed under the direction of a member of the Earth and Soil Sciences faculty. Total credit limited to 6 units. Prerequisite: Consent of instructor.

SS 501 Research Planning (4)

Problem solving and research planning for agriculture, natural resources and related sciences. Preparation of study plans that identify problems, review appropriate literature, formulate objectives, develop methods and provide for presentation and interpretation of results. Oral reports. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

SS 508 Environmental Assessment for Erosion Control (3)

Assessment techniques for the development of soil erosion control and the dispersal of surface runoff water on urban, agriculture, riparian, and rangelands. Development of a water quality management plan for a specific land use. 3 lectures. Prerequisite: SS 121 or equivalent 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 570 Selected Topics in Soil Science (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

SS 571 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1–4 laboratories. Prerequisite: Graduate standing or consent of instructor.

SS 581 Graduate Seminar in Soils (3)

Current research, experiments and problems related to soil science. Total credit limited to 3 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

SS 582 GIS in Advanced Land Management (3)

Development of plans and practices for the management of crop, range, urban and wood land. 2 seminars, 1 laboratory. Prerequisite: Graduate standing, NR/LA 318, or consent of instructor.

SS 599 Thesis (1–6)

Individual research in soil science under faculty supervision, leading to a scholarly written presentation exhibiting originality, clarity, critical and

independent thinking, proper analysis of data, appropriate organization and format, and accurate and thorough documentation. Six units required for the M.S. degree. Prerequisite: Graduate standing and consent of instructor.

STAT–STATISTICS

STAT 130 Introduction to Statistical Reasoning (4) GE B1

Survey of statistical ideas and philosophy. Emphasis on concepts rather than in-depth coverage of statistical methods. Topics include sampling, experimentation, data exploration, chance phenomena, and methods of statistical inference. Credit not allowed for students with a previous statistics course. 4 lectures. Prerequisite: Passing score on the ELM examination, or an ELM exemption, or credit in MATH 104. Fulfills GE B1.

STAT 150 Introduction to Statistical Investigations (4)

Orientation to the statistics program. Introduction to the discipline of statistics and the nature of statistical reasoning. Design of surveys and experiments, graphical and numerical summaries, statistical models, and interpretation of results. Development of discussion, writing, presentation, and evaluation skills. 4 lectures. Prerequisite: Freshman statistics major.

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 chair.

STAT 217 Introduction to Statistical Concepts and Methods (4) GE B1

Sampling and experimentation, descriptive statistics, confidence intervals, two-sample hypothesis tests for means and proportions, Chi-square tests, linear and multiple regression, analysis of variance. Substantial use of statistical software. Not open to students with credit in STAT 218 or STAT 221 or STAT 251. 4 lectures. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104. Fulfills GE B1.

STAT 218 Applied Statistics for the Life Sciences (4) GE B1

Data collection and experimental design, descriptive statistics, confidence intervals, parametric and non parametric one and two-sample hypothesis tests, analysis of variance, correlation, simple linear regression, chi-square tests, relative risk and odds. Applications of statistics to the life sciences. Substantial use of statistical software. Not open to students with credit in STAT 217 or STAT 221 or STAT 251. 4 lectures. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104. Fulfills GE B1.

STAT 221 Introduction to Probability and Statistics (5) GE B1

Data classification, descriptive statistics, elementary probability. Binomial and normal distributions. Random sampling, confidence intervals and hypothesis testing on common parameters. Introduction to regression and correlation, analysis of variance, contingency table analysis. Substantial use of statistical software. Not open to students with credit in STAT 217, STAT 218, STAT 252, STAT 302, or STAT 312. 5 lectures. Prerequisite: Passing score on ELM examination, or an ELM exemption, or credit in MATH 104. Fulfills GE B1.

STAT 251 Statistical Inference for Management I (4) GE B1

Descriptive statistics. Probability and counting rules. Random variables and probability distributions. Sampling distributions and point estimation. Confidence intervals and tests of hypotheses for a single mean and proportion. 4 lectures. Not open to students with credit in STAT 221. Prerequisite: Completion of the ELM requirement and a passing score on appropriate Mathematics Placement Examination for MATH 221 eligibility, or MATH 118 or equivalent. Fulfills GE B1.

STAT 252 Statistical Inference for Management II (5) GE B1

Confidence intervals and tests of hypotheses for two means and two proportions. Introduction to ANOVA, regression, correlation, multiple regression, time series, and forecasting. Statistical quality control. Enumerative data analysis. Substantial use of statistical software. 5 lectures. Prerequisite: STAT 221 or STAT 251 with a minimum grade of C- or consent of instructor. Fulfills GE B1.

STAT 270 Selected Topics (1–4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

STAT 301 Statistics I (4)

Introduction to statistics for mathematically inclined students, focused on process of statistical investigations. Observational studies, controlled

experiments, randomization, confounding, randomization tests, hypergeometric distribution, descriptive statistics, sampling, bias, binomial distribution, significance tests, confidence intervals, normal model, t -procedures, two-sample procedures. Substantial use of statistical software. 4 lectures. Prerequisite or concurrent: MATH 142.

STAT 302 Statistics II (4)

Continued study of the process, concepts, and methods of statistical investigations. Association, chi-square procedures, one-way ANOVA, multiple comparisons, two-way ANOVA with interaction, simple linear regression, correlation, prediction, multiple regression. Substantial use of statistical software. 4 lectures. Prerequisite: STAT 301.

STAT 312 Statistical Methods for Engineers (4) GE B6

Descriptive and graphical methods. Discrete and continuous probability distributions. One and two sample confidence intervals and hypothesis testing. Single factor analysis of variance. Quality control. Introduction to regression and to experimental design. Substantial use of statistical software. 4 lectures. Prerequisite: MATH 142. Fulfills GE B6.

STAT 313 Applied Experimental Design and Regression Models (4) GE B1

Analysis of variance and regression analysis for students not majoring in statistics or mathematics. Includes one-way classification, randomized blocks, Latin squares, factorial designs, multiple regression, diagnostics, and model comparison. 4 lectures. Prerequisite: STAT 217 or STAT 218 or STAT 221 or STAT 312 or STAT 542. Fulfills GE B1.

STAT 321 Probability and Statistics for Engineers and Scientists (4) GE B6

Tabular and graphical methods for data summary, numerical summary measures, probability concepts and properties, discrete and continuous probability distributions, expected values, statistics and their sampling distributions, point estimation, confidence intervals for a mean and proportion. Use of statistical software. 4 lectures. Prerequisite: MATH 142. Fulfills GE B6.

STAT 323 Design and Analysis of Experiments I (4)

Principles, construction and analysis of experimental designs. Completely randomized, randomized complete block, Latin squares, Graeco Latin squares, factorial, and nested designs. Fixed and random effects, expected mean squares, multiple comparisons, and analysis of covariance. 4 lectures. Prerequisite: STAT 252 or STAT 302 or STAT 312 or STAT 313.

STAT 324 Applied Regression Analysis (4)

Simple linear regression and associated special topics, multiple linear regression, indicator variables, influence diagnostics, assumption analysis, selection of "best subset", nonstandard regression models, logistic regression, nonlinear regression models. 4 lectures. Prerequisite: STAT 252 or STAT 302 or STAT 312 or STAT 313.

STAT 325 Introduction to Probability Models (4)

Introduction to probability and applied probability models. Topics include basic probability rules, counting rules, conditional probability, discrete and continuous random variables, and expectation. Applied models include Poisson processes, Markov chains, and reliability models. Not open to students with credit in STAT 321 or STAT 425. 4 lectures. Prerequisite: MATH 206, and CSC/CPE 101 or CSC 232 or CSC/CPE 235.

STAT 330 Statistical Computing with SAS (4)

Techniques available to the statistician for efficient use of computers to perform statistical computations and to analyze large amounts of data. Use of SAS throughout the course. Includes data preparation, report writing, and basic statistical methods. 4 lectures. Prerequisite: STAT 252 or STAT 302 or STAT 312 or STAT 313 or STAT 322.

STAT 331 Statistical Computing with R (4)

Data acquisition, cleaning, and management; use of regular expressions; functional and object-oriented programming; graphical, descriptive, and inferential statistical methods; random number generation; Monte Carlo methods including resampling, randomization, and simulation. 4 lectures. Prerequisite: STAT 252 or STAT 302 or STAT 312 or STAT 313, and CPE/CSC 101 or CPE/CSC 235 or CPE/CSC 237 or BUS 290, or consent of instructor.

STAT 350 Probability and Random Processes for Engineers (4) GE B6

Random events, random variables, and random processes, with emphasis on probabilistic treatment of signals and noise. Specific topics include: sample spaces, probability, distributions, independence, moments, covariance,

time/ensemble averages, stationarity, common processes, correlation and spectral functions. 4 lectures. Prerequisite: MATH 241, EE 228. Fulfills GE B6.

STAT 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

STAT 416 Statistical Analysis of Time Series (4)

Time series components, descriptive smoothing methods, regression models for time series data, forecasting via exponential smoothing, evaluation of forecasts, autocorrelation, ARIMA models and Box-Jenkins methods, combining forecasts, frequency domain analysis, filtering. 4 lectures. Prerequisite: STAT 324 or STAT 524.

STAT 417 Survival Analysis Methods (4)

Parametric and nonparametric methods for analyzing survival data. Topics include Kaplan-Meier and Nelson-Aalen estimates, Cox regression models, accelerated failure time models. Use of statistical software to implement methods throughout course. 4 lectures. Prerequisite: STAT 302.

STAT 418 Analysis of Cross-Classified Data (4)

Discrete multivariate statistics, including analysis of cross-classified data, log-linear models for multidimensional contingency tables, goodness of fit statistics, measures of association, model selection, and hypothesis testing. 4 lectures. Prerequisite: STAT 324 or STAT 524.

STAT 419 Applied Multivariate Statistics (4)

Continuous multivariate statistics. Multivariate linear model, principal components and factor analysis, discriminant analysis, clustering, and canonical correlation. Use of Minitab and SAS throughout the course. 4 lectures. Prerequisite: Two courses in statistics. Recommended: MATH 206.

STAT 421 Survey Sampling and Methodology (4)

Survey planning, execution, and analysis. Principles of survey research, including non-sampling and sampling error topics. Survey sample designs, including simple random, systematic, stratified, cluster, and multi-stage. Estimation procedures and sample size calculations. 4 lectures. Prerequisite: One of the following: STAT 252, STAT 302, STAT 313, STAT 512, or STAT 513.

STAT 423 Design and Analysis of Experiments II (4)

Continuation of STAT 323. 2^k factorial designs, 3^k factorial designs, balanced and partially balanced incomplete block designs, nested designs, split-plot designs, response surface methodology, confounding, repeated measures, and other design approaches. 4 lectures. Prerequisite: STAT 323 or STAT 523.

STAT 425 Probability Theory (4)

Basic probability theory, combinatorial methods, independence, conditional and marginal probability, probability models for random phenomena, random variables, probability distributions, distributions of functions of random variables, mathematical expectation, covariance and correlation, conditional expectation. 4 lectures. Prerequisite: MATH 241 and MATH 248. Recommended: STAT 301 and STAT 325.

STAT 426 Estimation and Sampling Theory (4)

Continuation of STAT 425. Properties of statistics obtained from samples. Sample mean properties, convergence in probability, law of large numbers, and central limit theorem. Selected probability distributions. Theory of estimation. Sampling distribution of estimators. 4 lectures. Prerequisite: STAT 425. Recommended: STAT 302.

STAT 427 Mathematical Statistics (4)

Continuation of STAT 426. The theory of hypothesis testing and its applications. Power and uniformly most powerful tests. Categorical data and nonparametric methods. Other selected topics. 4 lectures. Prerequisite: STAT 426.

STAT 440 SAS Certification Preparation (2)

Preparation and discussion of programming, data management, and data analysis topics related to the Certified Base Programmer Exam offered by the Statistical Analysis Systems (SAS) Institute. 2 lectures. Prerequisite: STAT 330.

STAT 461, 462 Senior Project I, II (1) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 90 hours total time.

STAT 465 Statistical Communication and Consulting (4)

Blending of the theoretical and practical aspects of statistical consulting. Development of tools necessary to conduct effective consulting sessions, present oral arguments and written reports, work collaboratively to solve problems, and utilize professional publications in statistics. 4 lectures. Prerequisite: Statistics majors with senior standing.

STAT 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Consent of instructor.

STAT 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 12 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. Major credit limited to 12 units; total credit limited to 24 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

STAT 512 Statistical Methods (4)

Statistical methods in research for graduate students not majoring in mathematical sciences. Probability distributions, confidence intervals, hypothesis testing, contingency tables, linear regression and correlation, multiple regression, analysis of variance. Substantial use of statistical software. 4 seminars. Prerequisite: Graduate standing and intermediate algebra or equivalent.

STAT 513 Applied Experimental Design and Regression Models (4)

Applications of statistics for graduate students not majoring in mathematics. Analysis of variance including the one-way classification, randomized blocks, Latin squares, and factorial designs. Introduction to multiple regression and to analysis of covariance. Substantial use of statistical software. 4 lectures. Not open to students with credit in STAT 313. Prerequisite: Graduate standing, and STAT 217 or STAT 218 or STAT 221 or STAT 252 or STAT 312 or STAT 512 or STAT 542.

STAT 523 Design and Analysis of Experiments I (4)

Principles, construction and analysis of experimental designs. Completely randomized, randomized complete block, Latin squares, Graeco-Latin squares, factorial, and nested designs. Fixed and random effects, expected mean squares, multiple comparisons, and analysis of covariance. Not open to students with credit in STAT 323. 4 lectures. Prerequisite: STAT 513 or STAT 542.

STAT 524 Applied Regression Analysis (4)

Simple linear regression and associated special topics, multiple linear regression, indicator variables, influence diagnostics, assumption analysis, selection of best subset, nonstandard regression models, logistic regression, nonlinear regression models. Not open to students with credit in STAT 324. 4 lectures. Prerequisite: STAT 513 or STAT 542.

STAT 530 Statistical Computing with SAS (4)

Techniques available to the statistician for efficient use of computers to perform statistical computations and to analyze large amounts of data. Use of the SAS software system. Includes data preparation, report writing, basic statistical methods, and a research project. Not open to students with credit in STAT 330. 4 lectures. Prerequisite: STAT 512 or STAT 513 or STAT 542.

STAT 531 Statistical Computing with R (4)

Obtain, manage, and clean data; use of regular expressions; functional and object-oriented programming; graphical, descriptive, and inferential statistical methods; random number generation; Monte Carlo methods including resampling, randomization, and simulation. 4 lectures. Not open to students with credit in STAT 331. Prerequisite: Graduate standing, STAT 513 or STAT 542, and one computer programming course; or consent of instructor.

STAT 542 Statistical Methods for Engineers (4)

Descriptive and graphical methods. Discrete and continuous probability distributions. One and two sample confidence intervals and hypothesis testing.

Single factor analysis of variance. Quality control. Introduction to regression and to experimental design. Substantial use of statistical software. 4 lectures. Not open to students with credit in STAT 312. Prerequisite: MATH 142 and graduate standing.

STAT 570 Selected Advanced Topics (1-4)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Graduate standing or consent of instructor.

TH-THEATRE**TH 210 Introduction to Theatre (4)****GE C3**

Principles of theatre and production process, including theatrical terminology, methods, dramatic literature, aesthetics, and technology. 4 lectures. Fulfills GE C3.

TH 220 Acting Methods (4)

Contemporary acting techniques focused on character building, objectives and tactics, with a focus on the development and implementation of various interactive methods of vocal work, images and actor resources. 3 lectures, 1 activity. Prerequisite: TH 210.

TH 227 Theatre History I (4)**GE C3**

Highlights of European theatrical history – Greeks, Romans, Medieval English and French theatre through the 17th century. Production methods, acting styles, playwrighting theories and representative plays. 4 lectures. Fulfills GE C3.

TH 228 Theatre History II (4)**GE C3**

Highlights of European and American theatrical history from the 17th century to contemporary. Production methods, acting styles, playwrighting theories and representative plays. 4 lectures. Fulfills GE C3.

TH 230 Stagecraft I (4)

Basic stagecraft technique used in the entertainment industry. Construction and painting of scenery, building and gathering properties, hanging and focusing lighting instruments, assisting with costumes and acting as running crew for department production each term. May not be taken concurrently with TH 250. 4 laboratories.

TH 240 Improvisational Theatre (4)

Objectives and techniques of improvisational theatre. Participation in a series of exercises designed to develop skills in dramatic structure formatting, interactive problem solving, spontaneous scripting, dynamic communications, and applied performance styles. 2 lectures, 2 activities.

TH 250 Costume Construction (4)

Basic costume construction techniques used in the entertainment industry. Building of all costumes and special craft projects for main stage theatre productions. Total credit limited to 12 units. May not be taken concurrently with TH 230 or TH 330. 4 laboratories.

TH 260 Voice and Diction for the Stage (4)

Theory and practice in developing command of oral techniques for the stage including breath support, resonance and articulation. 4 lectures.

TH 270 Stage Make-Up (4)

Introduction to the art of theatrical make-up design and application. Techniques for producing character, old age, fantasy and special effects make-up. Demonstration and discussion of various design and application styles. 3 lectures, 1 activity.

TH 275 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

TH 280 Movement for the Actor (4)

Directed group study of movement techniques and exercises to facilitate expressive physical performance for the actor. Body effectiveness, alignment and conditioning practice integrated with creative exploration and movement analysis of effort, spatial awareness and detailed body usage. 4 lectures.

TH 290 Script Analysis (4)

Script analysis taught as an essential applied skill for actors, designers and directors. Students read a variety of plays and learn how to examine their structure, theme and context. 4 seminars. Prerequisite: TH 210, TH 227 or TH 228.

TH 295 Foundations in Theatrical Design (4)

Exploration of the fundamental principles and practices of designing for the stage. Emphasis placed upon the creative and collaborative process of theatre; development of the visual world of the play via language, color, drawing, analysis, and peer evaluation. 3 lectures, 1 activity. Prerequisite: TH 210 or consent of instructor.

TH 300 Topics in Diversity on the American Stage (4) USCP

Critical analysis of traditionally underrepresented groups in the American theatre – as writers, practitioners, story subjects. Investigation of dramatic literature and performance trends related to special interest topics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Areas A and C3 (TH 210 recommended). For Theatre majors: TH 210, TH 227, or TH 228. Recommended: Junior standing. Fulfills USCP.

TH 310 Women's Theatre (4) GE C4 USCP

Examination of a variety of female theatre artists from the Greeks to the present and the socio-political contexts from which they emerged. Analysis of a variety of classic and contemporary playscripts emphasizing evolving visions of women. 4 lectures. Prerequisite: Completion of GE Areas A and C3 (TH 210 recommended). For Theatre majors: TH 210, TH 227, or TH 228. Recommended: Junior standing. Fulfills GE C4 except for Theatre Arts majors. Fulfills USCP.

TH 320 Black Theatre (4) GE C4 USCP

African-American theatre artists from the 17th-20th century, and the socio-political contexts from which they emerged. Particular emphasis on 20th century African-American plays and playwrights: Hansberry, Baldwin, Shange, Baraka, Gordone, and Wilson. 4 lectures. Prerequisite: Completion of GE Areas A and C3 (TH 210 recommended). For Theatre majors: TH 210, TH 227, or TH 228. Recommended: Junior standing. Fulfills GE C4 except for Theatre Arts majors. Fulfills USCP.

TH 330 Stagecraft II (4)

Basic stagecraft technique used in the entertainment industry. Students construct and paint scenery, build and gather properties, hang and focus lighting instruments, assist on costumes and act as running crew for department production each term. Total credit limited to 8 units. May not be taken concurrently with TH 250. 4 laboratories. Prerequisite: Junior standing.

TH 341 Advanced Acting Studio (4)

Selected acting techniques with focus on specific advanced modes of training. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures, 1 activity. Prerequisite: TH 210 and TH 220 or consent of instructor.

TH 345 Rehearsal and Performance (4)

Preparation of a play for public presentation, including acting, stage management, publicity, or serving as a key member of the artistic team. Total credit limited to 12 units. Major credit limited to 4 units; repeated units are free electives. 4 laboratories. Prerequisite: By audition only.

TH 350 Seminar in Playwriting (4)

Examines dramatic structure, techniques of dialogue, and means of characterization in variety of plays. Relates dramatic writing to technical, design, directorial and acting demands. Compositions of monologues, scenes and one-act play; works read and critiqued in class. 4 seminars. Prerequisite: TH 210, completion of GE Area A.

TH 360 Theatre in the United States (4) GE C4

Examination of American plays, playwrights, organizations and movements, applying them as portraits of the United States' historical, philosophical and cultural make-up. Topical emphasis focuses on the definition and development of an "American" identity via the context of theatre. 4 lectures. Prerequisite: Completion of GE Areas A and C3 (TH 210 recommended). For Theatre majors: TH 210, TH 227, or TH 228. Recommended: Junior standing. Fulfills GE C4 except for Theatre majors.

TH 370 Costume History (4)

Dress worn in Western society from Ancient Egypt through AD 2000. Silhouette; how, when, and why particular garments were worn; emphasis on social, political, and economic context. 4 lectures. Prerequisite: TH 210 or consent of instructor.

TH 380 Children's Drama (4)

Techniques for teaching theatre performance skills to children. Creation of small group seminar performance projects that are performed before an audience of elementary school children. 3 lectures, 1 activity. Prerequisite: TH

210 or upper-division Liberal Studies, Child Development or Psychology course.

TH 390 Global Theatre and Performance (4) GE C4

Investigation of non-western/underrepresented theatre and dramatic performance; emphasis on plays, playwrights, and movements as portraits of philosophical/national make-up. Topical emphasis focuses on the definition and development of a cultural identity via the context of historical and contemporary theatre practices. 4 lectures. Prerequisite: Completion of GE Areas A and C3 (TH 210 recommended). For Theatre majors: TH 210, TH 227, or TH 228. Recommended: Junior standing. Fulfills GE C4 except for Theatre majors.

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 Scenic Design (4)

Scenic design process used in the entertainment industry, including collaboration, concept development, research, sketching, drafting, color rendering using a variety of media, 3D model building, and the presentation of design material. 3 lectures, 1 activity. Prerequisite: TH 290 and TH 295 or consent of instructor.

TH 432 Costume Design (4)

Costume design process used in the entertainment industry, including collaboration, concept development, research, sketching, color rendering using a variety of media, and the presentation of design material. 3 lectures, 1 activity. Prerequisite: TH 290 and TH 295 or consent of instructor.

TH 434 Lighting Design (4)

Lighting design process used in the entertainment industry, including collaboration, concept development, research, functional aspects of lighting equipment, CAD drafting, the development of production paperwork and presentation of design material. 3 lectures, 1 activity. Prerequisite: TH 290 and TH 295 or consent of instructor.

TH 450 Directing (4)

Principles, philosophies, analytical methods, business practices, organizational techniques and interpersonal strategies of directing for the stage. Experiential work includes hands-on, in-class exercises, as well as intensive outside class rehearsals. Culmination in a public production of student-directed one-act plays. 3 lectures, 1 activity. Prerequisite: TH 290 and consent of instructor.

TH 461 Senior Project Seminar (4)

Focus on post-graduate career planning options in theatre arts, including resume and portfolio building, preparation for professional work, graduate school and internships. A structure by which students design and submit their senior projects. 4 seminars. Prerequisite: Senior standing. Theatre majors only or consent of instructor.

TH 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

TH 471 Selected Advanced Laboratory (1–4)

Directed group laboratory study of selected topics for theatre students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1–4 laboratories. Prerequisite: Consent of instructor.

TH 480 Internship (4) (CR/NC)

Part-time work experience in the entertainment industry. Ability to work independently; strong verbal and written skills. Faculty approval of job position required. Evaluations by job supervisor and written reports by student required. 120 hours of work experience. Total credit limited to 8 units. Credit/No Credit grading. Prerequisite: Junior standing with a minimum 3.0 GPA and consent of instructor.

UNIV–UNIVERSITY STUDIES**UNIV 125 First Year Seminar (2) (CR/NC)**

Issues associated with the successful transition from high school or community college to Cal Poly. Links fostered between student needs and campus resources. Coverage of academic policies and procedures, university study

skills, goal setting, career planning, wellness and other topics relevant to student success. Credit/No Credit grading only. 1 lecture, 1 activity.

UNIV 321 Undergraduate Research Methods and Practice (4)

Research methods and tools for sciences and humanities, including formulating a research question, designing a study, using the scientific method to conduct and analyze surveys, and analyzing data. Emphasis on working in interdisciplinary research teams. Total credit limited to 8 units. 2 lectures, 2 activities. Prerequisite: Completion of GE Areas A and B1, and consent of instructor. *Crosslisted as HNRS/UNIV 321.*

UNIV 330 Cal Poly Land: Nature, Technology and Society (4) GE Area F

Scientific investigation of the natural features of the Cal Poly landscape and their transformations by land management technology. Analysis of the environmental, economic, social, and political effects of agriculture, resource extraction, and construction technology on that landscape. Emphasis on the educational, land-use, and long term planning issues of technology presented by this case study. 4 lectures. Prerequisite: Junior standing and completion of GE Areas A and B. *Crosslisted as AG/HUM/UNIV 330.* Fulfills GE Area F.

UNIV 333 World Food Systems (4) GE Area F

Integrated, interdisciplinary study of the technologies of global food production, environmental, and social issues related to the application of those technologies, and moral and ethical issues associated with global food production and distribution. Emphasis on the politics of change. 4 lectures. Prerequisite: Junior standing and completion of Area B. *Crosslisted as POLS/UNIV 333.* Fulfills GE Area F.

UNIV 339 Disaster-Resistant Sustainable Communities (4) GE Area F

Creation of safer, more resilient cities through systematic application of urban disaster risk reduction methods that utilize the technology of GIS combined with principles from the engineering and geo-sciences. Emphasis on hazard identification and methods to lower disaster risk. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Area B. Fulfills GE Area F.

UNIV 350 The Global Environment (4) GE Area F

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Areas A and B. *Crosslisted as AG/BUS/EDES/ENGR/HUM/SCM/UNIV 350.* Fulfills GE Area F.

UNIV 361 Modernism (4) GE C4

Interdisciplinary survey of the eighteenth, nineteenth and twentieth-century concepts and cultural movements known as modernism throughout Europe, North America and Latin America. Disciplines may include architecture, art, drama, literature, music, philosophy, and photography. 4 lectures. Prerequisite: Completion of GE Area A and one class from Area C. Recommended: Junior standing. *Crosslisted as HUM/UNIV 361.* Fulfills GE C4.

UNIV 391 Appropriate Technology for the World's People: Development (4) GE D5

A broad overview of international development and appropriate design for sustainability. Besides traditional classroom work, students work in teams to address problems with technical solutions. Collaboration with mentors from the university, private sector, and nonprofits serves to provide diverse background and project mentorship. 4 lectures. Prerequisite: Junior standing; completion of GE Area A, two courses from GE D1-D4 and consent of instructor. *Crosslisted as HNRS/UNIV 391.* Fulfills GE D5.

UNIV 392 Appropriate Technology for the World's People: Design (4) GE Area F

Addresses the needs of international impoverished communities with technological solutions, which are inexpensive, ecologically sustainable, and socially appropriate. Group study of target communities, and design and construction of an appropriate technology prototype. Not open to students with credit in UNIV 492. 3 lectures, 1 laboratory. Prerequisite: Junior standing and completion of GE Area B, or graduate standing. Recommended: UNIV 391, GE Area D2, and GE Area D3. *Crosslisted as HNRS/UNIV 392.* Fulfills GE Area F.

UNIV 424 Design of Museum Displays on Science, Engineering, and Technology (4)

The design and creation of educational museum displays that highlight science, engineering, and technology. Projects done by multidisciplinary teams and for clients in the community. Emphasis on design, teamwork, service learning and

project management. 3 lectures, 1 laboratory. Prerequisite: GE Area B. *Crosslisted as HNRS/UNIV 424.*

UNIV 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

UNIV 491 Appropriate Technology for the World's People: Development (4)

A broad overview of international development and appropriate design for sustainability. Besides traditional classroom work, students work in teams to address problems with technical solutions. Collaboration with mentors from the university, private sector, and nonprofits serves to provide diverse background and mentorship. Seminar paper required. Not open to students with credit in UNIV/HNRS 391. 4 lectures. Prerequisite: Consent of instructor, and senior or graduate standing. Corequisite: GE Area D5.

UNIV 492 Appropriate Technology for the World's People: Design (4)

Addresses the needs of international impoverished communities with technological solutions, which are inexpensive, ecologically sustainable, and socially appropriate. Group study of target communities, and design and construction of an appropriate technology prototype. Seminar paper required. Not open to students with credit in UNIV/HNRS 392. 3 lectures, 1 laboratory. Prerequisite: Junior standing and completion of GE Area B, or graduate standing. Recommended: UNIV 391, GE Area D2, and GE Area D3.

VGSC-VEGETABLE SCIENCE

VGSC 190 California Vegetable Production (4)

History, botany, growth characteristics and climatic adaptation, pests, and harvesting methods for the most important vegetable crops grown in California. Use of transplants, plastic mulches and row covers in vegetable production. Current topics in agriculture important to the vegetable industry. Field trip to a major California vegetable production area required. Survey of vegetable production for Agricultural and Environmental Plant Sciences majors or Crop Science majors. 3 lectures, 1 laboratory. Prerequisite: HCS 120.

VGSC 202 Enterprise Project (2) (CR/NC)

Beginning field experience in production and marketing of a vegetable crop, under faculty supervision. Project participation is subject to approval by the department head and the Cal Poly Corporation. Degree credit limited to 4 units. Credit/No Credit grading only. 1 lecture and 1 unit of independent study. Prerequisite: HCS 110, or consent of instructor.

VGSC 230 Introduction to Vegetable Science (4)

Environmental and cultural principles involved in the production of California vegetable crops; temperature, daylength and fertility effects on production and yield, use of plastic mulches and row covers, and use of transplants. Harvest principles and precooling methods. Not open to Agricultural and Environmental Plant Science majors, Crop Science majors, nor students with credit in VGSC 190. 3 lectures, 1 laboratory.

VGSC 402 Enterprise Project Management (2) (CR/NC)

Advanced experience in the production of vegetable crops. Development of a plan for field operations, a marketing plan, and a budget. Management decision-making. Degree credit limited to 4 units. Credit/No Credit grading only. 1 lecture and 1 unit of independent study. Prerequisite: VGSC 202 and consent of instructor.

VGSC 423 Advanced Vegetable Science (4)

Agricultural land conservation; current laws impacting vegetable production and marketing. Environmental and cultural effects on selected vegetables including specific effects on growth, flowering, fruiting and yield. Field trip to desert vegetable production regions required. 3 lectures, 1 laboratory. Prerequisite: VGSC 190 or VGSC 230.

WGS-WOMEN'S and GENDER STUDIES

WGS 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

WGS 301 Introduction to Women's and Gender Studies (4) GE D5 USCP

Introduction to theories and research on gender and sexuality, gender stratification, and gender role development. Broad interdisciplinary examination of

issues involving gender and sexuality, as well as race and ethnicity, with special emphasis on how these issues affect both women's and men's lives. Issues such as reproductive rights, gender and body image, the origins of patriarchy, gender and class. 4 lectures. Prerequisite: Completion of GE Area A and one course from lower division Area D. Recommended: Junior standing. Fulfills GE D5 and USCP.

WGS 311 Sociology of Gender (4)

Description and analysis of the impact of gender definitions on men and women in society. Special attention is given to the learning process; the creation and perpetuation of gender stereotypes and the way these affect individual life chances and social structure, explored in the areas of work, education, family and abusive relationships. Focus on media presentation of gender and effects of ethnicity and class. 4 lectures. Prerequisite: Junior standing. *Crosslisted as SOC/WGS 311.*

WGS 314 Psychology of Women (4)

The lives of women from a psychological perspective. Topics include gender similarities and differences; masculinity, femininity, and androgyny; women's mental and physical health; female sexuality; women's roles in the workplace and the home; and harassment and violence against women. 4 lectures. Prerequisite: PSY 201 or PSY 202. *Crosslisted as PSY/WGS 314.*

WGS 316 Women as Subject and Object in Art History (4)

Exploration of the role of women in the visual arts. Women as artists, women as portrayed in art, and feminist theory as it applies to the study of the visual arts and art history. 4 lectures. Prerequisite: ART 111, ART 112 or consent of instructor. *Crosslisted as ART/WGS 316.*

WGS 320 Women in Global Perspective (4)

GE D5

Similarities and differences in women's lives internationally. Cultural influences such as class, ethnicity, and religion on women's status. Study of global feminism, reproductive rights, women's labor, women in development, women's politics. 4 lectures. Prerequisite: Completion of GE Area A and one course from lower division Area D. Recommended: Junior standing. Fulfills GE D5.

WGS 340 Sexuality Studies (4)

GE D5

Sexuality in a cultural and historical context. Changing definitions of human subjectivity. The cultural and social regimes that control and create sexuality (including the "invention" of homo/heterosexuality and the social, legal and political systems that define sexual abnormality). Contemporary issues of sexual orientation and topics of sexuality in relation to gender and race. 4 seminars. Prerequisite: Completion of GE Area A and one course from lower division Area D. Recommended: Junior standing. Fulfills GE D5.

WGS 350 Gender, Race, Science and Technology (4)

GE Area F USCP

Interdisciplinary examination of the complex relationships between gender, race, science, and technology in educational, work, knowledge production, policy, and ethical contexts. Topics may include reproductive, medical, genetic, and emerging technologies and exploration of efforts to create more socially responsible science/technology. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B2 or B3. Recommended: Junior standing. *Crosslisted as ES/WGS 350.* Fulfills GE Area F and USCP.

WGS 370 Religion, Gender and Society (4)

GE C4 USCP

Critical examination of religious ideas and institutions in America in relation to gender, race and politics. Focus on women and religion, the religious experience of minorities, and on politics. 4 lectures. Prerequisite: Completion of GE Areas A and C2. Recommended: Junior standing. *Crosslisted as RELS/WGS 370.* Fulfills GE C4 and USCP.

WGS 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: WGS 301 or consent of Women's and Gender Studies Chair.

WGS 401 Seminar in Women's and Gender Studies (4)

Intensive study of a selected topic in Women's Studies (such as women and work, women and the law, women in the arts). The Schedule of Classes will list topic selected. Field experience may be required as appropriate. May be repeated for up to 8 units. 3 seminars and a research project. Prerequisite: WGS 301 or consent of instructor. Recommended: Junior standing.

WGS 434 American Women's History to 1870 (4)

Female ideology and experience from the colonial period through the American Civil War. Use of a variety of sources, including women's own writing, in order to understand the history of women as it both reflects and shapes American

culture and society. 3 lectures and research project. Prerequisite: HIST 303; junior standing or consent of instructor. *Crosslisted as HIST/WGS 434.*

WGS 435 American Women's History from 1870 (4)

USCP

The female past in the modern period of U.S. history. Considers how transformations in gender roles are reflective of other significant changes in American culture and society. Emphasis on class, race, and ethnic variations in women's experience. 3 lectures and research project. Prerequisite: HIST 303 or consent of instructor. *Crosslisted as HIST/WGS 435.* Fulfills USCP.

WGS 450 Feminist Theory (4)

USCP

History and evolution of ideas about gender, race/ethnicity and sexual identity. Special attention as to how social, historical, and ideological forces, organized by the central, intertwined concepts of gender and race, shape both our critical thinking and our lives. 3 lectures, 1 activity. Prerequisite: WGS 301 or consent of instructor. Fulfills USCP.

WGS 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

WVIT-WINE AND VITICULTURE

WVIT 101 Orientation to Wine and Viticulture (1) (CR/NC)

Introduction to the wine and viticulture program. Emphasis on curriculum and career planning. Credit/No Credit grading only. 1 lecture.

WVIT 102 Global Wine and Viticulture (4)

Introduction to wine grape growing, winemaking, and wine business. Brief history and overview of major global wine regions, including growing conditions, grape varieties, winemaking styles, and wine business practices. 4 lectures.

WVIT 202 Fundamentals of Enology (4)

Introduction to the science of winemaking: development of wine components in grapes, grape maturation, harvesting, pre-fermentation wine-making methods, alcoholic fermentation, malolactic fermentation, wine maturation and post fermentation practices, wine spoilage, maintenance of wine integrity. 4 lectures. Prerequisite: CHEM 111 or CHEM 127.

WVIT 203 The Anatomy of a Wine (2)

The role and behavior of compounds in musts, wines, yeasts and oak and their contribution to the color, aromas, flavors, mouthfeel and structure of different wine styles. 2 lectures. Prerequisite: WVIT 202 and sophomore standing. *Formerly WVIT 103.*

WVIT 270 Selected Topics (1-4)

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and consent of instructor.

WVIT 301 Wine Microbiology (4)

Wine yeasts, bacteria, and molds: morphology and methods of identification; successful alcoholic and malolactic fermentations; management and prevention of unwanted microbial growth; micro-organisms and flavor development. 3 lectures, 1 laboratory. Open to MCRO or WVIT majors only. Prerequisite: MCRO majors must have MCRO 224; WVIT majors must have MCRO 221 and WVIT 202. *Crosslisted as MCRO/WVIT 301.*

WVIT 339 Internship in Wine and Viticulture (1-12) (CR/NC)

Time spent in an approved wine industry, engaged in wine production or related agribusiness and viticulture activities. Applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Prerequisite: WVIT 202, FRSC 231, junior standing, and consent of internship instructor.

WVIT 365 Wine Analysis and Amelioration (4)

Winery laboratory practices. Basic principles, techniques, and interpretation of common analyses for sugars, acidity, nitrogen, alcohol, volatile acidity, sulfur dioxide, phenols and color; wine and must amelioration, amendment effects, usage, calculations and procedures of addition. For WVIT majors only. 3 lectures, 1 laboratory. Prerequisite: WVIT 202. *Formerly FSN 365.*

WVIT 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 4 units per quarter. Prerequisite: Consent of instructor.

WVIT 404 Winemaking I (4)

Planning, managing and implementing harvest in the pilot winery; sanitation practices; monitoring grape maturity; handling juices and musts; alcoholic and malolactic fermentation, general cellar practices; sensory and laboratory analyses. 3 lectures, 1 laboratory. Prerequisite: WVIT 202 and FSN 365. Students must be at least 21 years in age.

WVIT 405 Winemaking II (4)

Planning, managing and implementing harvest in the pilot winery; sanitation practices; monitoring and maintaining wine integrity; planning for bottling; blending trials; general cellar practices; sensory and laboratory analyses. 3 lectures, 1 laboratory. Prerequisite: WVIT 404. Students must be at least 21 years in age.

WVIT 406 Winemaking III (4)

Planning, managing and implementing the preparation of wine for bottling; blending; fining; filtration; bottling; conducting general cellar practices; sensory and laboratory analyses. 3 lectures, 1 laboratory. Prerequisite: WVIT 405. Students must be at least 21 years in age.

WVIT 433 Professional Wine Selling (4)

Professional selling in the wine industry. Selling wine through the seven avenues of wine distribution in the 3-tier system. Exploration of aspects of wine selling, from customer relation management to cultural and legal differences among states. How strategies for selling differ for various sized wineries. 4 lectures. Prerequisite: WVIT 102 and junior standing.

WVIT 442 Sensory Evaluation of Wine (4)

Evaluation of wines using the techniques in sensory evaluation. Difference and rating tests; descriptive analysis and pairing of wine and food. For WVIT majors only. 3 lectures, 1 laboratory. Prerequisite: WVIT 202, STAT 218 or STAT 221, age 21 or older. *Formerly FSN/WVIT 342.*

WVIT 463 Issues, Trends and Careers in the Wine Industry (2)

Current issues and trends in viticulture, enology and wine business. Career opportunities and planning for WVIT majors nearing graduation. WVIT majors only. 2 seminars. Prerequisite: Senior standing.

WVIT 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

WVIT 471 Selected Advanced Laboratory (1-4)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

ZOO-ZOOLOGY**ZOO 231 Essentials of Human Anatomy and Physiology I (5)**

See ZOO 331. ZOO 231 accepted in lieu of ZOO 331, but not for upper division credit. Not open for major credit in the Biological Sciences.

ZOO 232 Essentials of Human Anatomy and Physiology II (5)

See ZOO 332. ZOO 232 accepted in lieu of ZOO 332, but not for upper division credit. Not open for major credit in the Biological Sciences.

ZOO 321 Mammalogy (4)

Ecology, behavior, physiology, functional morphology, and evolution of mammals. Classification and identification of mammals, with emphasis on California species. 2 lectures, 2 laboratories. Prerequisite: BIO 162 or BIO 263 or BIO 427 or ASCI 329.

ZOO 322 Ichthyology (4)

Phylogeny, anatomy, functional morphology, physiology, and ecology of marine and freshwater fishes. Special reference to local and economically important species. Laboratory emphasis on taxonomy of California species, especially marine groups. 2 lectures, 2 laboratories. Prerequisite: BIO 162.

ZOO 323 Ornithology (4)

Classification and identification of birds, with emphasis on California species. Functional morphology, physiology, ecology, behavior and census methods. Field trips may require meeting in the morning before scheduled lab time. 2 lectures, 2 laboratories. Prerequisite: BIO 162 or BIO 263 or BIO 427 or ASCI 329.

ZOO 329 Vertebrate Field Zoology (4)

Identification and natural history of terrestrial vertebrates, with emphasis on field studies and local species. Field trips may require meeting in the morning before scheduled lab time. 2 lectures, 2 laboratories. Prerequisite: Junior standing; BIO 162 or BIO 263 or BIO 427 or ASCI 329.

ZOO 331 Human Anatomy and Physiology I (5)

Structural and functional organization of the skeletal, muscular, nervous, endocrine, and integumentary systems. Includes discussion of molecular, cellular, and organ system levels of organization. Activities emphasize histology, cadaver anatomy, physiology of muscle contraction, nerve impulse initiation and conduction, sensory and motor functions. 4 lectures, 1 laboratory. Prerequisite: BIO 111, BIO 115, or BIO 161; CHEM 111, CHEM 124, or CHEM 127. Not open for major credit in Biological Sciences. Not open to students with credit in BIO 432.

ZOO 332 Human Anatomy and Physiology II (5)

Structural and functional organization of the circulatory, respiratory, digestive, excretory, and reproductive systems. Includes discussion of molecular, cellular, and organ system levels of organization. Activities emphasize histology, cadaver anatomy, and physiological experiments. 4 lectures, 1 laboratory. Prerequisite: BIO 111, BIO 115, or BIO 161; CHEM 111, CHEM 124, or CHEM 127. Not open for major credit in Biological Sciences. Not open to students with credit in BIO 433.

ZOO 335 General Entomology (4)

Introduction to the study of insects. Structure, major orders and families of insects, life histories, medical, and economic importance. Insect collection required. 2 lectures, 2 laboratories. Prerequisite: BIO 160, or BIO 113 and BIO 115, or PPSC 311. Recommended: BIO 162.

ZOO 336 Invertebrate Zoology (4)

Invertebrate groups of animals with emphasis on taxonomy, morphology, distribution, and economic importance. 2 lectures, 2 laboratories, and fieldwork. Prerequisite: BIO 160 and BIO 162.

ZOO 341 Herpetology (4)

Living and extinct reptiles and amphibians; an adaptive approach to their diversity, biology, and classification. 2 lectures, 2 laboratories. Prerequisite: BIO 160 and BIO 162.

ZOO 422 Functional Histology (4)

Functional microscopic anatomy of principal tissues and organs of vertebrates, including humans. Structural studies to determine mechanisms underlying physiological processes and their clinical applications in medicine. 2 lectures, 2 laboratories. Prerequisite: BIO 162.

ZOO 425 Parasitology (4)

External and internal parasites of man and animals. Life history. Parasite-host relationships. Control and recognition of species of clinical importance. 2 lectures, 2 laboratories. Prerequisite: BIO 160 and BIO 161, or MCRO 221, or MCRO 224.

ZOO 428 Hematology (4)

Development of blood as a tissue. Composition, function, and mechanisms of formation and destruction of blood components in health and disease. Methods for examination of blood. Suitable for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: BIO 351 and consent of instructor. Recommended: CHEM 313 or CHEM 371.

ZOO 437 Animal Behavior (4)

Behavioral adaptations of animals to their environment and way of life. Analysis of behavior patterns, use of patterns in clarifying evolutionary, and ecological relationships. 3 lectures, 1 laboratory. Prerequisite: BIO 263.

ZOO 537 Behavioral Ecology (1)

Function and evolution of behavioral traits as they relate to ecological phenomena. Habitat selection, migration, spacing mechanisms, reproductive strategies, feeding strategies, agonistic, parasitic, altruistic behavior, communication, and comparative social systems. 1 activity. Prerequisite: ZOO 437, or graduate standing and consent of instructor.

The California State University

The individual California State Colleges were brought together as a system by the Donahoe Higher Education Act of 1960. In 1972, the system became the California State University and Colleges and in 1982 the system became the California State University. Today the campuses of the CSU include comprehensive and polytechnic universities and, since July 1995, the California Maritime Academy, a specialized campus.

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

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

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

Academic excellence has been achieved by the CSU through a distinguished faculty, whose primary responsibility is superior teaching. While each campus in the system has its own unique geographic and curricular character, all campuses, as multipurpose institutions, offer undergraduate and graduate instruction for professional and occupational goals as well as broad liberal education. All 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 high-quality, affordable bachelor's and master's level degree programs. Many of these programs are offered so that students can complete all upper division and graduate requirements by part-time, late afternoon, and evening study. In addition, a variety of teaching and school service credential programs are available. A limited number of doctoral degrees are offered jointly with the University of California and with private institutions in California. In 2005, the CSU was authorized to independently offer educational doctorate (Ed.D.) programs.

Enrollment in fall 2009 totaled 433,000 students, who were taught by more than 21,000 faculty. The system awards about half of the bachelor's degrees and a third of the master's

degrees granted in California. More than 2.5 million students have graduated from CSU campuses since 1961.

A recent economic report found that the CSU supports more than 150,000 jobs statewide, annually. The engine driving job creation is more than \$17 billion in economic activity that directly results from CSU-related spending that generates \$5.43 for every dollar the state invests. For more information, please see www.calstate.edu/impact.

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California Maritime Academy

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

California State University, Monterey Bay

100 Campus Center, Seaside, CA 93955-8001
Dr. Dianne Harrison, President
(831) 582-3330 www.csumb.edu

California State University, Northridge

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

California State Polytechnic University, Pomona

3801 West Temple Avenue, Pomona, CA 91768
Dr. J. Michael Ortiz, President
(909) 869-7659 www.csupomona.edu

California State University, Sacramento

6000 J Street, Sacramento, CA 95819
Dr. Alexander Gonzalez, President
(916) 278-6011 www.csus.edu

California State University, San Bernardino

5500 University Parkway, San Bernardino, CA 92407-2393
Dr. Albert K. Karnig, President
(909) 537-5000 www.csusb.edu

San Diego State University

5500 Campanile Drive, San Diego, CA 92182
Dr. Stephen L. Weber, President
(619) 594-5200 www.sdsu.edu

San Francisco State University

1600 Holloway Avenue, San Francisco, CA 94132
Dr. Robert A. Corrigan, President
(415) 338-1111 www.sfsu.edu

San José State University

One Washington Square, San Jose, CA 95192-0001
Mr. Don W. Kassing, Interim President
(408) 924-1000 www.sjsu.edu

California Polytechnic State University, San Luis Obispo

One Grand Avenue
San Luis Obispo, CA 93407
Dr. Jeffrey D. Armstrong, President
(805) 756-1111 www.calpoly.edu

California State University, San Marcos

333 S. Twin Oaks Valley Road
San Marcos, CA 92096-0001
Dr. Karen S. Haynes, President
(760) 750-4000 www.csusm.edu

Sonoma State University

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

California State University, Stanislaus

One University Circle, Turlock, CA 95382-0299
Dr. Hamid Shirvani, President
(209) 667-3122 www.csustan.edu

University Administration

For most current information, please consult
www.president.calpoly.edu (“Additional Campus Links”).

OFFICE OF THE PRESIDENT

President Jeffrey D. Armstrong
Chief of Staff (Interim)..... Matthew J. Roberts
Executive Assistant..... Kimberly C. Uytewaal
Associate Vice President for Inclusive Excellence,
Director of Ombuds Services W. David Conn
University Legal Counsel Carlos Córdova

ACADEMIC AFFAIRS

Provost Robert D. Koob
Vice Provost/Chief Information Officer for Information
Technology Services, Timothy J. Kearns
Vice Provost for Programs and Planning Erling Smith
Dean, Cal Poly Continuing Education Brian C. Tietje
Dean, Library Services Michael D. Miller
Dean, Research and Graduate Programs..... Susan C. Opava
Associate Vice Provost for Academic
Personnel Albert A. Liddicoat
Associate Vice Provost for Marketing and Enrollment
Development James L. Maraviglia
Assistant Vice President for University/
Community Engagement..... Dennis “Skip” R. Parks
Associate Vice Provost for Systems and
Resources..... Kimi M. Ikeda
Registrar, Office of the Registrar Cem Sunata
Assistant to Provost for Academic Facilities Charlie Crabb

Colleges

College of Agriculture, Food and Environmental Sciences,
Dean David J. Wehner
College of Architecture and Environmental Design,
Dean R. Thomas Jones
Orfalea College of Business, Dean David P. Christy
College of Engineering, Acting Dean Erling A. Smith
College of Liberal Arts, Dean Linda H. Halisky
College of Science and Mathematics, Dean Philip S. Bailey

ADMINISTRATION AND FINANCE

Vice President for Administration and
Finance Lawrence R. Kelley
Associate Vice President for
Commercial Services Bonnie D. Murphy
Associate Vice President for Finance Richard R. Ramirez
Assistant Vice President for Administration
and Finance Karen Webb

STUDENT AFFAIRS

Vice President for Student Affairs..... Cornel N. Morton
Associate Vice President Denise M. Campbell
Associate Vice President Preston C. Allen
Associated Students, Inc., Executive Director Rick Johnson
Dean of Students Jean DeCosta

UNIVERSITY ADVANCEMENT

Vice President (Interim), University
Advancement Robert D. Koob
Associate Vice President/Chief
Development Officer..... Michael D. McCall

Associate Vice President for Operations
and Finance Robert D. Stets
Associate Vice President for
Strategic Communications Joseph “Chip” M. Visci

AUXILIARY ORGANIZATIONS

Associated Students, Inc.

Executive Director Rick Johnson

Cal Poly Corporation

Executive Director Bonnie D. Murphy
Director Emeritus Al Amaral
Associate Executive Director, Administration and
Legal Affairs Starr Lee
Associate Executive Director, Finance and
Business Operations Grant Trexler

CAL POLY CHIEF EXECUTIVE OFFICERS

Cal Poly has been guided by the following chief executive officers.

Leroy Anderson.....	1902 to 1908
Leroy Burns Smith	1908 to 1914
Robert W. Ryder	1914 to 1921
Nicholas Ricciardi	1921 to 1924
Margaret Chase (acting)	1924
Benjamin Ray Crandall	1924 to 1933
Julian A. McPhee	1933 to 1966
Dale W. Andrews (acting).....	1966 to 1967
Robert E. Kennedy	1967 to 1979
Dale W. Andrews (acting).....	1979
Warren J. Baker.....	1979 to 2010
Robert B. Glidden (Interim).....	2010 to 2011
Jeffrey D. Armstrong.....	2011 to Present

FACULTY AND STAFF EMERITI

The faculty and staff, who have served at least fifteen years of full-time meritorious service at Cal Poly, are awarded emeritus status. A complete list of faculty emeriti is available at: www.academic-personnel.calpoly.edu/QuickLinks.html Contact Human Resources for information regarding staff emeriti. The University appreciates its emeriti members’ contributions to the Cal Poly community.

DISTINGUISHED TEACHER AWARD RECIPIENTS

In 1963 the University instituted a program of recognizing outstanding teaching efforts through the Distinguished Teacher Awards. Selections for this honor are based upon recommendations of the Academic Senate committee which follows the procedure of soliciting nominations from students and colleagues. Evaluations and recommendations of the nominees are based upon an in-depth review by the committee, including classroom visitations. Recipients of the Distinguished Teacher Awards and their departments are listed below.

1963–64	Robert E. Holmquist, Physics John L. Merriam, Agricultural Engineering
1964–65	Joy O. Richardson, Mechanical Engineering Milo E. Whitson, Mathematics
1965–66	A. Norman Cruikshanks, Social Sciences Richard F. Johnson, Animal Husbandry George R. Mach, Mathematics
1966–67	Robert W. Adamson, Mechanical Engineering Kenneth G. Fuller, Mathematics William D. Curtis, Psychology
1967–68	Rodney G. Keif, Environmental Engineering David M. Grant, English Wesley S. Ward, Architecture

- 1968–69 Robert M. Johnson, Mechanical Engineering
Bruce Kennelly, Chemistry
Alice E. Roberts, Education
- 1969–70 Donald W. Hensel, History
David H. Montgomery, Biological Sciences
Philip H. Overmeyer, Business Administration
Willard M. Pederson, English
Omer K. Whipple, Chemistry
- 1970–71 Robert L. Cleath, Speech
Kenneth E. Schwartz, Architecture
Hewitt G. Wight, Chemistry
- 1971–72 Stuart E. Larsen, Aeronautical Engineering
Barton C. Olsen, History
Ronald L. Ritschard, Biological Sciences
Joseph N. Weatherby, Political Science (Social Sciences)
- 1972–73 Lyle G. McNeal, Animal Science
Charles W. Quinlan, Architecture
James E. Simmons, English
- 1973–74 William J. Phaklides, Engineering Technology
Louis D. Pippin, Education
Duane O. Seaberg, Agricultural Management
- 1974–75 Peter Jankay, Biological Sciences
Josephine S. Stearns, Child Development
George J. Suchand, Social Sciences
- 1975–76 James Hayes, Journalism
William V. Johnson, Music
Erna Knapp, Art
- 1976–77 Harry L. Fierstine, Biological Sciences
Grant D. Venerable II, Chemistry
Ralph M. Warten, Mathematics
- 1977–78 Timothy M. Barnes, History
Donald P. Grant, Architecture and Environmental Design
John C. Syer, Political Science
- 1978–79 Pat Pends, Biological Sciences
Dane Jones, Chemistry
Adelaide Harmon-Elliott, Mathematics
- 1979–80 David J. Keil, Biological Sciences
Thomas Ruehr, Soil Science
Stephen Weinstein, Mathematics
Michael D. Zohns, Ornamental Horticulture
- 1980–81 Sarah E. Burroughs, Food Science and Nutrition (Child
Development and Home Economics)
Christina Orr-Cahall, Art
Kendrick W. Walker, Philosophy
- 1981–82 Christina A. Bailey, Chemistry
Kenneth E. Ozawa, Physics
Thomas L. Richards, Biological Sciences
- 1982–83 James Bermann, Agricultural Engineering
Donald J. Koberg, Architecture
Jack D. Wilson, Aeronautical and Mechanical Engineering
- 1983–84 Euel W. Kennedy, Mathematics
William L. Preston, Social Sciences
Michael J. Wenzl, English
- 1984–85 Robert S. Cichowski, Chemistry
Harvey C. Greenwald, Mathematics
Max E. Riedlsperger, History
- 1985–86 Edward H. Baker, Mechanical Engineering
Sue McBride, Education
Phillip K. Ruggles, Graphic Communication
- 1986–87 Boyd W. Johnson, Mathematics
Craig H. Russell, Music
Calvin H. Wilvert, Social Sciences
- 1987–88 James R. Mueller, Mathematics
Ronald S. Mullisen, Mechanical Engineering
Robert G. Reynolds, Art and Design
- 1988–89 Stephen W. Ball, Philosophy
George Cotkin, History
Abraham B. Shani, Management
- 1989–90 Lloyd N. Beecher, History
Talmage E. Scriven, Philosophy
Jan W. Simek, Chemistry
- 1990–91 Jay L. Devore, Statistics
Linda H. Halisky, English
Ann Morgan, Psychology
James L. Webb, Physical Education & Recreation Admin.
- 1991–92 Mary E. Pedersen, Food Science and Nutrition
John Snetsinger, History
W. Fred Stultz, Psychology and Human Dev.
- 1992–93 Susan Duffy, Speech Communication
Donald K. Maas, University Center for Teacher Education
Charles M. Slem, Psychology and Human Development
- 1993-94 William T. Little, Foreign Languages and Literatures
Steven R. Marx, English
Raymond M. Nakamura, Physical Education & Kinesiology
- 1994-95 Ronald F. Brown, Physics
Lee B. Burgunder, Business Administration
Nancy Lucas, English
- 1995-96 David Keeling, Chemistry and Biochemistry
John Russell, Music
Richard Simon, English
- 1996-97 Leonard Davidman, University Center for Teacher Education
Al Landwehr, English
Robert Thompson, Agribusiness
- 1997-98 John Culver, Political Science
Jay S. DeNatale, Civil and Environmental Engineering
David R. Henry, Speech Communication
- 1998-99 Colette Frayne, Global Strategy and Law
Carol MacCurdy, English
Leonard Myers, Computer Science
- 1999-00 J. Michael Geringer, Global Strategy and Law
Brent G. Hallock, Soil Science
Clinton A. Staley, Computer Science
- 2000-01 Sky Bergman, Art and Design
Phillip M. Doub, Agribusiness
William Martinez, Jr., Modern Languages and Literatures
- 2001-02 Kevin Clark, English
Alyson McLamore, Music
Mark Zohns, BioResource and Agricultural Engineering
- 2002-03 Alvin De Jong, Biological Sciences
Bernard Duffy, Speech Communication
Linda Vanasupa, Materials Engineering
- 2003-04 Mathew Moelter, Physics
Robert Smidt, Statistics
Nanine A. Van Draanen, Physics
- 2004-05 Fred DePiero, Electrical Engineering
John Hampsey, English
David Headrick, Horticulture and Crop Science
- 2005-06 Mary Armstrong, English
Michael Miller, Art and Design
Yarrow Nelson, Civil and Environmental Engineering
- 2006-07 William Fitzhenry, English
Elena Levine Keeling, Biological Sciences
Donald H. Ryujin, Psychology and Child Development
- 2007-08 Michael Fahs, Communications Studies
Michael Lucas, Architecture
Charles Miller, Accounting
- 2008-09 Derek Gragson, Chemistry and Biochemistry
Josh T. Machamer, Theatre and Dance
Eric J. Kantorowski, Chemistry and Biochemistry
- 2009-10 J. Kevin Taylor, Kinesiology

DISTINGUISHED SCHOLARSHIP AWARD

In 2003-04 Cal Poly instituted an award program to recognize faculty in the areas of distinguished research, creative activity, and professional development. Nominations are solicited from the faculty, students, and alumni, and the Academic Senate's research and professional development committee, a group of eleven, selects the recipients. The recipients of the award and their departments are listed below:

2003-04	Charles Burt, BioResource and Agricultural Engineering
	Joanne Ruggles, Art and Design
2004-05	Estelle Basor, Mathematics
	Rami Shani, Management
2005-06	Daniel Biezad, Aerospace Engineering
	Andrew Morris, History
2006-07	Mark A. Moline, Biological Sciences
	Craig H. Russell, Music
2007-08	Terry Jones, Social Sciences
	Michael Marlow, Economics
2008-09	Patricia L. Engle, Psychology and Child Development
	Dean E. Wendt, Biological Sciences
2009-10	George Cotkin, History Department
	Rafael Jimenez, Dairy Science

OUTSTANDING FACULTY ADVISOR AWARD

In 2001-02 the University instituted a program of recognizing outstanding achievement by a faculty member in the area of student advising. Nominations are solicited from the faculty and staff and students. Recipients' names will be displayed on a perpetual plaque. The recipients of the Outstanding Faculty Advisor Award and their departments are listed as follows:

2001-02	Kathryn Rummell, English
2002-03	Jack Robison, Accounting
2003-04	William Preston, Social Sciences
2004-05	Lorraine Donegan, Graphic Communication
2005-06	Taufik, Electrical Engineering
2006-07	Abraham Lynn, Architectural Engineering
2007-08	Cynthia Moyer, Recreation, Parks and Tourism Administration
2008-09	Curtis Illingworth, Architecture
2009-10	Philip Costanzo, Chemistry and Biochemistry

PROVOST'S LEADERSHIP AWARD FOR PARTNERSHIP IN PHILANTHROPY

This award was established in 2006 to recognize current or former faculty member's superior achievement in fundraising.

2006	Allan J. Hauck, Construction Management
	James A. Rodger, Construction Management
2007	Andrew J. Thulin, Animal Sciences
2008	Harvey Robert Levenson, Graphic Communication
2009	Charles M. Burt, BioResource and Agricultural Engineering
2010	Philip S. Bailey, College of Science and Mathematics

PRESIDENT'S DIVERSITY AWARD

This award recognizes campus units that exhibit a commitment to the value of cultural diversity.

2009	Multicultural Engineering Program
	Delta Lambda Phi
2010	Society of Women Engineers
	Ethnic Studies Department

OUTSTANDING STAFF EMPLOYEE AWARD

The 1972-73 academic year saw the inception of the Outstanding Staff Employee Award. This honor is bestowed upon permanent, full-time employees of the University, Foundation, or Associated Students, Inc. who are in at least their third year of employment at Cal Poly. In order to be considered for this award, an employee

should be truly dedicated and loyal; exhibit expertise in job performance; demonstrate a willingness to assist others enthusiastically; take initiative in making his or her department more efficient and productive; maintain an excellent relationship with co-workers, faculty, and students; and make contributions to both the University and the community. Nominations are solicited from staff employees, faculty members, and department or division heads. Selection of the awardees is made by a committee of former recipients of the award. Outstanding Staff Employees Award recipients are listed here as follows.

1972-73	Everette Dorrough	1991-92	Wanda Bolt
1973-74	Vic Allen		Pam Parsons
	Florence Hauge		Joe Risser
	Lionel Middlecamp	1992-93	Rosemary Bowker
	Jim Neelands		Deborah L. Brothwell
1974-75	Robert Baldrige		Andy McMeans
	John Lee	1993-94	Connie Davis
	Gerry Wagner		Jim McLaughlin
	Arthur Young		Richard Tibbetts
1975-76	Merriam Erickson	1994-95	Francesca Fairbrother
	Viola Hughes		Joyce Kalicicki
	Mary Johnson		Lorraine Ridgeway
	Boyd Wettlaufer	1995-96	George Enriquez
1976-77	Trudy Beck		Cynthia Jelinek
	Stella Nuncio		Carol Montgomery
1977-78	Luther Bertrando	1996-97	Kristina Pena
	Pauline Shaffer		Don Shemenske
	Joanna DeRosier		Judy Swanson
1978-79	Harold Miller	1997-98	Richard Equinoa
	Doris Anderson		Pat Harris
	Richard Tartaglia		Nettie Steels
	Frank Lebens	1998-99	Darrell Blankenship
1979-80	Dale Lackore		Delores Estrada
	Steven Riddell		Rosemary Wagner
	Joan Roberts	1999-00	Bonnie Krupp
1980-81	Joan Cirone		Druci Reese
	Farlin Halsey		Ellen Stier
	Irene Lund	2000-01	Donna Amos
1981-82	James Neal		Stacey Breitenbach
	Connie Jonte		Joyce Haratani
	Frank Kassak	2001-02	Margaret Booker
1982-83	Barbara Lund		Judy Drake
	Larry Grimes		Jimmy Ray Motley
	Norman Johnson	2002-03	Sue Bethel
1983-84	Jerald (Louie) Budoff		Jim Gerhardt
	Walter Clark		Bonnie Long
	Gail Simmons	2003-04	Carol Erickson
1984-85	Alfred W. Amaral		Lori La Vine
	Ethel Spry		Bob Pinkin
	Kathleen Lamoree	2004-05	Sharon Arnold
1985-86	James Landreth		Prisila Johnson
	Geraldine Montgomery		Dan Mull
	Vicki Stover	2005-06	Larry Coolidge
1986-87	Lee Brown		Alice Gold
	Gary Ketcham		Mary Whiteford
	French Morgan	2006-07	Michele Abba
1987-88	Lynette Klooster		Peggy Smith Andersen
	Judi Pinkerton		Joyce McAlexander
	Nancy Raetz	2007-08	Carson Crain
1988-89	Debbie Arseneau		Ben Johnson
	June Powell		Emanuel Vieira
	Jacque Rossi	2008-09	Vera Gee
1989-90	Grace Arvidson		George Leone
	Janet Carlstrom		Colleen Rodriguez
	Ronald Christensen	2009-10	Christine Cobb
1990-91	Barbara Ciesielski		Vivian Longacre
	Harriet Clendenen		Terry Vahey
	Harriet Ross		

Faculty and Staff

(Number in parentheses indicates year of appointment)

Listed as of March 2011.

- ABERCROMBY, KIRA J. (2008) Aerospace Engineering
B.S., University of California, Los Angeles, 1994; M.S., University of Colorado,
Boulder, 1998; Ph.D., 2000. Assistant Professor.
- ADAMS, NIKKI L. (2002) Biological Sciences
B.A., University of California, Santa Barbara, 1988; M.S., University of Maine,
1995; Ph.D., 2000. Associate Professor.
- ADAN, ELIZABETH (2007) Art and Design
B.A., University of California, Davis, 1993; M.F.A., University of California,
Santa Barbara, 1997; M.A., University of California, Berkeley, 2000; Ph.D.,
University of California, Santa Barbara, 2006. Assistant Professor.
- AGBO, SAMUEL O. (1991) Electrical Engineering
B.Sc., University of Nigeria, 1975; M.S.E., University of Michigan, 1978; Ph.D.,
University of Houston, 1984. Professor.
- AGRONSKY, STEVEN J. (1981) Mathematics
B.A., University of California, Santa Barbara, 1970; M.S., 1972; Ph.D., 1974.
Professor.
- AHERN, JAMES J. (1980) Agribusiness
B.S., California State Polytechnic College, Pomona, 1971; M.S., University of
Maryland, 1973; Ph.D., 1980. Professor.
- AHLGREN, WILLIAM L. (1999) Electrical Engineering
S.B., Massachusetts Institute of Technology, 1975; M.S., University of Arizona,
1977; Ph.D., University of Southern California, 1981. Associate Professor.
- ALLEN, PRESTON C. (1993) Student Affairs
B.A., Michigan State University, 1980; M.S., California State University,
Fullerton, 1989. Associate Vice President for Student Affairs, and Executive
Director, University Housing.
- ALLEN, REGULUS L. (2006) English
B.A., University of California, Los Angeles, 1994; M.A., 2000; Ph.D., 2006.
Assistant Professor.
- ALLEN, TERESA (2001) Journalism
B.A., University of Washington at Seattle, 1976; M.A., University of Colorado at
Boulder, 1993; additional graduate study. Professor.
- ALLEN-BARKER, JENNIFER C. (2007) Disability Resource Center
B.S., San Jose State University, 1981. Access Specialist (Visual Impairments).
- ALEXANDER, ERIC (2006) Associated Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 2001. Coordinator
- Fitness.
- ALPTEKIN, SEMA E. (1994) Industrial and Manufacturing
Engineering, Academic Programs
B.Sc., Istanbul Technical University, Istanbul, 1973; M.Sc., 1975; Ph.D., 1981.
Professor; Director, University Honors Program.
- AMSPACHER, WILLIAM H. (1985) Agribusiness
B.S., Clemson University, 1978; M.S., 1980; Ph.D. University of California,
Davis, 1988. Professor.
- ANDERSON, BING (2004) Finance
B.Eng., University of Science and Technology of China, 1993; M.A., University
of Chicago, 1996; M.S., Stanford University, 2000; Ph.D., 2002. Associate
Professor.
- ANDERSON, BRADFORD P. (2006) Orfalea College of Business
B.A., Purdue University, 1984; J.D., State University of New York, 1987.
Associate Dean and Associate Professor.
- ANDERSON, SHARON (2008) Information Technology Services
B.S., California Polytechnic State University, San Luis Obispo, 1987; M.S.,
Carnegie Mellon University, 1993. Director, Administrative Computing Services.
- ANDERSON, VIRGINIA (2010) Theatre and Dance
B.A., Carlton College, 2000; M.A., Stanford University, 2002; M.A., Goldsmith's
College, University of London; Ph.D., Tufts University, 2009. Assistant Professor.
- APPEL, CHRISTOPHER S. (2002) Earth and Soil Sciences
B.S., California Polytechnic State University, San Luis Obispo, 1995; M.S., 1998;
Ph.D., University of Florida, 2001. Associate Professor.
- ARAKAKI, DEAN Y. (2001) Electrical Engineering
B.S., California State Polytechnic University, Pomona, 1984; M.B.A., California
State University, Long Beach, 1989; M.S., 1992; Ph.D., Penn State University,
2000. Associate Professor.
- ARCENEUX, CRAIG (2001) Political Science
B.A., California State University, Fullerton, 1989; M.A., Ohio State University,
1991; Ph.D., University of California, Riverside, 1997. Professor and Department
Chair.
- ARCHER, GRAHAM C. (2002) Architectural Engineering
B.A.Sc., University of Waterloo, Canada, 1985; M.A.Sc., 1986; Ph.D., University
of California, Berkeley, 1996. Associate Professor. Professional Engineer, Ontario.
- ARENS, ROBERT M. (2005) Architecture
B.S., University of Michigan, 1981; M.Arch., 1984. Professor. Registered
Architect, Michigan.
- ARRIVÉE, DAVID A. (2004) Music
B.A., Princeton University, 1993; M.Mu., Boston University, 1995; D.M.A.,
Northwestern University, 2004. Associate Professor.
- ARMSTRONG, MARY A. (2000) English, Women's and Gender Studies
B.A., College of the Holy Cross, 1987; M.A., Duke University, 1989; Ph.D., 1995.
Associate Professor and Department Chair.
- ARMSTRONG, JEFFREY D. (2011) President
B.S., Murray State University, 1981; M.S., North Carolina State University, 1984;
Ph.D., 1986. President.
- ARVIZU-RODRIGUEZ, MARIA (1987) Student Academic Services
B.S., California Polytechnic State University, San Luis Obispo, 1987; M.A., 2007.
Academic Advisor/Coordinator, Summer Institute Program.
- ASPLUND, RICHARD (1999) Orfalea College of Business
B.S., California Polytechnic State University, San Luis Obispo, 1960; M.A., 1992.
Director of Computer Lab.
- AUBOURG, VICKIE (1997) College of Architecture and Environmental Design
B.A., Montclair University, 1968; M.S., Pratt Institute, 1972; M.A., University of
California, Davis, 1986. Media Resource Center Coordinator.
- AVAKIAN, GREGORY (2000) Associated Students, Incorporated
B.S., California State University, Long Beach, 1992. Assistant Director,
Recreational Sports.
- AXELROTH, ELIE (1984) Counseling Services
B.A., State University of New York, Albany, 1976; M.A., University of Maryland,
1978; Psy.D., University of Denver, 1983. Psychologist.
- AZEVEDO, JOHN (2001) Intercollegiate Athletics
B.A., California State University, Bakersfield, 1982. Head Coach, Wrestling.
- BAILEY, CHRISTINA ANNE (1978) Chemistry and Biochemistry
B.S., College of Saint Elizabeth, New Jersey, 1964; Ph.D., Purdue University,
1970. Professor Emeritus and Department Chair.
- BAILEY, HELEN (2006) Office of the Registrar
B.A., Vanderbilt University, 1983; M.A., Princeton University, 1985. Assistant
Registrar.
- BAILEY, PHILIP S. (1969) College of Science and Mathematics, Chemistry and
Biochemistry
B.S., University of Texas, 1964; Ph.D., Purdue University, 1969. Dean and
Professor.
- BAKER, CHRIS (2001) Intercollegiate Athletics
B.S., California Polytechnic State University, San Luis Obispo, 1997. Associate
Athletic Director of Advancement.
- BALL, STEPHEN W. (1983) Philosophy
B.A., Purdue University, 1972; M.A., University of Michigan, 1973; Ph.D., 1978.
Professor.
- BALTIMORE, CRAIG V. (2001) Architectural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1986; M.S., Duke
University, 1996; Ph.D., 1998. Associate Professor. Registered Structural
Engineer and Professional Engineer, California.

- BARATA, ANTONIO G. (1985)..... Music
B.A., Towson State University, 1977; M.M., Northwestern University, 1979;
D.M.A., University of Illinois, 1985. Professor.
- BARBER, CLIFFORD S. (1986)..... Industrial Technology
B.A., California Polytechnic State University, San Luis Obispo, 1982; M.A., 1986;
Ed.D., University of Southern California, 1999. Licensed General Contractor.
Associate Professor.
- BARCLAY, KENNETH B. (1979)..... Student Life and Leadership
B.A., Bowling Green State University, 1967; M.A., University of Massachusetts,
1969; Ph.D., Kent State University, 1975. Director (retired June 2011).
- BARLOW, PHILIP L. (2006)..... Construction Management
B.S., California Polytechnic State University, San Luis Obispo, 1987; M.B.A.,
Golden Gate University, 1993. Associate Professor. Licensed General Contractor,
Licensed Broker, Certified Professional Constructor (CPC), Certified Cost
Consultant (CCC), Designated Design-Build Professional (DBIA), LEED
Accredited Professional (LEED AP).
- BASS, BEVERLY J. (2008)..... Landscape Architecture
B.F.A., East Carolina University, 1982; M.L.A., University of Arizona, 2003.
Assistant Professor. LEED Accredited Professional. Certified Arborist.
- BATTENBURG, JOHN (1989)..... English
B.A., Andrews University, 1982; M.A., Ohio University, 1984; Ph.D., Purdue
University, 1989. Professor.
- BEALS, DAVID R. (1995)..... College of Liberal Arts
B.A., California Polytechnic State University, San Luis Obispo, 1987. Technical
Director/Manager, Spanos Theatre.
- BELLARDO, JOHN M. (2006)..... Computer Science
B.S., California Polytechnic State University, San Luis Obispo, 1999; M.S.,
University of California, San Diego, 2001; Ph.D., 2006. Assistant Professor.
- BENADIBA, MARC F. (2002)..... Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1990. Assistant
Director for Payroll Services, Fiscal Services. Certified Public Accountant.
- BENNETT, PENNY K. (2000)..... College of Liberal Arts, Graphic Communication
B.S., Ferris State University, 1986; M.E., University of Nevada, Las Vegas, 1992;
Ph.D., University of Idaho, 2002. Professor and Associate Dean.
- BENSKY, THOMAS J. (2001)..... Physics
B.S., California State University, Northridge, 1992; Ph.D., University of Virginia,
1998. Associate Professor.
- BERBER-JIMENEZ, LOLA (1995)..... Liberal Studies
B.S., Universidad LaSalle, 1983; Ph.D., University of California, Davis, 1990.
Department Chair.
- BERG, LORRAINE M. (1983)..... Health Services
R.N., Cuesta College, 1975; N.P. Family Planning, San Jose State University,
1982. Nurse Practitioner.
- BERGMAN, SKY (1995)..... Art and Design
B.S., University of South Florida, 1987; M.F.A., University of California, Santa
Barbara, 1991. Professor and Department Chair.
- BERNARD, THOMAS J. (2008)..... Theatre and Dance
B.A., University of Minnesota, 1991; M.F.A., Northern Illinois University, 1995.
Assistant Professor.
- BERNER, LOUISE A. (1987)..... Food Science and Nutrition
B.S., Pennsylvania State University, 1979; M.S., Cornell University, 1982; Ph.D.,
1986. Professor.
- BERNING, LEANNE M. (1990)..... Dairy Science
B.S., California Polytechnic State University, San Luis Obispo, 1982; M.S.,
University of Wisconsin, 1985; Ph.D., University of Maryland, 1990. Professor.
- BESEL, RICHARD D. (2007)..... Communication Studies
B.A., North Central College, 1999; M.A., University of Illinois, Chicago, 2001;
Ph.D., University of Illinois, Champaign/Urbana, 2007. Assistant Professor.
- BICKEL, CHRISTOPHER (2008)..... Social Sciences
B.A., Indiana University, 1997; M.A., University of California, Santa Barbara,
2004. Assistant Professor.
- BIEZAD, DANIEL J. (1990)..... Aerospace Engineering
B.S., Illinois Institute of Technology, 1966; M.S., Air Force Institute of
Technology, 1972; Ph.D., Purdue University, 1984. Professor Emeritus.
Registered Professional Engineer, Ohio.
- BIRDSONG, CHARLES B. (2003)..... Mechanical Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S.,
Michigan State University, 1996; Ph.D., 1999. Associate Professor.
- BIXLER, XENIA E. (2007)..... Research and Graduate Programs
B.S., University of Maryland, 1981; M.S., University of Southern California,
1983. Grants Development Director.
- BLACK, MICHAEL W. (2001)..... Biological Sciences
B.S., Southwest Missouri State, 1993; Ph.D., Stanford University, 1999. Associate
Professor.
- BLANK, JASON M. (2009)..... Biological Sciences
B.S., Duke University, 1996; Ph.D., Stanford University, 2006. Assistant
Professor.
- BLAU, JNAN A. (2008)..... Communication Studies
B.S., Arizona State University West, 1999; M.S., Southern Illinois University,
2002; Ph.D., 2007. Assistant Professor.
- BLOOM, SCOTT (2003)..... University Housing
B.S., California Polytechnic State University, San Luis Obispo, 1994. Housing
Facilities Manager.
- BLUM, MICHAEL L. (1981) (1984)..... Graphic Communication
B.A., University of California, Los Angeles, 1971; M.S., Rochester Institute of
Technology, 1979. Professor.
- BODEMER, BRETT (2009)..... University Library
B.A., University of Hawaii at Manoa, 2004; M.A., 2006; M.L.I.S., 2009. Senior
Assistant Librarian.
- BOHR, GREGORY S. (2005)..... Social Sciences
B.A., University of California, Berkeley, 1993; M.A., San Diego State University,
1997; Ph.D., Louisiana State University, 2004. Associate Professor.
- BONINI, VINCENT (2008)..... Mathematics
B.A., University of California, Santa Cruz, 2000; M.A., 2001; Ph.D., 2006.
Assistant Professor.
- BORIN, NORM. A. (1992)..... Marketing
B.S., University of California, Davis, 1981; M.B.A., California State University,
Sacramento, 1987; Ph.D., University of Virginia, Charlottesville, 1992. Professor.
- BORZELLINO, JOSEPH E. (2001)..... Mathematics
B.S., University of California, Irvine, 1987; M.A., University of California, Los
Angeles, 1989; Ph.D., 1992. Professor.
- BOSWELL, MICHAEL R. (1998)..... City and Regional Planning
B.A., University of Central Florida, 1989; M.S.P., Florida State University,
Tallahassee, 1991; Ph.D., 2000. Professor.
- BRADY, PAMALEE (1998)..... Architectural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1979; M.S.,
University of California, Berkeley, 1980; Ph.D., University of Illinois, Urbana-
Champaign, 2004. Associate Professor. Registered Civil Engineer, California.
- BRAGG, MARTIN E. (1995)..... Health and Counseling Services
B.A., Indiana University, Bloomington, 1971; M.A., University of California, Los
Angeles, 1972; Ph.D., 1979. Director.
- BRAMMEIER, MEREDITH (2001)..... Music
B.A., Princeton University, 1992; M.M., Eastman School of Music, 1995; D.M.A.,
University of Southern California, 2000. Professor.
- BRANCART, VICTOR N. (1994)..... Administration and Finance
B.A., California State University, Fullerton, 1989; M.A., California Polytechnic
State University, San Luis Obispo, 2000. Director, Budget and Analytic Business
Services.
- BRANDT, MICHAEL (2001)..... Admissions, Recruitment and Financial Aid
B.S., University of Phoenix, 2006; M.B.A., Capella University, 2009. Senior
Admissions Advisor.
- BRAR, NAVJIT (1998)..... University Library
B.A., Government College for Girls, India, 1981; M.L.S., Panjab University,
India, 1983; M.A., 1985; M.L.S., San Jose State University, 1992. Librarian,
Library Assessment and Lifelong Learning.
- BRAUN, DAVID B. (1996)..... Electrical Engineering, Computer Engineering
B.S., Stanford University, 1985; M.S., 1986; Ph.D. University of California, Santa
Barbara, 1991. Professor.
- BREAM, HUGH (2000)..... Intercollegiate Athletics
B.S., California Polytechnic State University, 1980; M.S., 1982. Head Coach,
Women's Tennis.

- BREITENBACH, STACEY M. (1981)College of Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1989; M.A., 1994.
Assistant Dean.
- BREMER, WALTER D. (1981)..... Landscape Architecture, Center for Teaching and
Learning
B.F.A., Mankato State University, 1973; M.L.A., Utah State University, 1977.
Professor and Director, Instructional Technology.
- BRENNER, BETH (2011)College of Engineering
B.A., Sonoma State University, 2002; M.A., University of San Francisco, 2008.
Director of Major Gifts.
- BRIZENDINE, CAROL (2003)Associated Students, Incorporated
B.A., Western Illinois University, 1997. Coordinator – Human Resources.
- BROOKS, EVERETTE (2006) Student Life and Leadership
B.S., Park University, 1996; M.B.A., Long Island University, 1999. Coordinator,
Sport Clubs.
- BROOM, MICHELLE (2001)Associated Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 1996. Coordinator
- Public Relations.
- BROWN, D. KENNETH (2007)Philosophy
B.A., University of California, Irvine, 1992; M.A., Claremont Graduate
University, 1998; Ph.D., University of California, Irvine, 2006. Assistant
Professor.
- BROWN, J. WYATT (1990) Horticulture and Crop Science
B.S., Louisiana State University, 1978; M.S., 1985; Ph.D., Cornell University,
1990. Professor. Pest Control Advisor, California.
- BRUCE, LISA K. (2008) Admissions, Recruitment and Financial Aid
B.A. California Polytechnic State University, San Luis Obispo, 1998; M.A., 2005.
Financial Aid Counselor.
- BRUMMETT, DWAYNE (2001)Associated Students, Incorporated
B.A., University of California, Santa Barbara, 1986. Director of Business Services.
- BRYLEWSKI, PAUL (2009)Health Services
B.S., Trevecca Nazarene University, 1996; M.P.A.S., University of Nebraska,
2007. Physician Assistant.
- BUCKALEW, W. CHRIS (1990)Computer Science
B.S., North Texas State University, 1980; M.S., 1982; M.S., 1984; Ph.D.,
University of Texas, 1990. Professor.
- BULLOCK, MISSI (1996)Associate Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 1996. Coordinator
– ASI Programs.
- BURD, MATTHEW A. (2003)Animal Science
B.S., University of Wisconsin–Madison, 1987; M.S., San Jose State University,
1991; D.V.M., University of California, Davis, 1996. Professor.
- BURGOA, BENALI (2006)BioResource and Agricultural Engineering
B.S., Universidad de Panama, Panama, 1979; M.S., University of Florida,
Gainesville, 1984; Ph.D., 1989; M.S., California Polytechnic State University, San
Luis Obispo, 2003. Associate Professor.
- BURGUNDER, LEE B. (1983) Accounting
B.A., Dartmouth College, 1977; M.B.A., Stanford University, 1981; J.D., 1981.
Professor.
- BURN, SHAWN MEGHAN (1990)Psychology and Child Development
B.S., Virginia Commonwealth University, 1982; M.A., The Claremont Graduate
University, 1984; Ph.D., 1988. Professor.
- BURT, CHARLES M. (1978)BioResource and Agricultural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1973; M.S., Utah
State University, 1975; Ph.D., 1983. Professor. Registered Civil Engineer and
Agricultural Engineer, California. Registered Professional Engineer, Utah.
- BUSH, SETH (2005) Chemistry and Biochemistry
B.S., Reed College, 1994; Ph.D., University of California, Berkeley, 1999.
Associate Professor.
- CABRINHA, MARK (2003) Architecture
B.Arch., California Polytechnic State University, San Luis Obispo, 1995; M.Arch.,
University of Illinois, 2001; Ph.D., Rensselaer Polytechnic Institute, 2010.
Assistant Professor. Registered Architect, Illinois.
- CAI, XIAOWEI (2008) Agribusiness
B.S., M.S., Nanjing Agricultural University, 2001; M.S., Ph.D., University of
Wisconsin, 2009. Assistant Professor.
- CALDWELL, ROSLYN M. (2007)Psychology and Child Development
B.A., University of California, Irvine, 1995; M.A., University of California, Santa
Barbara, 1997; Ph.D., 2000. Associate Professor.
- CALL, LEWIS W. (1996) History
B.A., University of California, San Diego, 1990; M.A., University of California,
Irvine, 1992; Ph.D., 1996. Assistant Professor.
- CALLERO, JOE (2009) Intercollegiate Athletics
B.A., Central Washington University, 1986; M.A., Seattle University, 1991. Head
Coach, Men's Basketball.
- CAMP, CHARLES D. (2007)Mathematics
B.A., University of California, San Diego; 1989; Ph.D., California Institute of
Technology, 2004. Assistant Professor.
- CAMPBELL, BRAD (2007)English
B.A., St. Mary's College of California, 1997; M.A., University of Illinois at
Urbana-Champaign, 1999; Ph.D., 2007. Assistant Professor.
- CAMPBELL, DENISE (1995)Student Affairs
B.A., University of California, Irvine, 1977; M.A., American University,
Washington, D.C. 1979; Ph.D., Claremont Graduate University. Associate Vice
President.
- CAMPBELL, RENODA (2006) Student Life and Leadership
B.A., Loyola Marymount University, 1985; M.Ed., California Polytechnic State
University, San Luis Obispo, 2005. Coordinator, Multicultural Programs.
- CANNON, STACY (2001) University Advancement
B.A., University of Colorado at Boulder, 1994; M.B.A., University of Denver,
1998. Director, Planned Giving.
- CARDINAL, KRISTEN O'HALLORAN (2007) Biomedical and General
Engineering
B.S., California Polytechnic State University, San Luis Obispo, 2003; Ph.D.,
University of Arizona, 2007. Assistant Professor.
- CARDINAL, TREVOR (2007) Biomedical and General Engineering
B.S., California Polytechnic State University, San Luis Obispo, 2003; Ph.D.,
University of Arizona, 2007. Assistant Professor.
- CARLTON, MATTHEW A. (1999)Statistics
B.A., University of California, Berkeley, 1994; M.A., University of California,
Los Angeles, 1996; Ph.D., 1999. Professor.
- CARR, CHRIS A. (1998) Accounting
B.A., University of Nebraska, 1987; M.A., University of California, Los Angeles,
1998; J.D., Santa Clara University, 1990. Associate Dean and Professor.
- CARR, JANICE L. (1983) Accounting
B.S., California State University, Northridge, 1971; M.S., 1975; Ph.D., Arizona
State University, 1985. Professor Emeritus. Certified Public Accountant.
- CARROLL, JENNIFER (2006) Chemistry and Biochemistry
B.S., Sonoma State University, 1996; Ph.D., University of California, Santa Cruz,
2001. Assistant Professor.
- CARTER, CASSIE (2008) University Advancement
B.A., California State University, Northridge, 1985; Ph.D., University of Southern
California, 2006. Director, Donor Strategy and Relations.
- CARTTER, MARLENE A. (1985-88) (1993)Academic Affairs
B.A., California State University, Los Angeles, 1976; M.A., California
Polytechnic State University, San Luis Obispo, 2001. Compliance Officer.
- CARTWRIGHT, LIONEL SCOTT (2001) Intercollegiate Athletics
B.S., California State University, Fullerton, 1980. Head Coach, M/W Golf.
- CASEY, GLEN R. (1982) Agricultural Education and Communication
B.S., Chico State College, 1966; M.S., California Polytechnic State University,
San Luis Obispo, 1979; Ed.D., Oklahoma State University, Stillwater, 1987.
Professor Emeritus.
- CAVALETTO, RICHARD A. (1990) BioResource and Agricultural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1981; M.S.,
University of California, Davis, 1983; Ph.D., 1987. Professor and Department
Head. Registered Mechanical Engineer, California.
- CAWLEY, FRANK (1996) Cal Poly Corporation
B.A., St. Patrick's College, 1969; M.A., 1971; M.Div., St. Patrick's Seminary,
1971. Director, El Corral Bookstore.
- CERF, DOUGLAS C. (1990) Accounting
B.S., University of California, Berkeley, 1978; M.A., University of California,
Davis, 1987; Ph.D., 1991. Professor and Area Chair.

- CHADWELL, CHARLES (2003)..... Civil and Environmental Engineering
B.S., University of California, Berkeley, 1997; Ph.D., 2003. Associate Professor.
Registered Professional Engineer, California.
- CHANCE, BETH L. (1999).....Statistics
B.S., Harvey Mudd College, 1990; M.S., Ph.D., Cornell University, 1994.
Professor.
- CHANDLER, DAWN E. (2006)..... Management
B.S., California State University, Chico, 1993; M.B.A., San Jose State University,
1997; D.B.A., Boston University, 2006. Assistant Professor.
- CHAPMAN, ARTHUR J. (1972)..... Architecture
B.S., B.Arch., California State Polytechnic College, 1970; M.S., Pennsylvania
State University, 1971; additional graduate study, University of California, Los
Angeles. Professor Emeritus.
- CHATZIOANOU, ALYPIOS E. (1992)..... Civil and Environmental Engineering
B.S., Athens Polytechnic, 1980; M.S., University of California, Berkeley, 1982;
Ph.D., 1989. Professor. Registered Professional Engineer, Greece.
- CHEN, HUEI-YU (SOPHIA) (2010).....Modern Languages and Literatures
B.A., Fu-Jen Catholic University, 1980; M.A., Fairleigh Dickenson University,
1995; Ph.D., Florida State University, 2007. Assistant Professor.
- CHEN, JOHN (2008).....Mechanical Engineering
B.S. University of Virginia, 1984; M.S., Stanford University, 1987; Ph.D., 1991.
Professor.
- CHEN, KATHERINE C. (1999)..... Materials Engineering
B.S., B.A., Michigan State University, 1990; Ph.D., Massachusetts Institute of
Technology, 1996. Professor.
- CHIPPING, DAVID H. (1971).....Physics
B.S., Cambridge University, England, 1965; M.S., Stanford University, 1967;
Ph.D., 1970. Professor Emeritus.
- CHOBOTER, PAUL F. (2005)..... Mathematics
B.Sc., Simon Fraser University, 1995; M.Sc., McGill University, 1997; Ph.D.,
University of Alberta, 2002. Associate Professor.
- CHOI, DON H. (2003)..... Architecture
A.B., Princeton University, 1988; M.Arch., Rice University, 1993; Ph.D., U.C.
Berkeley, 2003. Associate Professor.
- CHOUDHURY, GOUR (2011).....Food Science and Nutrition
B.S., University of Gauhati, India, 1972; M.S., University of Mysore, India, 1977;
Ph.D., University of Alberta, Canada, 1987.
- CHRISTIANSEN, JODI (2006).....Physics
B.A., Harvey Mudd College, 1985; M.S., University of Wisconsin, Madison,
1988; Ph.D., 1993. Assistant Professor.
- CHRISTY, DAVID P. (2004).....Orfalea College of Business
B.S., University of Dayton, 1972; M.Ed., University of Georgia, 1979; Ph.D.,
1984. Dean.
- CIROVIC, MICHAEL M. (1968)..... Electrical Engineering
B.E., New York University, 1965; M.S., 1968. Professor Emeritus.
- CLAGUE, DAVID (2007)..... Biomedical and General Engineering
B.S., University of California, Santa Barbara, 1987; M.S., University of
California, Davis, 1993; Ph.D., 1997. Associate Professor.
- CLARK, CHRISTOPHER M. (2007).....Computer Science, Computer Engineering
B.S. Queen's University, 1995; M.S., University of Toronto, 1998; Ph.D., Stanford
University, 2004. Associate Professor.
- CLARK, KEVIN (1988).....English
B.A., University of Florida, 1972; M.A., 1979; Ph.D., University of California,
Davis, 1986. Professor.
- CLARK, M. MILES (2006).....College of Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1995. Web
Administrator.
- CLARK, NANCY A. (2000).....Associated Students, Incorporated
B.A., Washington State University, 1982; M.S., 1990. Coordinator – Outdoor
Recreation.
- CLARK, ROBERT (1998).....Kinesiology
B.S., California Polytechnic State University, San Luis Obispo, 1992; M.S.,
Louisiana State University, 1996; Ph.D., 1998. Associate Professor.
- CLARK, SARAH (2006)..... Student Academic Services
B.S., California Polytechnic State University, San Luis Obispo, 2002; M.A., ED,
2004. Academic Advisor/Coordinator, Supplemental Workshops in Science.
- CLAYBORN, ROBYN (2008)..... Associated Students, Incorporated
B.A., California Polytechnic State University, San Luis Obispo, 2006. Coordinator
– Recreational Sports.
- CLAYTON, ROBERT (2007)..... Counseling Services
B.A., New College of Florida, 1987; J.D., College of William and Mary, 1994;
Psy.D., George Washington University, 2008. Psychologist.
- CLAY, GARY R. (1995).....Landscape Architecture
B.L.A., Utah State University, 1974; M.L.A., University of Illinois, 1986; Ph.D.,
University of Arizona, 1996. Professor.
- CLEMENT, SANDRA L. (2011)..... Biological Sciences
B.S., Doane College, 1995; Ph.D., Michigan State University, 2004. Assistant
Professor.
- CLEMENTS, JOHN (2005).....Computer Science
B.A., Princeton University, 1996; M.S., Rice University, 2001; Ph.D.,
Northeastern University, 2005. Associate Professor.
- CLIFT, LISA R. (2002)..... Health Services
B.S., Montana State University, Bozeman, 1987. Clinical Laboratory Scientist.
- CODY, MARTHA (2008).....Office of the President
B.A., University of California, Santa Barbara, 1985; J.D., Golden Gate University
School of Law, 2004. Member of the California Bar. Director, Employment
Equity.
- COGET, JEAN-FRANCOIS AXEL HUGUES (2006)..... Management
M.B.A., HEC School of Management, Paris, France, 1998; Ph.D., University of
California, Los Angeles, 2004. Associate Professor.
- COLEMAN, JAMES W. (1973)..... Social Sciences
B.A., California State University, Northridge, 1969; M.A., University of
California, Santa Barbara, 1971; Ph.D., 1975. Professor.
- COLVARD, ANTHONY (1999)..... Associated Students, Incorporated
B.S., California State University, Fresno, 1987. Coordinator - Information
Technology.
- COLVIN, KURT (1999).....Industrial and Manufacturing Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S.,
Oregon State University, 1997; Ph.D., 1999. Professor. Registered Professional
Engineer, California.
- CONDON, JENNY (2004)..... Intercollegiate Athletics
B.S., Iowa State University, 1991. Head Coach, Softball.
- CONN, W. DAVID (1999).....Office of the President
B.A., Oxford University, 1968; M.A., 1972; D.Phil., 1973. Associate Vice
President for Inclusive Excellence, Director of Ombuds Services, and Professor.
- CONNOR, DAREN (1993)..... Associated Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 1990; MA, 2004.
Assistant Director for Programs.
- CONOVER, MARK (1996)..... Intercollegiate Athletics
B.S., Humboldt State University, 1983; M.S., California Polytechnic State
University, San Luis Obispo, 1989. Head Coach, Cross Country.
- CONWAY, JAMES R. (1969)..... Communication Studies
B.A., California State College, Los Angeles, 1966; M.A., 1968; Ph.D., University
of Southern California, 1977. Professor Emeritus.
- COOPER, KEVIN (2005)..... Graphic Communication
B.S., California Polytechnic State University, San Luis Obispo, 1980; M.B.A.,
University of Southern California, 1990. Associate Professor.
- COOPER, SUSAN M. (2006)..... Mathematics
B.Sc., University of Regina, 1998; M.Sc., Queen's University, 2000; Ph.D., 2005.
Assistant Professor.
- CÓRDOVA, CARLOS (1994).....Office of the President
B.A., Loyola-Marymount University, 1980; M.A., University of California, Santa
Barbara, 1982; J.D., University of California, Los Angeles, 1985. Member of the
California Bar. University Legal Counsel.
- COSTANZO, PHILIP (2007)..... Chemistry and Biochemistry
B.S., Carnegie Mellon University, 2001; Ph.D., University of California, Davis,
2005. Assistant Professor.

- COSTELLO, ENRICA LOVAGLIO (2002)Art and Design
M.A., University of California, Santa Barbara, 2001; M.F.A. equivalent,
University of Studies of Genova, Italy, 1996. Associate Professor.
- COSTELLO, MICHAEL J. (1999) Horticulture and Crop Science
B.S., California Polytechnic State University, San Luis Obispo, 1981; Ph.D.,
University of California, Berkeley, 1992. Professor. Pest Control Advisor.
- COTKIN, GEORGE (1980) History
B.A., Brooklyn College (C.U.N.Y.), 1972; M.A., Ohio State University, 1974;
Ph.D., 1978. Professor.
- COTTLE, MATTHEW (2009) College of Engineering, University Advancement
B.B.A., University of Kentucky, 1981; M.B.A., University of Cincinnati, 1984.
Assistant Dean. Director, College of Engineering Advancement.
- CRABB, A. CHARLES (1978-1997) (2010) Academic Affairs
B.S., University of California, Davis, 1973; M.S., Bowling Green State University
1974; Ph.D., University of California, Davis, 1991. Assistant to Provost for
Academic Facilities.
- CRAIN, CARSON (1989) College of Liberal Arts
B.A., California Polytechnic State University, San Luis Obispo, 1972.
Administrative Operations Analyst.
- CRAWFORD, MICHELLE (2005) Associated Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 2005; M.S., 2009.
Coordinator – ASI Programs.
- CROCKETT, ROBERT (2003) Biomedical and General Engineering
B.S., University of California, Berkeley, 1989; M.B.A., Pepperdine University,
1992; Ph.D., University of Arizona, 1997. Professor and General Engineering
Program Director.
- CROZIER, ALEX (1992) Intercollegiate Athletics
B.S., California Polytechnic State University, San Luis Obispo, 1984. Head
Coach, Women’s Soccer.
- CURCIO, KARA (2008) University Housing
B.S., University of Pittsburg, 2002; M.A., Indiana University of Pennsylvania,
2004. Learning Community Coordinator.
- DANDEKAR, HEMALATA (2009) City and Regional Planning
B.Arch., University of Bombay, India, 1967; M.Arch., University of Michigan,
1969; Ph.D., University of California, Los Angeles, 1978. Professor and
Department Head. Registered Architect, California.
- DANES, JEFFREY E. (1986) Marketing
B.A., San Jose State University, 1972; M.A., 1974; Ph.D., Michigan State
University, 1976. Professor.
- DANG, LI (2007) Accounting
Ph.D., Drexel University, 2004. Associate Professor.
- DANIELS, DENISE H. (2003) Psychology and Child Development
B.A., University of California, Santa Barbara, 1982; M.A., Pacific Oaks College,
1983; Ph.D., University of California, Los Angeles, 1992. Professor.
- D’ACQUISTO, JOSH (2002) Associated Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 1995. Assistant
Director, Recreational Sports Facilities.
- DAUGHERTY, M. STEVEN (1988) Animal Science
B.S., New Mexico State University, 1977; M.S., Colorado State University, 1979;
Ph.D., New Mexico State University, 1984. Professor.
- DAVIES, THOMAS H. (1983) Music
B.M.E., Bowling Green State University, 1975; M.A., 1977; D.M.A., University
of Southern California, 1983. Professor.
- D’AVIGNON, INDIA (2007) Music
B.M.E., Wittenberg University, 1974; M.A., The Ohio State University, 1980.
Assistant Professor.
- DAVIS, DONNA (1984) Student Academic Services
B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A. 1977.
Academic Advisor/Coordinator, Connections for Academic Success.
- DAVIS, GERALD E. (2001) Health Services
R.Ph., Drake University, 1961. Pharmacist.
- DAVIS, STEVEN C. (1987) Kinesiology
B.S., University of California, Davis, 1979; M.S., San Diego State University,
1983; Ph.D., Pennsylvania State University, 1986. Professor.
- DAVOL, ANDREW I. (1999) Mechanical Engineering
B.S.M.E., California Polytechnic State University, San Luis Obispo, 1987;
M.S.M.E., University of California, San Diego, 1993; Ph.D., 1998. Professor and
Department Chair. Registered Professional Engineer, California.
- DeCOSTA, JEAN (1994) Dean of Students
B.A., San Francisco State University, 1972; M.S., California Polytechnic State
University, San Luis Obispo, 1986; Ph.D., Fielding Institute, 1993. Dean of
Students.
- De HAHN, HENRI T. (2006) Architecture
Baccalaureat Scientifique, Collège Saint-Michel, Switzerland, 1979; M.Arch.,
Ecole Polytechnic Fédérale de Lausanne, Switzerland, 1979. Professor and
Department Head.
- De HAHN, TRACEE (2008) University Advancement
B.Arch., University of Kentucky, 1991; M.A., 2000. Director, Alumni Relations.
- DEKHTYAR, ALEXANDER (2007) Computer Science
Ph.D., University of Maryland College Park, 2000. Associate Professor.
- De LAY, ANN M. (2008) Agricultural Education and Communication
B.S., California State University, Fresno, 1997; M.S., California Polytechnic State
University, San Luis Obispo, 2002; Ph.D., University of Florida, 2008. Assistant
Professor.
- DELMORE, ROBERT J., JR. (2003) Animal Science
B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S.,
University of Nebraska, 1993; Ph.D., Colorado State University, 1998. Professor.
- DEL RIO, VICENTE (2001) City and Regional Planning
B.Arch., Universidade Federal do Rio de Janeiro, 1978; M.U.R.P., Universidade
do Estado do Rio de Janeiro, 1979; M.A., Oxford Polytechnic, 1981; Ph.D.,
Universidade de São Paulo, 1991. Professor.
- DEL VALLE, OSVALDO (2010) University Housing
B.A., University of Illinois at Chicago, 1998; M.A., DePaul University, 2004;
Ed.M., Boston University, 2008. Learning Community Coordinator.
- DeNATALE, JAY S. (1988) Civil and Environmental Engineering
B.S., University of California, Davis, 1977; M.S., 1979; Ph.D., 1983. Professor
Emeritus. Registered Professional Engineer, California.
- DEN HARTOG, CHRISTOPHER (2006) Political Science
B.A., University of California, San Diego, 1996; Ph.D., 2004. Associate Professor.
- DEN OTTER, RONALD (2005) Political Science
B.A., University of California, Davis, 1989; J.D., University of Pennsylvania,
1992; Ph.D., University of California, Los Angeles, 2003. Associate Professor.
- DePIERO, FRED W., (1996) College of Engineering, Electrical Engineering, and
Computer Engineering
B.S., Michigan State University, 1985; M.S., 1987; Ph.D., University of
Tennessee, 1996. Professor and Associate Dean.
- DERELIAN, DORIS (2004) Food Science and Nutrition, University Library
B.S., California State University, Fresno, 1968; M.S., University of California,
Davis, 1975; Ph.D., University of California, Los Angeles, 1994; J.D., University
of California, Davis, 2001. Professor and OLLI Program Director. Registered
Dietitian.
- DERICKSON, DENNIS (2005) Electrical Engineering
B.S., South Dakota State University, 1981; M.S., University of Wisconsin–
Madison, 1988; Ph.D., University of California, Santa Barbara, 1992. Associate
Professor and Department Chair.
- DETURRIS, DIANNE J. (1998) Aerospace Engineering, Academic Programs
B.S., Georgia Institute of Technology, 1984; M.S., Pennsylvania State University,
1986; Ph.D., Virginia Polytechnic Institute and State University, 1992. Professor
and Director, Global Technical Education Initiatives.
- DETWEILER, ROBERT C. (1998) History
B.A., Humboldt State University, 1960; M.A., San Francisco State University,
1968; Ph.D., University of Washington, 1968. Trustee Professor.
- DICUS, CHRISTOPHER A. (2001) Natural Resources Management
B.S., Louisiana Tech University, 1992; M.S., Utah State University, 1995; Ph.D.,
Louisiana State University, 2000. Professor. Registered Professional Forester,
California.
- DIETTERICK, BRIAN C. (1994) Natural Resources Management
B.A., University of Pennsylvania, 1980; M.S., University of Arizona, 1982; Ph.D.,
Penn State University, 1994. Professor.

- DISANTO, THOMAS L. (2003)..... Architecture
M.Arch., California State Polytechnic University, Pomona, 1989; B.Arch, 1997;
Ecole D'Architecture De Paris, La Defense, 1999. Associate Professor.
- DJASSEMI, MANOCHER (2003) Industrial Technology
B.S., University of Science and Technology, Tehran, 1977; M.S., University of
Wisconsin-Milwaukee, 1990; Ph.D., 1994. Professor.
- DOBSON, JOHN (1990).....Finance
B.A., University of Lancaster, England, 1979; M.A., University of South Carolina,
1981; Ph.D., 1988. Professor.
- DOERFLER, JAMES A. (2005) Architecture
B.A., University of Hartford, 1981; M.Arch., Syracuse University of Architecture,
1985. Professor. Registered Architect, New York, Australia.
- DOI, JIMMY A. (2003).....Statistics
B.A., California State University, Northridge, 1995; M.S., North Carolina State
University, 1998; Ph.D., 2003. Associate Professor.
- DOLAN, DALE S.L. (2009) Electrical Engineering
B.S., University of Toronto, Ontario, Canada, 2003; M.S., 2005; Ph.D., 2008.
Assistant Professor.
- DOMINGUES, ANTHONY (1985)..... Admissions, Recruitment and Financial Aid
B.S., California Polytechnic State University, San Luis Obispo, 1979. Senior
Assistant Director.
- DOMINGUEZ, ROJEAN Y. (1994)Health Services
B.S., Central Michigan University, 1972; M.P.H., University of Michigan, 1997.
Health Educator.
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B.A., University of California, Berkeley, 2002; M.A., Antioch New England
Graduate School, 2005. Access Specialist/Supervisor of Accommodations.
- DONEGAN, LORRAINE D. (2002)..... Graphic Communication
B.S., California Polytechnic State University, San Luis Obispo, 1997; M.A., 2001.
Associate Professor.
- DONG, KEVIN J. (2001) Architectural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1986; M.S.,
University of California, Berkeley, 1988. Professor. Registered Structural
Engineer and Professional Engineer, California.
- DOVE, DANIEL (2005).....Art and Design
B.F.A., University of Texas at Austin, 1994; M.F.A., Yale University, 1996.
Associate Professor.
- DUERK, DONNA P. (1981) Architecture
B.Arch., North Carolina State University, 1971; B.A., 1972; M.Arch.A.S.,
Massachusetts Institute of Technology, 1980. Professor Emeritus. Registered
Architect, Texas.
- DUFFY, BERNARD K. (1988) Communication Studies
B.A., San Jose State College, 1970; M.A., 1971; Ph.D., University of Pittsburgh,
1976. Professor.
- DUFFY, SUSAN (1988) Theatre and Dance
B.A., Seton Hill College, 1973; M.A., University of Pittsburgh, 1974; Ph.D., 1979.
Professor.
- DUFFY, TREY (2006)Disability Resource Center
B.A., California State University, Hayward, 1980; M.Ed., San Jose State
University, 1984. Director.
- DUGAN, TIMOTHY J. (1999) Theatre and Dance
B.A., California State University, Sacramento, 1993; M.F.A., Temple University,
1996. Professor and Department Chair.
- DUKE, JULIETTE (2004)University Housing
B.S., Barry University, 1997; M.Ed., University of South Florida, 2001. Associate
Director of Apartment Life and Education.
- DURGIN, WILLIAM W. (2006) Aerospace Engineering
Sc.B., Brown University, 1964; M.S., University of Rhode Island, 1966; Ph.D.,
Brown University, 1970. Professor.
- DUTT, SAMIR (2007)Finance
M.S., Indian Institute of Technology, New Delhi, 1979; Ph.D., State University of
New York, Stony Brook, 1987; Ph.D., University of California, Berkeley, 2006.
Associate Professor.
- ECHOLS, ERIN (2006)..... Student Life and Leadership
B.S., University of New Haven, 1998; M.F.A., North Carolina School of the Arts,
2001. Coordinator, Pride Alliance: LGBT Center.
- ECHOLS, ROBERT (1999) Physics
B.S., University of California, Davis, 1992; M.S., 1994; M.S., University of
California, Santa Cruz, 1996; Ph.D., 1999. Associate Professor.
- EDWARDS, MARK S. (2007) Animal Science
B.A., Miami University, 1987; Ph.D., Michigan State University, 1995. Associate
Professor.
- ELFRINK, T. LEIGH (1980) Administration and Finance
B.A., California Polytechnic State University, San Luis Obispo, 1978; M.A., 1998.
Associate Director, Facilities Administration.
- ELLIOT, DENNIS K. (1985) Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1993. Registered
Professional Engineer. Chief Engineer, Facility Services.
- ELLIS, REBECCA (1987) Management
B.A., University of Wisconsin, Madison, 1969; M.A., 1971; M.S., 1981; Ph.D.
1984. Professor.
- ELROD, SUSAN L. (1997)..... Biological Sciences
B.S., California State University, Chico, 1986; Ph.D., University of California,
Davis, 1995. Professor.
- ENGLE, PATRICE L. (1980)Psychology and Child Development
B.A. Wellesley College, 1966; Ph.D., Stanford University, 1971. Professor
Emeritus.
- ENRIQUEZ, GUSTAVO (2010)Student Academic Services
B.A., California State University, Fresno, 2008. Academic Advisor/Coordinator,
Upward Bound.
- ERISEN, ELIF (2008) Political Science
B.A., Bogazici University, Istanbul, 1999; M.Sc., London School of Economics
and Political Science, Merit, 2000; Ph.D., Stony Brook University, 2008. Assistant
Professor.
- ESTES, ALLEN C. (2007) Architectural Engineering
B.S., United States Military Academy, 1978; M.S., Stanford University, 1987;
M.B.A., Long Island University, 1989; Ph.D., University of Colorado, 1997.
Professor and Department Head. Registered Civil Engineer, Virginia.
- FAGAN, KEVIN (2001)Modern Languages and Literatures
B.A., Gregorian University, Rome, 1972; M.A., 1977; M.A., Texas Tech
University, 2000; Ph.D., 2003. Associate Professor.
- FAHS, MICHAEL L. (1983)..... Communication Studies
A.B., California State University, Long Beach, 1972; M.A., University of
Southern California, 1974; Ph.D., 1976. Professor.
- FARKYE, NANA Y. (1990)Dairy Science
B.Sc. (Hon), University of Ghana, 1980; M.S., Utah State University, 1985; Ph.D.,
1986. Professor.
- FARUQUE, OMAR (1989).....Landscape Architecture
B.S.L.A., Texas A & M University, 1971; M. Arch., 1972. Professor. Registered
Architect, Texas, and Landscape Architect, Texas and Indiana.
- FERNFLORES, FRANCISCO (2000).....Philosophy
B.Sc., University of Toronto, 1992; M.A., University of Western Ontario, 1993;
Ph.D., 1998. Associate Professor.
- FERNFLORES, RACHEL (2006)Philosophy, Women's and Gender Studies
B.A., University of Regina, 1993; M.A., University of Saskatchewan, 1995; Ph.D.,
Queens University, 2006. Assistant Professor.
- FERNANDO, RAYMOND (2002) Chemistry and Biochemistry
B.S., University of Sri Jayewardenepura, Sri Lanka; Ph.D., North Dakota State
University, Fargo, 1986. Professor, The Arthur C. Edwards Endowed Chair in
Coatings Technology and Ecology.
- FERNSLER, JONATHAN (2006) Physics
B.S., College of William and Mary, 1996; M.S., University of Colorado, Boulder,
1999; Ph.D., 2004. Assistant Professor.
- FERREIRA, LESLIE S. (1978).....Dairy Science
B.S., California State Polytechnic College, 1970; M.S., University of Illinois,
1972; Ph.D., Utah State University, 1980. Professor Emeritus.
- FERRERO, VALERIE (2000) Admissions, Recruitment and Financial Aid
B.A., California State University, Chico, 1982. Senior Admissions Advisor.
- FIDOPIASTIS, PANTELIS M. (2006) Biological Sciences
B.A., California State University, Fullerton, 1992; M.A., 1995; Ph.D., University
of Hawaii, Manoa, 2001. Associate Professor.

- FIEGEL, GREGG L. (1995)..... Civil and Environmental Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1990; M.S.,
University of California, Davis, 1992; Ph.D., 1995. Professor. Registered
Professional Engineer and Geotechnical Engineer, California.
- FINE, EVE (2002)..... Office of the Registrar
B.S., San Jose State University, 2000. Academic Progress Counselor.
- FINGER, HELENE (1997)..... College of Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1988; M.S., 1998.
Director, Women's Engineering Program.
- FIORENZA, GIANCARLO (2008)..... Art and Design
B.A., University of California, Santa Cruz, 1991; M.A., Johns Hopkins University,
1993; Ph.D., 2000. Assistant Professor.
- FIORITO, BASIL A. (1977)..... Psychology and Child Development
B.A., Marist College, 1968; M.S., New York University, 1970; M.A., 1975; Ph.D.,
Syracuse University, 1977. Professor Emeritus. Licensed Marriage, Family and
Child Counselor, California.
- FIRPO, CHRISTINA E. (2006)..... History
B.A., The George Washington University, 2000; M.A., University of California,
Los Angeles, 2002; Ph.D., 2007. Assistant Professor.
- FISHER, ERIC (2007)..... Economics
M.A., John Hopkins School of Advanced International Studies, 1979; Ph.D.,
University of California, Berkeley, 1985. Professor.
- FISHER, GENE L. (1991)..... Computer Science
B.S., University of California, Irvine, 1973; Ph.D., 1985. Professor.
- FITZHENRY, WILLIAM (1997)..... English
B.A., State University of New York at Buffalo, 1984; M.A., University of
Colorado, 1991; Ph.D., Duke University, 1997. Associate Professor.
- FLEISHON, NEIL L. (1985)..... Physics
S.B., Massachusetts Institute of Technology, 1973; M.A., University of California,
Berkeley, 1975; Ph.D., 1979. Professor.
- FLORES, MARIA D. (2001)..... Orfalea College of Business
B.S., California State Polytechnic University, Pomona, 1985. Administrative
Analyst.
- FLORES, ROBERT A. (1983)..... Agricultural Education and Communication
B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., 1978;
Ph.D., Texas A & M University, 1989. Professor.
- FLOYD, BARRY (1990)..... Management
B.S., Michigan State University, 1973; M.S., 1974; M.B.A., University of
Michigan, 1983; Ph.D., 1985. Professor.
- FOGLE, EMILY (2007)..... Chemistry and Biochemistry
B.A., Sonoma State University, 2000; Ph.D., University of California, Davis,
2005. Assistant Professor.
- FOLGER, ROBERT K. (2004)..... Admissions, Recruitment and Financial Aid
B.A., University of Arizona, 1998. Financial Aid Counselor.
- FOROOHAR, MANZAR (1987)..... History
B.A., National University of Iran; M.A., California State University, Northridge,
1973; C. Phil., University of California, Los Angeles, 1978; Ph.D., 1984. Professor.
- FORSTER, SOPHIA (2008)..... English
B.A., York University, 1998; M.A., University of Victoria, 2001; Ph.D., State
University of New York at Buffalo, 2008. Assistant Professor.
- FOWLER, THOMAS, IV (1995)..... Architecture
B.Arch., New York Institute of Technology/Old Westbury, 1984; M.Arch.,
Cornell University, 1994. Professor. Registered Architect, New York.
- FRAME, SAMUEL (2007)..... Statistics
B.S., California Polytechnic State University, San Luis Obispo, 2001; M.S.,
University of California, Santa Barbara, 2004; Ph.D., 2007. Assistant Professor.
- FRAYNE, COLETTE (1992)..... Management
B.S., University of Delaware, 1980; M.B.A., University of San Diego, 1981;
Ph.D., University of Washington, 1986. Professor.
- FREBERG, LAURA A. (1987)..... Psychology and Child Development
B.A., University of California, Los Angeles, 1974; M.A., 1975; Ph.D., 1979.
Professor.
- FREED, TALI (2001)..... Industrial and Manufacturing Engineering
B.Sc., Technion-Israel Institute of Technology, Israel, 1983; M.Sc., 1988; Ph.D.,
University of California, Berkeley, 1995. Associate Professor.
- 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.
- FRISCH, SHERYL (1990)..... Art and Design
B.A., University of California, Riverside, 1983; M.A., 1988. Visual Resource
Specialist.
- FRITZ, SUZANNE (1992)..... University Housing
B.S., University of California, Davis, 1985; M.Ed., University of Vermont, 1987.
Associate Director of Residential Life and Education.
- FRYER, STUART (2008)..... Office of the Registrar
B.A., Norwich College, U.K., 1991; DIP.M., 1991. Articulation Officer.
- FUENTES, DANIEL (2008)..... Student Academic Services
B.A., California State University, Fresno, 2008. Outreach Counselor/Advisor,
Educational Talent Search.
- GALANTI, TERA (2008)..... Art and Design
B.F.A., California State University, Long Beach, 1986; M.F.A., 1995. Assistant
Professor.
- GALLAGHER, BETH (2011)..... Administration and Finance
B.A., Antioch University, 1996; M.A., 1998; M.S., California School of
Professional Psychology, 2001. Director, Human Resources.
- GARCIA, ANTONIO F. (2001)..... Physics
B.A., University of California, Los Angeles, 1988; B.S., San Jose State University,
1994; M.S., The University of New Mexico, 1996; Ph.D., University of California,
Santa Barbara, 2001. Associate Professor.
- GARCIA, JOHN (2009)..... Health Services
B.S., University of California, Los Angeles, 1981; M.D., University of California,
Davis, 1985. Physician.
- GARCIA, JULIE A. (2007)..... Psychology and Child Development
B.A., California State University, San Bernardino, 1996; Ph.D., University of
Michigan, Ann Arbor, 2005. Associate Professor.
- GARCIA, STEVEN (1999)..... Associated Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 2006. Coordinator
– Facilities Operations.
- GARNER, LAUREN C. (2005)..... Horticulture and Crop Science
B.S., The College of William and Mary, 1992; M.S., Cornell University, 1996;
Ph.D., University of California, Riverside, 2004. Associate Professor.
- GEARHART, RICHARD O. (2006)..... Brock Center for Agricultural Communication
B.S., California Polytechnic State University, San Luis Obispo, 1991. Director.
- GEE, VERA (1985)..... Admissions, Recruitment and Financial Aid
B.S., California Polytechnic State University, San Luis Obispo, 1982. Data Analyst.
- GELLING, JUNE A. (2004)..... Health Services
B.S., University of California, Santa Barbara, 1980; Pharm.D., University of
Southern California, 1986. Pharmacist-in-Charge.
- GENTILUCCI, JAMES L. (2003)..... School of Education
B.A., California State University, Northridge, 1980; M.A., California Polytechnic
State University, San Luis Obispo, 1985; Ph.D., University of California, Santa
Barbara, 2001. Associate Professor.
- GERINGER, J. MICHAEL (1992)..... Management
B.S., Indiana University, 1980; M.B.A., University of Washington, 1983; Ph.D.,
1986. Professor.
- GHARIBYAN, HASMIK (2000)..... Computer Science
M.S., Yerevan State University, Republic of Armenia, USSR, 1981; Ph.D., 1991.
Professor.
- GIBERTI, BRUNO (1994)..... Architecture, Center for Teaching and Learning
B.S. Arch., California Polytechnic State University, San Luis Obispo, 1980;
M.Arch., University of California, Berkeley, 1989; Ph.D., 1994. Professor,
Director, Center for Teaching and Learning, and WASC Accreditation
Coordinator. Registered Architect, California.
- GILBERT, BARBARA J. (2003)..... Counseling Services
A.B., University of Missouri, 1982; M.A., Southern Illinois University, 1985;
Ph.D., 1988. Psychologist.
- GILL, SAMANTHA J. (1997)..... Natural Resources Management, BioResource
and Agricultural Engineering
B.S., Humboldt State University, 1991; M.S., 1993; Ph.D., University of
California, Berkeley, 1997. Professor. Registered Professional Forester,
California.

- GILLEN, GLEN D. (2006).....Physics
B.S., Denison University, 1994; M.S., Miami University, 1996; M.A.T., 1997;
M.S., The Ohio State University, 2001; Ph.D., 2002. Assistant Professor.
- GILLEN, KATHARINA (2006) Physics
Vordiplom, Rheinische Friedrich-Wilhelms Universität Bonn, 1998; M.S., The
Ohio State University, 2000; Ph.D., 2005. Assistant Professor.
- GILLETTE, DAVID (2001).....English, Liberal Arts and Engineering Studies
B.A., University of Iowa, 1985; M.A., University of New Mexico, 1992; Ph.D.,
1995. Associate Professor and Co-Director, Liberal Arts and Engineering Studies.
- GOBLE, MARK (2008) Counseling Services
B.S., Excelsior College, 2006. Information Technology Consultant.
- GOEL, RAKESH K. (1997)..... Civil and Environmental Engineering
B.Tech, Indian Institute of Technology, New Delhi, 1982; M.S., University of
California, Berkeley, 1985; Ph.D., 1990. Professor and Department Chair.
Registered Professional Engineer, California.
- GOERS, JOHN W. F. (1980) Chemistry and Biochemistry
B.S., University of Illinois, 1969; Ph.D., University of California, Los Angeles,
1974. Professor Emeritus.
- GOLD, ANNA (2008)..... University Library
B.A., University of California, Santa Cruz, 1976; M.L.S., Catholic University of
America, 1982; M.S., Virginia Polytechnic and State University, 1999. Associate
Dean.
- GOLDEN, BRUCE L. (2007) Dairy Science
B.S., Washington State University, Pullman, 1981; M.S., 1983; Ph.D., Colorado
State University, 1991. Professor and Department Head.
- GOLDENBERG, MARNI (2003) Recreation, Parks, and Tourism Administration
B.S., California State University, Sacramento, 1995; M.S., Purdue University,
1997; Ph.D., University of Minnesota, 2002. Associate Professor.
- GOMEZ, PETRA (2008).....Student Academic Services
B.A., University of California, Santa Barbara, 2008. Outreach Counselor/Advisor,
Educational Talent Search.
- GONZALEZ, LUIS (2007) Student Academic Services
B.A., University of California, Santa Barbara, 2003; M.A., 2007; additional
graduate study. Director, Upward Bound.
- GOODMAN, ANYA (2005) Chemistry and Biochemistry
B.S., Florida Atlanta University, 1996; Ph.D., Massachusetts Institute of
Technology, 2003. Associate Professor.
- GOODMAN, BRENT S. (2005) Institutional Planning and Analysis
B.A., University of Northern Colorado, 1989; M.S., 1997. Director, Institutional
Planning and Analysis.
- GORMAN, LARRY R. (1997) Finance
B.S., Washington State University, 1985; M.B.A., Western Washington
University, 1988; Ph.D., Northwestern University, 1998. Professor.
- GRAGSON, DEREK E. (1999) Chemistry and Biochemistry
B.S., California State University, Hayward, 1991; M.S., University of Oregon,
1995; Ph.D., 1997. Professor.
- GRANGER, BRIAN E. (2008) Physics
B.S., Westmont College, 1994; Ph.D., University of Colorado at Boulder, 2001.
Assistant Professor.
- GREENWALD, HARVEY C. (1973)..... Mathematics
B.S., Massachusetts Institute of Technology, 1964; M.A., Washington University,
1966; Ph.D., 1970. Professor Emeritus.
- GREENWOOD, JERUSHA B. (2006) Recreation, Parks, and Tourism
Administration
B.S., University of Utah, 1998; M.S., 2002; Ph.D., North Carolina State
University, 2006. Assistant Professor.
- GREENWOOD, P. BRIAN (2006) Recreation, Parks, and Tourism Administration
B.A., University of North Carolina at Chapel Hill, 1996. M.S., North Carolina
State University, 2001; Ph.D., 2007. Assistant Professor.
- GREIG, PATRICIA (1983)..... Associated Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 1981. Assistant
Director, Children's Programs.
- GREVE, ADRIENNE I. (2006) City and Regional Planning
B.S., Cornell University, 1996; M.S., Colorado State University, Ft. Collins, 1999;
Ph.D., University of Washington, Seattle, 2007. Assistant Professor.
- GRIFFIN, LANNY (1997) Biomedical and General Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1992; Ph.D.,
University of California, Davis, 1996. Professor and Department Chair.
- GRIFFIN, PATRICK E. (1983) Administration and Finance
B.A., California Polytechnic State University, San Luis Obispo, 1982; M.A., 1989.
Supervisor, Building Trades, Facility Services.
- GRIFFITH, A. ELIZABETH (2005)..... Physics
B.A., Wellesley College, 1994; Ph.D., Cornell University, 2000. Assistant
Professor.
- GRIGGS, KENNETH A. (1999)..... Management
B.A., University of Maryland, 1972; M.S., 1975; M.B.A., 1979; Ph.D., 1989.
Professor.
- GRIMES, JOSEPH E. (1973)..... Computer Science
B.A., St. Ambrose University, 1963; M.S., Illinois State University, 1968; Ph.D.,
Iowa State University, 1973. Professor Emeritus.
- GRISE, RICHARD (1988) Student Academic Services
B.S., Western Kentucky University, 1975; M.S., California State University, San
Jose, 1984. Analyst/Programmer.
- GRUNDMEIER, TODD A. (2004)..... Mathematics
B.S., University of New Hampshire, 1997; M.S., 2000; Ph.D., 2003. Associate
Professor.
- GU, CAIXING (1998) Mathematics
B.S., Zhejiang University, 1982; M.S., China Textile University, 1986; Ph.D.,
Indiana University, 1994. Professor.
- GUISE, MEGAN (2009) English
B.S., Millersville University, 2002; M.Ed., 2004; Ph.D., University of Pittsburgh,
2009. Assistant Professor.
- GUTHRIE, JAMES (2009) Architectural Engineering
B.S., University of California, Davis, 1972; M.S., University of California,
Berkeley, 1973. Assistant Professor. Registered Structural Engineer and Civil
Engineer, California.
- GUTIERREZ, THOMAS D. (2006) Physics
B.S., San José State University, 1991; M.S., 1994; Ph.D., University of California,
Davis, 2000. Associate Professor.
- HAAG, SARAH (2009) Counseling Services
B.A., Humboldt State University, 2003; Ph.D., University of Iowa, 2008.
Counselor.
- HABIB, KENNETH (2006) Music
B.A., University of California, Los Angeles, 1983; M.A., University of California,
Santa Barbara, 1995; Ph.D., 2005. Associate Professor.
- HAGEN, CHARLES T. (1980) Philosophy
B.A., Harvard University, 1968; M.A., University of Michigan, 1977; Ph.D., 1981.
Professor Emeritus.
- HAGEN, JOHN (2001) Chemistry and Biochemistry
B.S., University of Nevada, Las Vegas, 1992; Ph.D., Stanford University, 1996.
Associate Professor.
- HAGOBIAN, TODD A. (2009) Kinesiology
B.A., University of Southern California, 1991; M.A., San Francisco State
University, 2002; Ph.D., University of Massachusetts at Amherst, 2007. Assistant
Professor.
- HALEY, MARK (2007) Health Services
B.S., California Polytechnic State University, San Luis Obispo, 1984; M.Phys.A.,
Samuel Merritt College, 2003. Physician Assistant.
- HALISKY, LINDA H. (1984)..... College of Liberal Arts, English
B.A., Whittier College, 1968; M.A., University of California, Riverside, 1978;
Ph.D., 1984. Professor and Dean.
- HALL, GARRETT J. (2002)..... Civil and Environmental Engineering
B.S., Worcester Polytechnic Institute, 1992; M.S., University of Washington,
1993; Ph.D., University of California, Berkeley, 2001. Associate Professor.
- HALL, KELLIE G. (1990) Kinesiology
B.S., Rocky Mountain College, 1977; M.S., Eastern Washington University, 1987;
Ph.D., Louisiana State University, 1990. Professor.
- HALL, LAURA M. (2009)..... Food Science and Nutrition
B.S., California Polytechnic State University, San Luis Obispo, 2003; Ph.D.,
University of California, Davis, 2008. Assistant Professor. Registered Dietitian.

- HALL, MICHAEL H. (1974)..... Animal Science
B.S., California Polytechnic State University, San Luis Obispo, 1973; M.S.,
Kansas State University, 1975. Professor.
- HALLOCK, BRENT G. (1979) Earth and Soil Sciences
B.S., University of California, Davis, 1970; M.S., 1972; Ph.D., 1976. Professor
Emeritus. Certified Professional Soil Scientist; Certified Professional Soil Erosion
and Sediment Control Specialist.
- HAMILTON, LYNN (1996) Agribusiness
B.S., Ohio State University, 1988; M.S., University of Minnesota, 1995; Ph.D.,
1996. Professor.
- HAMILTON, STEPHEN (2004) Economics
B.A., University of California, Santa Barbara, 1991; M.S., University of
California, Berkeley, 1994; Ph.D., 1996. Professor and Area Chair.
- HAMMOND, AMIE (2007) Career Services
B.A., Occidental College, 1995; M.A., New York University, 1998. Career
Counselor.
- HAMPSEY, JOHN C. (1992) English
B.A., Holy Cross College, 1976; Ph.D., Boston College, 1982. Professor.
- HAMPSON, BRIAN C. (1991) Food Science and Nutrition
B.S., University of Illinois at Champaign-Urbana, 1981; M.S., 1983; Ph.D., 1988.
Professor.
- HANNINGS, DAVID W. (1974) Horticulture and Crop Science
B.S., Auburn University, 1972; M.S., Cornell University, 1974. Professor
Emeritus.
- HANSON, JAMES L. (2005) Civil and Environmental Engineering
B.S., University of Wisconsin, Madison, 1990; M.S., University of Minnesota,
Minneapolis, 1992; Ph.D., University of Wisconsin, Madison, 1996. Registered
Professional Engineer, Wisconsin. Professor.
- HANSON, MICHAEL T. (1978) Biological Sciences
B.S., Idaho State University, 1970; M.A., University of Missouri, 1973; Ph.D.,
Texas A & M University, 1976. Professor Emeritus.
- HARATANI, JOYCE T. (1986) Administration and Finance
B.S., University of California, Los Angeles, 1974; B.S., California Polytechnic
State University, San Luis Obispo, 1979. Manager, Human Resources.
- HARDING, TREVOR S. (2006) Materials Engineering
B.S., University of Michigan, 1995; M.S., 1997; Ph.D., 2000. Professor and
Department Chair.
- HARDY, KRISTIN M. (2011) Biological Sciences
B.S., Tulane University, 2003; Ph.D., University of North Carolina Wilmington,
2009. Assistant Professor.
- HARGRAVE, TERRY C. (1979) Architecture
B.Arch.Eng., Washington State University, 1965; M.Arch., Massachusetts
Institute of Technology, 1978. Professor Emeritus. Architect, California.
- HARKINS, JOY (2002) Student Life and Leadership
B.A., Claremont McKenna College, 2000; M.A., California Polytechnic State
University, San Luis Obispo, 2004; Ph.D., University of California, Santa Barbara,
2008. Coordinator, The Community CENTER.
- HARLAN, CRAIG (1986) History
B.A., University of California, Irvine, 1971; M.A., 1973; Ph.D., 1981. Professor
Emeritus.
- HARRIS, DAVID L. (2004) Health Services
B.S., California State University, Long Beach, 1971; M.D., University of East
Quezon City, 1976. Head of Medical Services.
- HARRIS, JAMES G. (1982) Electrical Engineering, Computer Engineering
B.S., University of California, Berkeley, 1961; M.S., 1962; Ph.D., Syracuse
University, 1968. Professor Emeritus.
- HARRIS, JOHN H. (1978) Natural Resources Management
B.S., Humboldt State College, 1968; M.S., 1970; Ph.D., Utah State University,
1972. Professor.
- HARRIS, KATHLEEN C. (2003) School of Education
B.A., Douglass College, Rutgers University, 1971; M.Ed., Rutgers University,
1972; Ph.D., Temple University, 1981. Professor.
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B.S., California Polytechnic State University, San Luis Obispo, 2003; M.A., 2006.
Admissions Officer.
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B.S., California Polytechnic State University, San Luis Obispo, 1973; M.A., 1975.
Associate Director.
- HARTIG, DONALD G. (1979) Mathematics
B.S., Rensselaer Polytechnic Institute, 1964; M.S., University of Wisconsin,
Milwaukee, 1966; Ph.D., University of California, Santa Barbara, 1970. Professor.
- HATTEN, GERRIE (2008) Admissions, Recruitment and Financial Aid
B.A., University of California, San Diego, 1984; M.A., National University, 1988.
Assistant Director of Financial Aid.
- HAUCK, ALLAN J. (2002) Construction Management
B.A., Kalamazoo College, 1973; M.Ed., Bowling Green State University, 1979;
Ph.D., University of Maryland, 1990. Professor and Department Head. Certified
Professional Constructor (CPC).
- HAUNGS, MICHAEL L. (2003) Computer Science,
Liberal Arts and Engineering Studies
B.S., University of California, Berkeley, 1992; M.S., Clemson University, 1998;
Ph.D., University of Davis, 2002. Associate Professor and Co-Director, Liberal
Arts and Engineering Studies.
- HAZELWOOD, SCOTT (2007) Biomedical and General Engineering
B.S., Harvey Mudd College, 1985; M.E., 1986; M.S., University of California,
Davis, 1992; Ph.D., 1998. Associate Professor.
- HEADRICK, DAVID H. (1998) Horticulture and Crop Science
B.S., California State Polytechnic University, Pomona, 1986; M.S., University of
California, Riverside, 1988; Ph.D., 1992. Professor. Pest Control Advisor,
California.
- HELMBRECHT, BRENDA (2004) English
B.A., Truman State University, 1997; M.A., Miami University, 1999; Ph.D., 2004.
Associate Professor, and Director of Writing.
- HENDERSON, STANLEY L. (1990) Dairy Science
B.S., Iowa State University, 1973; M.S., Southern Illinois University, 1976; Ph.D.,
Utah State University, 1990. Professor.
- HENDRICKS, WILLIAM W. (1994) Recreation, Parks, and Tourism Administration
B.A., California State University, Chico, 1980; M.B.P.A., John F. Kennedy
University, 1984; Ph.D., University of Utah, 1993. Professor.
- HERNANDEZ, ANITA (1999) School of Education
B.A., California State University, Chico, 1978; M.A., California State University,
Sacramento, 1990; Ph.D., Stanford University, 1999. Associate Professor.
- HERTER, ROBERTA J. (1998) School of Education
B.A., Michigan State University, 1969; M.A., 1979; Ph.D., University of
Michigan, 1998. Professor.
- HESS, JEFFREY (2007) Marketing
B.A., Biola University, 1986; M.B.A., Pepperdine, 1988; Ph.D., University of
Colorado-Boulder, 1998. Associate Professor.
- HEWES, AMY B. (1995) College of Engineering
B.A., Smith College, 1974; M.A., California Polytechnic State University, San
Luis Obispo, 1997. Director, Publications and Communications.
- HEY, DAVID W. (2008) Kinesiology
B.S., University of Wisconsin, La Crosse, 1987; M.S., 1993; Ph.D., Southern
Illinois University, 2004. Assistant Professor.
- HILL, JENNIFER L., CPT (2008) Military Science
B.S., University of Wisconsin - La Crosse, 2003.
- HILL, MARGARITA M. (2005) Landscape Architecture
B.S.L.A., University of California, Davis, 1986; M.S.C.D., 1989. Professor and
Department Head.
- HILLERS, KENNETH J. (2004) Biological Sciences
B.S., Western Washington University, 1980; Ph.D., University of Oregon, 1998.
Associate Professor.
- HILTPOLD, PAUL (1989) History
B.A., University of Texas, 1974; M.A., 1976; Ph.D., 1981. Professor.
- HIMELBLAU, EDWARD T. (2005) Biological Sciences
B.S., University of California San Diego, 1992; Ph.D., University of Wisconsin,
2000. Associate Professor.
- HOELLWARTH, CHANCE (1997) Physics
B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S.,
University of California, Davis, 1994; Ph.D., 1997. Associate Professor.

- HOLMAN, BRETT (2002) Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1988. Assistant Director for Accounts and Payment Management, Fiscal Services. Certified Public Accountant.
- HOLOCHER, PAUL (2006) Intercollegiate Athletics
B.A., Santa Clara University, 1990. Head Coach, Men's Soccer.
- HOLT, CRYSTAL L. (2007) Office of the Registrar
B.S., California Polytechnic State University, San Luis Obispo, 2006. Academic Progress Counselor.
- HOLTZ, ANDREW J. (2008) BioResource and Agricultural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1999; D.E., University of California, Davis, 2005. Assistant Professor. Registered Professional Engineer, California.
- HOLTZAPPLE, ROBERT (2008) Physics
B.A., University of California, Berkeley, 1988; M.S., Stanford University, 1991; Ph.D., 1996. Associate Professor.
- HOOPER, CRAIG (2008) Agribusiness
B.Kin., McMaster University, 1997; M.A., Biola University, 2005; M.A.C.A., 2005. Academic Advisor.
- HOPPER, MATTHEW S. (2006) History
B.A., Pepperdine University, 1996; M.A., Temple University, 1998; M.A., University of California, Los Angeles, 2000; Ph.D., 2006. Assistant Professor.
- HORD-SANDQUIST, KAREN (2011) Health Services
B.A., University of Colorado, Boulder, 1985; M.D., University of Colorado Health Sciences Center, Boulder, 1989. Physician.
- HORNEY, MARC R. (2009) Animal Science
B.S., California Polytechnic State University, San Luis Obispo, 1990; M.S., Oregon State University, 1992; Ph.D., University of Nebraska-Lincoln, 1999. Assistant Professor.
- HOWARD, WAYNE H. (1999) Agribusiness
B.A., California State University, 1974; M.Sc., University of Florida, 1982; Ph.D., Texas A&M University, 1987. Professor and Department Chair.
- HOWELL, ROBERT (1974) Art and Design
B.A., Brooks Institute, 1973; M.A., Pepperdine University, 1976. Professor.
- HOWES, DANIEL J. (2011) BioResource and Agricultural Engineering
B.S., University of California, Davis, 1997; M.S., California Polytechnic State University, San Luis Obispo, 2001; Ph.D., University of California, Irvine, 2010. Assistant Professor. Registered Professional Engineer, California..
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B.S., California Polytechnic State University, San Luis Obispo, 2006; M.S., 2008. Academic Advisor.
- HUNTER, MARK A. (2001) Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1987. Director, Facility Services.
- HURLEY, SEAN P. (2002) Agribusiness
B.A., University of San Francisco, 1994; Ph.D., Iowa State University, 2000. Associate Professor.
- HURT, SHELLEY L. (2008) Political Science
B.A., University of California, Berkeley, 1995; M.A., New School for Social Research, New York, 2001; Ph.D., 2008. Assistant Professor.
- HWANG, JENNIE M. (2007) Communication Studies
B.A., National Central University (Taiwan), 1998; M.A., Michigan State University, 2001; Ph.D., University at Buffalo, 2007. Assistant Professor.
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B.A., University of San Francisco, 2001; M.A., Chapman University, 2005; M.Ed.Psy., Azusa Pacific University, 2005. Credentialed Educational Psychologist Learning Disability Specialist.
- IDDINGS, GAYLE (1991) Physics
B.Sc., Imperial College, London, 1973; M.S., University of Colorado, 1977; Ph.D., 1982. Professor.
- IGNATOVA, ILIANA (2007) Statistics
B.M.S., Saint Kliment Ohridski University of Sofia, Bulgaria, 2001; M.S., University of South Carolina, 2003; Ph.D., 2007. Assistant Professor.
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B.S., California Polytechnic State University, San Luis Obispo, 1988; M.A., 1996. Associate Vice Provost for Systems and Resource Management.
- IMMOOS, CHAD E. (2004) Chemistry and Biochemistry
A.B., Occidental College, 1996; Ph.D., University of California, Irvine, 2002. Associate Professor.
- INCHAUSTI, ROBERT L. (1984) English
B.A., California State University, Sacramento, 1974; M.A., 1976; Ph.D., University of Chicago, 1981. Professor.
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B.S., B.A., University of California, Davis, 1989; M.A., 1992; Ph.D., Loyola University, Chicago, 2003. Associate Professor.
- IVERSEN, TONYA (1990) Associated Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 1986; M.B.A., 1996. Director, Children's Programs.
- JACKSON, BARBARA J. (1998) Construction Management
B.S., Colorado State University, 1975; M.S., 1998; Ph.D., 2000. Professor. Class A General Contractor, Virginia. Designated Design-Build Professional (DBIA).
- JACKSON, DOUGLAS (2008) Architecture
B.Arch., Virginia Polytechnic Institute and State University, 1993; M.Arch, Princeton University, 2000. Assistant Professor. Registered Architect, California.
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B.A., University of Western Ontario, 1987; M.A., Pennsylvania State University, 1989; Ph.D., 1992. Professor.
- JACOBS, JEFFREY A. (2003) Recreation, Parks, and Tourism Administration
B.A., University of Michigan, 1991; M.S.W., 1994; Ph.D., 2004. Associate Professor.
- JAGGIA, SANJIV (2007) Economics, Finance
B.A., Panjab University, India, 1981; Ph.D., Indiana University, Bloomington, 1990. Professor.
- JAMES, JENNIFER (2007) Agribusiness
B.S., University of California, Davis, 1994; M.S., 1996; Ph.D., 2000. Professor.
- JAMESON, KRISTINA K. (2008) Aerospace Engineering
B.S., California Polytechnic State University, San Luis Obispo, 2003; M.S., 2003; Ph.D., University of California, Los Angeles, 2008. Assistant Professor.
- JANKE, DAWN M. (2009) College of Liberal Arts
B.A., Northeastern Illinois University, 1997; M.A., Southern Illinois University-Carbondale, 2003. Director, University Writing and Rhetoric Center/EPT Coordinator.
- JANKOVITZ, KRISTINE Z. (1996) Kinesiology
B.S., California Polytechnic State University, San Luis Obispo, 1984; M.S., 1989; Ph.D., University of Nebraska-Lincoln, 1995. Associate Professor and Graduate Coordinator.
- JANOWICZ, ROSEMARIE (1993) Health Services
B.S., California Polytechnic State University, San Luis Obispo, 1978. Clinical Laboratory Scientist.
- JANSEN, DANIEL (2003) Civil and Environmental Engineering
B.S., University of California, San Diego, 1988; Ph.D., Northwestern University, 1996. Associate Professor.
- JANZEN, DAVID S. (2006) Computer Science
B.A., Tabor College, 1990; M.S., University of Kansas, 1993; Ph.D., 2006. Associate Professor.
- JAQUES, JODI D. (2001) School of Education
B.A., Saint Mary's College of California, 1986; M.Ed., Virginia Polytechnic Institute and State University, 1993; Ph.D., University of Virginia, 2000. Associate Professor.
- JASBINSEK, JOHN J. (2008) Physics
B.S., California State Polytechnic University, Pomona, 1992; M.A., University of California, Santa Barbara, 1994; Ph.D., University of Wyoming, 2008. Assistant Professor.
- JAVADPOUR, ROYA (2003) Industrial and Manufacturing Engineering
B.S., Isfahan University of Technology, 1993; M.S., Louisiana State University, 1996; M.S., 2000; Ph.D., 2001. Professor.
- JENNINGS, BETTY S. (2001) College of Liberal Arts
B.A., California Polytechnic State University, San Luis Obispo, 1995; M.A., 2000. Academic Advisor, College of Liberal Arts.

- JERICICH, GEORGE D. (1985) Art and Design
 B.A., San Jose State University, 1972; M.A., 1976; M.F.A., 1983. Professor Emeritus.
- JIMÉNEZ-FLORES, RAFAEL (1995) Dairy Science
 B.S., U. La Salle, Mexico City, 1981; M.S., Cornell University, 1984; Ph.D., University of California, Davis, 1989. Professor.
- JIN, XIAOMIN (2004) Electrical Engineering
 B.S., Tsinghua University, Beijing, China, 1992; M.S., 1996; Ph.D., University of Illinois at Urbana-Champaign, 2001. Associate Professor.
- JIPSON, JENNIFER (2005) Psychology and Child Development
 B.A., Smith College, 1993; M.S., University of California, Santa Cruz, 1996; Ph.D., 2000. Associate Professor.
- JOHNSON, ERIC B. (1980) Art and Design
 B.A., University of Oregon, 1971; M.A., University of New Mexico, 1975; M.F.A., 1978. Professor.
- JOHNSON, RICK (1987) Associated Students, Incorporated
 B.A., University of the Pacific, 1978; M.A., 1982; D.P.A., University of La Verne, 1999. Executive Director.
- JOHNSTON, HAL (1988) Construction Management
 B.S., Washington State University, 1970; M.S., University of Florida, 1983. Professor Emeritus. Certified Professional Estimator, Licensed General Contractor.
- JOHNSTON, SCOTT C. (2008) Physics
 B.S., Stanford University, 1999; M.S., 2000; Ph.D., University of California, Santa Barbara, 2006. Assistant Professor.
- JOINES, LAURA E. (1989) Architecture
 A.B. Vassar College, 1981; M.Arch., North Carolina State University, 1987. Professor. Registered Architect, California.
- JONES, BARRY K. (2001) Construction Management
 M.Sc., University of Aston, U.K., 1980; Ph.D., University of Southampton, U.K., 1999. Professor. Chartered Builder (FCIOB); Fellow American Society of Civil Engineers.
- JONES, CINDY (1999) Admissions, Recruitment and Financial Aid
 B.S., California Polytechnic State University, San Luis Obispo, 1979. Communications Analyst.
- JONES, DANE R. (1976) College of Science and Mathematics,
 Chemistry and Biochemistry
 B.A., University of Utah, 1969; Ph.D., Stanford University, 1974. Associate Dean and Professor.
- JONES, R. THOMAS (2003) College of Architecture and Environmental Design
 B.Arch., Cornell University, 1969. Dean. AIA, Registered Architect, California.
- JONES, TERRY L. (1998) Social Sciences
 B.A., University of California, Santa Cruz, 1978; M.A., Sonoma State University, 1982; M.A., University of California, Davis, 1989; Ph.D., 1995. Professor and Department Chair.
- JOSEPH, EILEEN E. (2006) College of Liberal Arts
 B.A., Bucknell University, 1988; M.A., University of Virginia, Charlottesville, 1992. Director of Advancement.
- JOVANOVIC, JASNA (2005) Psychology and Child Development
 B.S., University of Illinois, 1985; M.S., Pennsylvania State University, 1987; Ph.D. 1991. Associate Professor.
- JUNCO, MARIA L. (1989) Theatre and Dance
 B.A., University of California, Los Angeles, 1985; M.A., 1988. Professor. C.M.A. – Certified Movement Analyst.
- KACHLAKEV, DAMIAN I. (2000) Civil and Environmental Engineering
 B.S., University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, 1986 and 1988; M.S., 1988; Ph.D., Oregon State University, Corvallis, 1997. Professor. Registered Professional Engineer, Bulgaria.
- KAIWI-LENTING, ANDRENE (1994) Student Life and Leadership
 B.A., California Polytechnic State University, San Luis Obispo, 1991; M.A., 2007. Assistant Director/Coordinator, Orientation Programs.
- KANE, STEVEN (1994) School of Education
 B.A., California State Polytechnic University, Pomona, 1985; M.A., University of California, Los Angeles, 1989; Ph.D., 1993. Associate Professor. Licensed Psychologist, California.
- KANN, DAVID J. (1969) English
 B.A., Brandeis University, 1964; M.A., New York University, 1966; Ph.D., Occidental College, 1971. Postdoctoral study, State University of New York, Buffalo. Professor.
- KANTOROWSKI, ERIC J. (2004) Chemistry and Biochemistry
 B.S., California State University, Fullerton, 1993; Ph.D., University of California, Davis, 1998. Associate Professor.
- KASPER, ERIC P. (1997) Civil and Environmental Engineering
 B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S., University of California, Davis, 1992; Ph.D., University of California, Berkeley, 1997. Professor. Registered Professional Engineer, California.
- KATO, GORO C. (1981) Mathematics
 B.S., Shizuoka University, Japan, 1972; M.A., West Virginia University, 1974; Ph.D., University of Rochester, 1979. Professor.
- KAUL, ANTON (2003) Mathematics
 B.S., University of California, Davis, 1994; M.S., Oregon State University, 1996; Ph.D., 2000. Associate Professor.
- KAVIANI, CHRISTINA (2010) Student Life and Leadership
 B.S., University of California, Santa Cruz, 2004; M.A., California Polytechnic State University, San Luis Obispo, 2009. Coordinator, Women's Programs.
- KEAN, ANDREW J. (2004) Mechanical Engineering
 B.E., The Cooper Union, 1997; M.S., University of California, Berkeley, 1999; Ph.D., 2003. Associate Professor.
- KEARNS, TIMOTHY J. (2000) Information Technology Services, Computer Science
 B.A., Boston College, 1969; M.S., University of Notre Dame, 1970; Ph.D., 1976. Associate Professor and Vice Provost/Chief Information Officer.
- KEELING, DAVID L. (1975) Chemistry and Biochemistry
 B.S., Arizona State University, 1969; Ph.D., University of Hawaii, 1974. Professor Emeritus.
- KEELING, ELENA L. (1997) Biological Sciences
 B.S., Yale University, 1989; Ph.D., University of California, San Francisco, 1996. Professor.
- KEEN, AARON W. (2002) Computer Science
 B.S., University of California, Davis, 1997; M.S., 2000; Ph.D., 2002. Associate Professor.
- KEESE, JAMES R. (2003) Social Sciences
 B.S., California Polytechnic State University, San Luis Obispo, 1987; M.A., American Graduate School of International Management, 1989; Ph.D., University of Arizona, 1996. Associate Professor.
- KEESEY, DOUGLAS (1988) English, General Education Program
 B.A., University of California, Berkeley, 1982; M.A., 1984; Ph.D., Princeton University, 1988. Professor; Director, General Education Program.
- KEIF, MALCOLM G. (1989) Graphic Communication
 B.S., California Polytechnic State University, San Luis Obispo, 1986; M.A., California State University, Long Beach, 1989; Ph.D., University of Missouri, 1995. Professor.
- KEIL, DAVID J. (1976) Biological Sciences
 B.S., Arizona State University, 1968; M.S., 1970; Ph.D., Ohio State University, 1973. Professor Emeritus.
- KELLER, EARL C. (1987) Accounting
 B.B.A., University of Houston, 1963; M.B.A., University of Washington, 1970; Ph.D., University of Washington, 1973. Professor. Certified Public Accountant.
- KELLER, JOHN M. (2006) Physics
 B.S., Stanford University, 1991; M.A., 1992; M.S., University of Colorado, Boulder, 1999; Ph.D., University of Arizona, 2006. Assistant Professor.
- KELLEY, LAWRENCE R. (2002) Administration and Finance
 B.A., University of Akron, 1971; M.S., 1980. Vice President, Administration and Finance.
- KELLOGG, WILLIAM C. (1983) Agricultural Education and Communication
 B.S., California Polytechnic State University, San Luis Obispo, 1976; M.S., 1983; Ph.D., Colorado State University, 1987. Professor and Department Head.
- KELLY, LOIS M. (2005) Admissions, Recruitment and Financial Aid
 A.B., Westmont College, 1971; M.S., Southern Illinois University, Edwardsville, 1986. Director of Financial Aid.

- KELLY, SHAUN F. (2002) BioResource and Agricultural Engineering
B.S., Michigan State University, 1985; M.S., 1990; Ph.D., Oregon State
University, 1998. Associate Professor. Registered Professional Engineer, Oregon.
- KELTING, SCOTT D. (2007)..... Construction Management
B.S., California Polytechnic State University, San Luis Obispo, 2000; M.S., 2003.
Assistant Professor. LEED Accredited.
- KENNELLY, BRIAN (2006)..... Modern Languages and Literatures
B.A., University of California, Davis, 1986; M.A., University of Virginia, 1989;
Ph.D., New York University, 1996. Professor.
- KERBO, HAROLD R. (1977)..... Social Sciences
B.A., University of Oklahoma, 1970; M.A., 1972; Ph.D., Virginia Polytechnic
Institute and State University, 1975. Professor Emeritus.
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B.S., Lynn University, 1997; M.B.A., 1999. Academic Progress Counselor.
- KHALIL, HANY M. (1987)..... Food Science and Nutrition
B.S., University of Alexandria, Egypt, 1973; M.S. University of Illinois,
Champaign-Urbana, 1983; Ph.D., 1987. Professor.
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B.A., California State University, Long Beach, 1984; M.B.A., California
Polytechnic State University, San Luis Obispo, 1993. Assistant Dean,
Advancement and External Relations.
- KIM, JUN-HYUN (2010)..... Landscape Architecture
B.S.L.A., Sungkyunkwan University, 1999; M.S.L.A., 2001; Ph.D., Texas A&M
University, 2010. Assistant Professor. Licensed Landscape Architect, Korea.
- KINGSBURY, KEVIN B. (1996)..... Chemistry and Biochemistry
B.S., College of William and Mary, 1986; Ph.D., Stanford University, 1993.
Professor.
- KIRK, COLLEEN M. (2001)..... Mathematics
B.S., Stanford University, 1994; M.S., Southern Illinois University, Carbondale,
1995; Ph.D., Northwestern University, 1999. Associate Professor.
- KISTE, ALAN L. (2011)..... Chemistry and Biochemistry
B.S., Calvin College, 1993; Ph.D., University of Michigan, 2009. Assistant
Professor.
- KITAMURA, ROBERT E. (1978)..... Administration and Finance
B.Arch., California Polytechnic State University, San Luis Obispo, 1975; M.S.,
1993. Director, Facilities Planning and Capital Projects.
- KITTS, CHRISTOPHER L. (1995)..... Biological Sciences
B.Sc., University of Auckland, New Zealand, 1984; Ph.D., University of
California, Santa Cruz, 1992. Professor and Department Chair.
- KLAY, JENNIFER L. (2006)..... Physics
B.S., University of California, Los Angeles, 1994; M.S., University of California,
Davis, 1998; Ph.D., 2001. Assistant Professor.
- KLISCH, STEPHEN M. (2001)..... Mechanical Engineering
B.S., University of Virginia, 1991; M.S., 1994; Ph.D., University of California,
Berkeley, 1999. Professor.
- KNIGHT, CHARLES A. (2003)..... Biological Sciences
B.S., Western Washington University, 1996; Ph.D., Stanford University, 2002.
Associate Professor.
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B.S., Washington University, 1972; Ph.D., University of California, Berkeley,
1979. Professor.
- KOHLER, DALE (1999)..... University Library
B.S., California Polytechnic State University, San Luis Obispo, 1988. Director,
Library Information Technology.
- KOLKAILAH, FAYSAL A. (1984)..... Aerospace Engineering
B.S., Cairo University, Egypt, 1969; M.S., University of Cincinnati, 1978; Ph.D.,
Louisiana State University, 1982; additional graduate study, Cairo University.
Professor. Registered Professional Engineer, Egypt.
- KOLLURU, GITA R. (2008)..... Biological Sciences
B.Sc., Queen's University, Kingston, Canada, 1991; M.A., University of
California, Riverside, 1994; Ph.D., 1999. Assistant Professor.
- KOOB, ROBERT D. (1990-1995) (2008)..... Academic Affairs
B.A., University of Northern Iowa, 1962; Ph.D., University of Kansas, 1967.
Provost.
- KORMAN, THOMAS M. (2005)..... Construction Management
B.S., California Polytechnic State University, San Luis Obispo, 1995; M.S.,
Stanford University, 1997; Ph.D., 2001. Associate Professor. Registered
Professional Engineer and Land Surveyor, California. Cal-EMA Safety
Assessment Evaluator, ACI Concrete Flatwork and Field Testing Technician.
- KRIVDA, ERIK (2011)..... Military Science
B.S., Mount St. Mary's College, Emmitsburg, Maryland, 1994; M.A., University
of Oklahoma, 1999; M.A., School of Advanced Military Science, Ft.
Leavenworth, Kansas, 2007. Department Head.
- KUHN, DEVIN (2007)..... Philosophy, Women's and Gender Studies
B.A., Georgetown University, 2000; M.A., Claremont Graduate University, 2006;
Ph.D., 2007. Assistant Professor.
- KURFESS, FRANZ J. (2000)..... Computer Science
M.S., Technical University of Munich, 1984; Ph.D., 1990. Professor.
- KYKER, BRADLEY W. (2003)..... College of Agriculture, Food and
Environmental Sciences
B.S., California Polytechnic State University, San Luis Obispo, 1992; M.S.,
California State University, Long Beach, 2003. Advising Resource Specialist;
Director, MAP Student Center.
- LAIHO, LILY (2007)..... Biomedical and General Engineering
B.S., Stanford University, 1995; M.S., 1996; Ph.D., Massachusetts Institute of
Technology, 2004. Associate Professor.
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B.A., Santa Clara University, 1973; M.A., University of the Americas, 1975;
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B.S., Michigan State University, 1991; M.S., University of Illinois, 1993; Ph.D.,
1997. Assistant Professor.
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Obispo, 1975. Project Manager, Facility Services.
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B.A., Fort Lewis College, 1990; M.S., Colorado State University, 1991; Ph.D.,
Texas A & M University, 1997. Associate Professor. Certified Public Accountant.
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B.S., California Polytechnic State University, San Luis Obispo, 2006. Academic
Progress Counselor.
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B.S., University of Cincinnati, 1968; M.Arch., Stanford University, 1972; Ph.D.,
University of Pennsylvania, 1975. Professor. Registered Architect, California.
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B.Arch., California Polytechnic State University, San Luis Obispo, 1980; M.Arch.,
Columbia University, 1982. Professor. Registered Architect, California.
- LANGNER, CARRIE A. (2008)..... Psychology and Child Development
B.A., University of Michigan, 1997; Ph.D., University of California, Berkeley,
2005. Assistant Professor.
- LAPORTE, MARY L. (1985)..... Art and Design
B.A., Washington State University, 1975; M.F.A., 1980. Professor.
- LASSANSKE, DANIEL E. (1975)..... Horticulture and Crop Science
B.S., California State Polytechnic College, 1970; M.S., 1971. Professor.
- LATHROP, AMANDA A. (2009)..... Food Science and Nutrition
B.S., California Polytechnic State University, San Luis Obispo, 1999; M.S.,
Purdue University, 2002; Ph.D., 2005. Assistant Professor.
- LATNER, MICHAEL (2007)..... Political Science
B.A., California State University, Chico, 1995; M.A., University of California,
Irvine, 2006; Ph.D., 2008. Assistant Professor.
- LAURSEN, PETER T. (2007)..... Architectural Engineering
M.S., University of California, San Diego; Ph.D., University of Auckland, New
Zealand, 2003. Assistant Professor. Registered Civil Engineer, California.
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B.A., University of California, Santa Cruz, 1983; M.A., Claremont Graduate
University, 1987; Ph.D., 1992. Professor and Department Chair.
- LAWLER, BRIAN P. (2007)..... Graphic Communication
B.S., California Polytechnic State University, San Luis Obispo, 1976; M.S., 2006.
Associate Professor.

- LAWSON, JOHN W. (2009) Architectural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1983; M.S.,
Stanford University, 1986. Assistant Professor. Registered Structural Engineer and
Civil Engineer, California, Arizona.
- LEADER STOEBER, DENISE (2010) College of Liberal Arts
B.A., University of California, Santa Cruz, 1972; M.B.A., University of Southern
California, 2001. Program and Development Specialist, Cal Poly Arts.
- LEE, JOHN P. (2010) Disability Resource Center
B.A., University of North Carolina, Chapel Hill, 1994; M.S., 1999. Adaptive
Technology Specialist.
- LEE, LARRY (2002) Intercollegiate Athletics
B.S., Pepperdine University, 1983; M.S., California Polytechnic State University,
San Luis Obispo, 1985. Head Coach, Baseball.
- LEE, LINDA (2009) Psychology and Child Development
B.A., University of California, Los Angeles, 1999; M.Ed., Harvard Graduate
School of Education, 2000; Ph.D., University of California, Los Angeles, 2007.
Assistant Professor.
- LEE, LINDSEY (2006) Associated Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 2005. Coordinator
– Membership and Staff Services.
- LEE, STARR (2001) Cal Poly Corporation
B.A., Kansas State University, 1981; J.D., University of San Diego, 1990; M.B.A.,
University of Texas, Austin, 1995. Associate Executive Director, Administration
and Legal Affairs.
- LEETHAM, LORLIE (1996) Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1991. Certified
Public Accountant. Director, Fiscal Services.
- LEHR, CORINNE (2006) Chemistry and Biochemistry
B.S.C., University of Calgary, 2003; Ph.D., Montana State University, 2006.
Assistant Professor.
- LEHR, JANE L. (2007) Ethnic Studies, Women's and Gender Studies
B.A., University of Rochester, 1997; M.S., Virginia Polytechnic Institute and State
University, 2002; Ph.D., 2006. Assistant Professor.
- LEITHNER, ANIKA (2006) Political Science
Vordiplom, Friedrich-Alexander-Universität Erlangen-Nuremberg, Germany,
1999; M.A., University of Colorado, 2002; Ph.D., 2006. Associate Professor.
- LEMA, SEAN C. (2011) Biological Sciences
B.S., University of California, Davis, 1999; M.S., 2001; Ph.D., 2004. Assistant
Professor.
- LEMIEUX, PATRICK (2007) Mechanical Engineering
B.Sc.Eng., University of New Brunswick, Fredericton, Canada, 1991; M.Sc.,
Cranfield Institute of Technology, Bedford, England, 1992; Ph.D., California
Institute of Technology, 1999. Associate Professor.
- LEPORE, JASON (2007) Economics
B.A., University of California, Irvine, 2002; M.A., University of California, Davis,
2003; Ph.D., 2007. Assistant Professor.
- LERIAN, STEVEN T. (2008) College of Liberal Arts
B.A., University of Southern California, 1972; M.F.A., Wayne State University,
1975. Director, Cal Poly Arts.
- LERTWACHARA, KEVIN (2004) Management
B.S., King Monkut's Institute of Technology, Thonburi, Bangkok, Thailand, 1994;
M.B.A., Westminster College, 1996; Ph.D., University of Connecticut, 2004.
Associate Professor.
- LEVENSON, HARVEY ROBERT (1983) Graphic Communication, Journalism
B.S., Rochester Institute of Technology, 1967; M.S., South Dakota State
University, 1968; Ph.D., University of Pittsburgh, 1980. Professor, Department
Head, and Interim Department Chair for Journalism.
- LEVI, DANIEL J. (1982) Psychology and Child Development
B.A., Lehigh University, 1973; M.S., University of Arizona, 1979; Ph.D., 1981.
Professor.
- LEWIS, JASON D. (2010) Horticulture and Crop Science
B.S., University of Nebraska – Lincoln, 2001; M.S., 2005; Ph.D., Kansas State
University, 2010. Assistant Professor.
- LIDDICOAT, ALBERT A. (2002) Academic Personnel, Computer Engineering,
Electrical Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1989; M.S.,
Stanford University, 1996; M.S., 1999; Ph.D., 2002. Associate Vice Provost for
Academic Personnel, and Professor.
- LIESE, JEFFREY E. (2008) Mathematics
B.S., California Polytechnic State University, San Luis Obispo, 2000; M.A.,
University of California, San Diego, 2004; Ph.D., 2008. Assistant Professor.
- LINDERT, LISA M. (2002) Chemistry and Biochemistry
B.S., University of Michigan, 1997; M.S., University of California, Santa Barbara,
2000; Ph.D., 2002. Associate Professor.
- LINDSEY-MULLIKEN, JOAN M. (2007) Marketing
B.S., University of Missouri, 1983; M.B.A., University of Arizona, 1996; Ph.D.,
1999. Associate Professor.
- LIU, MEI-LING (1994) Computer Science
B.S., Iowa State University, 1972; M.S., 1974; M.S., California Polytechnic State
University, San Luis Obispo, 1982; Ph.D., University of California, Santa Barbara,
1994. Professor Emeritus.
- LLOYD-MOFFETT, STEPHEN (2005) Philosophy
B.A., Claremont McKenna College, 1994; M.Th., St. Vladimir's Orthodox
Seminary, 2004; M.A., University of California, Santa Barbara, 2001; Ph.D., 2005.
Associate Professor.
- LO, CHIEN-KUO (1983) Civil and Environmental Engineering
B.S., National Cheng Kung University, Taiwan, 1969; M.S., 1973; Ph.D.,
University of Iowa, 1981. Professor Emeritus.
- LOBERG, MOLLY J. (2007) History
B.A., Pacific Lutheran University, 1998; M.A., Princeton University, 2002; Ph.D.,
2006. Assistant 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.
- LONDON, BLAIR (1993) Materials Engineering
B.S. Drexel University, 1981; M.S., Stanford University, 1983; Ph.D., 1986.
Professor.
- LONG, DIANNE N. (1982) Political Science
B.S., State University of New York College at Buffalo, 1964; M.P.A., Michigan
State University, 1977; Ph.D., 1982. Professor Emeritus.
- LONG, TODD (2004) Philosophy
B.A., University of Southern Mississippi, 1986; M.A., 1995; M.A., University of
Wales, 2000; M.A., University of Rochester, 2002; Ph.D., 2003. Associate
Professor.
- LOOSLEY, SCOTT L. (2006) Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1980. Assistant
Director, Facility Services Operations. Certified Arborist, International Society of
Arboriculture; Licensed Pest Control Adviser and Qualified Applicator Certificate,
California Department of Pesticide Regulation.
- LOVING, BILL (2008) Journalism
B.A., University of Texas, El Paso, 1979; J.D., Southern Methodist University,
1991. Professor.
- LOWHAM, ELIZABETH A. (2007) Political Science
B.A., Carlton College, 2001; M.A., University of Colorado, 2003; Ph.D., 2007.
Assistant Professor.
- LUCAS, MICHAEL A. (1998) Architecture
B.Arch., University of Cincinnati, 1979; M.Arch, Morgan State University, 1995.
Professor. Registered Architect, Maryland.
- LUND, ULRIC J. (2001) Statistics
B.S., University of California, San Diego, 1990; M.S., University of California,
Santa Barbara, 1993; Ph.D., 1998. Associate Professor.
- LUNDQUIST, TRYG J. (2006) Civil and Environmental Engineering
B.A., University of California, Berkeley, 1989; M.S., 1992; Ph.D., 2006. Associate
Professor. Registered Civil Engineer, California.
- LUPO, CHRISTOPHER (2008) Computer Engineering, Computer Science
B.S., California State University, Fresno, 1997; M.S., University of California,
Davis, 2007; Ph.D., 2008. Assistant Professor.

- LUTRIN, CARL E. (1970)..... Political Science
B.A., Adelphi University, 1962; M.S., University of Wisconsin, 1965; Ph.D.,
University of Missouri, 1971; additional graduate work, Stanford University.
Professor Emeritus.
- LYNCH, JOSEPH (2001)..... Philosophy
B.A., Virginia Commonwealth University, 1982; M.A., Claremont Graduate
School, 1985; Ph.D., 1989. Professor.
- LYNN, ABRAHAM C. (1996)..... Architectural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1986; M.S.,
University of California, Berkeley, 1991; Ph.D., 2001. Professor.
- LYONS, JOHN P. (2008)..... Cal Poly Continuing Education
B.A., University of California, Santa Barbara, 1997; M.A., 1999. Director,
Business Services.
- MAAS, DONALD K. (1976)..... School of Education
B.A., University of California, Los Angeles, 1966; M.Ed., State University of New
York at Buffalo, 1969; Ed.D., 1971. Professor.
- MACCARLEY, C. ARTHUR (1988) Electrical Engineering, Computer Engineering
B.S., University of California, Los Angeles, 1976; M.S., 1978; Ph.D., Purdue
University, 1987. Professor. Registered Professional Engineer, Colorado.
- MACCURDY, CAROL A. (1987)..... English
B.A., Southwestern at Memphis, 1972; M.A., University of South Carolina, 1975;
Ph.D., 1980. Professor.
- MACDOUGALL, NEAL A. (1997)..... Agribusiness
B.A., Williams College, 1984; Ph.D., University of California, Berkeley, 1999.
Associate Professor.
- MACEDO, JOSE (2002)..... Industrial and Manufacturing Engineering
B.S., Catholic University of Peru, Peru, 1982; M.S., University of California,
Berkeley, 1984; Ph.D., Lehigh University, 1991. Professor, and Department Chair.
Registered Professional Engineer, Texas.
- MACHAMER, JOSHUA T. (2003)..... Theatre and Dance
B.A., Whittier College, 1989; M.F.A., The Pennsylvania State University, 2000.
Professor and Associate Department Chair.
- MACHTANS, KAROLIN (2010)..... Modern Languages and Literatures
B.A., Universität Hamburg, 1996; M.A., 2001; Ph.D., 2007. Assistant Professor.
- MACKAY, ALISON (2007)..... Management
B.A., Brigham Young University, 1999; M.B.A., 2001; Ph.D., Ohio State
University, 2006. Assistant Professor.
- MACKAY, TYSON (2007)..... Management
B.S., Brigham Young University, 2000; M.B.A., 2002; Ph.D., Ohio State
University, 2006. Assistant Professor.
- MACKIN, THOMAS J. (2005)..... Mechanical Engineering
B.S., The Pennsylvania State University, 1980; M.S., 1987; Ph.D., 1991.
Professor.
- MACRO, KENNETH L. (2000)..... Graphic Communication
B.A., Pennsylvania State University, University Park, 1993; M.A., The University
of Akron, 2000; Ph.D., Walden University, 2011. Associate Professor.
- MADDREN, JESSE (1999)..... Mechanical Engineering
B.S., University of California, Santa Barbara, 1985; M.S., 1988; Ph.D., 1994.
Associate Professor. Registered Professional Engineer, California.
- MADJEDI, JOHANNA J. (1992)..... Information Technology Services
B.S., California Polytechnic State University, San Luis Obispo, 1988. Director,
Communications and Computing Services.
- MAGNUSSON, SHIRLEY J. (2004)..... School of Education
B.S., University of Missouri, Columbia, 1980; M.S., University of Iowa, 1986;
Ph.D., University of Maryland, College Park, 1991. Professor.
- MAIN, KELLY D. (2007)..... City and Regional Planning
B.A., University of California, Santa Barbara, 1972; M.A., Brown University,
1983; Ph.D., University of California, Los Angeles, 2007. Assistant Professor.
American Institute of Certified Planners.
- MALONEY, MARCY (1990)..... Associated Students, Incorporated
B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A., 1991.
Director, ASI Programs.
- MANZANO, MARIA S. (2007)..... College of Engineering
B.A., University of California, Santa Barbara, 2001. Coordinator/MEP.
- MARAVIGLIA, JAMES L. (1991)..... Admissions, Recruitment and Financial Aid
B.S., Elmhurst College, 1976; M.S., Chicago State University, 1984. Associate
Vice Provost for Marketing and Enrollment Development.
- MARCHBANKS, PAUL (2007)..... English
B.S., Centre College of Kentucky, 1993; M.A., University of North Carolina at
Chapel Hill, 2000; Ph.D., 2006. Assistant Professor and Graduate Director.
- MARGARITO, CESAR (2003)..... Student Academic Services
B.A., California Polytechnic State University, San Luis Obispo, 2002; M.A., 2006.
Program Director, Student Support Services.
- MARK, WALTER R. (1972)..... Natural Resources Management
B.S., Utah State University, 1968; M.S., Colorado State University, 1970; Ph.D.,
1972. Professor Emeritus. Registered Professional Forester, California.
- MARLIER, JOHN F. (1981)..... Chemistry and Biochemistry
B.S., University of Wisconsin, Stevens Point, 1972; Ph.D., University of
Wisconsin, Madison, 1978. Professor.
- MARLOW, MICHAEL L. (1988)..... Economics
B.A., George Washington University, 1975; Ph.D., Virginia Polytechnic Institute,
1978. Professor.
- MARRERO-HOWIESON, CHRISTINA (2009)..... Counseling Services
B.A., University of Texas, Dallas, 2002; Psy.D., Argosy University, Dallas, 2007.
Psychologist.
- MARSALEK, KIMBERLY C. (2006)..... College of Engineering
B.S., California Polytechnic State University, San Luis Obispo, 2006; M.A., 2010.
Coordinator for Advising Services.
- MARSHALL, DAVID D. (2004)..... Aerospace Engineering
B.S., Worcester Polytechnic Institute, 1994; M.S., Georgia Institute of
Technology, 1995; Ph.D., 2003. Associate Professor.
- MARSHALL, KATHRYN G. (2007)..... Economics
B.A., University of Texas, 1980; Ph.D., University of California, Berkeley, 1990.
Assistant Professor.
- MARTIN, KATHLEEN J. (2002)..... Ethnic Studies
B.A., California State University, Northridge, 1992; M.A., University of
California, Santa Barbara, 1993, 1996; Ph.D., 1997. Associate Professor.
- MARTIN, TAMMY S. (1998)..... Career Services
B.A., Buena Vista College, 1987; M.A., California Polytechnic State University,
San Luis Obispo, 2007. Career Counselor.
- MARTINEZ, ANDRES W. (2010)..... Chemistry and Biochemistry
B.S., Stanford University, 2003; Ph.D., Harvard University, 2009. Assistant
Professor.
- MARTINEZ, CHARMAINE (2006)..... Art and Design
B.F.A., University of Notre Dame, 1993; M.F.A., University of Wisconsin-
Madison, 2003. Associate Professor.
- MARTINEZ, MARK (1997)..... Office of the Registrar
B.S., California Polytechnic State University, San Luis Obispo, 1982; M.B.A.,
1991. Academic Progress Counselor.
- MASE, G. THOMAS (2007)..... Mechanical Engineering
B.S.M.E., Michigan State University, 1980; M.S.M.E., University of California,
Berkeley, 1982; Ph.D., 1987. Associate Professor.
- MAY, THOMAS A. (1979)..... Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1977. Licensed
Building Contractor (B), Licensed Landscape Contractor (C27), Certified
Asbestos Building Inspector, Certified Asbestos Contractor/Supervisor. Project
Manager, Facility Services.
- McCALL, MICHAEL D. (1999)..... University Advancement
B.A., Old Dominion University, 1982; J.D., Wake Forest University, 1986.
Associate Vice President/Chief Development Officer.
- McCARTHY, KEVIN (2009)..... Health Services
B.A., University of California, Davis, 1978; PA-C, University of Southern
California Physician Assistant Program, 1980. Physician Assistant.
- McCAULEY, SHANNON J. (2010)..... Biological Sciences
A.B., Bowdoin College, 1992; M.S., University of Florida, Gainesville, 1997;
Ph.D., University of Michigan, 2005. Assistant Professor.
- McCORMICK, KATHRYN E. (2003)..... Art and Design
B.S., University of Cincinnati, 1996; M.S., 2001. Associate Professor.

- McCULLOUGH, MICHAEL (2008) Agribusiness
 B.S., Boise State University, 2003; M.S., Washington State University, 2007;
 Ph.D., 2008. Assistant Professor.
- McDANIEL, COLE C. (2005) Architectural Engineering
 B.S., University of California, San Diego, 1996; M.S., 1997; Ph.D., 2002.
 Associate Professor. Registered Civil Engineer, California.
- McDERMOTT, ANN M. (2006) Kinesiology
 B.S., Boston University, 1977; M.S., Northeastern University, 1989; Ph.D., Tufts
 University, 2002. Associate Professor.
- McDERMOTT, STEVEN T. (1989) Communication Studies
 B.A., San Jose State University, 1973; M.A., 1976; Ph.D., Michigan State
 University, 1980. Professor Emeritus.
- McDONALD, MARGOT K. (1992) Architecture
 B.A., B.S., University of California, Santa Barbara, 1980; M.Arch., University of
 Oregon, 1987. Professor. AIA, Registered Architect, Oregon. NCARB Certificate.
- McDONALD, ROB A. (2006) Aerospace Engineering
 B.S., University of Missouri-Rolla, 1999; M.S., Georgia Institute of Technology,
 2001; Ph.D., 2006. Associate Professor.
- McGRATH, JUSTIN (2006) Intercollegiate Athletics
 B.S., University of Arkansas, Fayetteville, 2001. Head Coach, Men's Tennis.
- McKIM, BONNIE L. (2001) College of Liberal Arts
 B.S., California Polytechnic State University, San Luis Obispo, 1993; M.S., 2000;
 M.A., 2001. Academic Advisor, College of Liberal Arts.
- McKINLAY, KRISTINA I. (2002) Orfalea College of Business
 B.A., Westmont College, 1979; M.Div., San Francisco Theological Seminary,
 1985; M.B.A., California Polytechnic State University, San Luis Obispo, 2001.
 Assistant Dean.
- McLAMORE, ALYSON (1991) Music
 B.A., University of California at Los Angeles, 1982; M.A., 1985; Ph.D., 1991.
 Professor.
- McMAHAN, ANDREW (2010) Music
 B.S., Western Carolina University, 1996; M.M., University of Wisconsin, 1998;
 D.M.A., University of Minnesota, 2008. Assistant Professor.
- McQUAID, PATRICIA (1996) Management
 B.S., Case-Western Reserve University, 1978; M.B.A., Eastern Michigan
 University, 1982; M.S., Auburn University, 1988; Ph.D., Auburn University,
 1996. Professor.
- MEAGHER, JAMES M. (1988) Mechanical Engineering
 B.S., University of Akron, 1978; M.S., 1981; Ph.D., University of California,
 Berkeley, 1987. Professor.
- MEALY, BRYAN J. (2003) Electrical Engineering, Computer Engineering
 B.S., California Polytechnic State University, San Luis Obispo, 1990; M.S., 1993;
 M.S., University of California, Santa Cruz, 1999; Ph.D., 2002. Associate Professor.
- MEDIANO, CHRISTINE, CPT (2011) Military Science
 B.S., California Polytechnic State University, San Luis Obispo, 2002..
- MEDINA-MALONEY, DELFINA (2008) Admissions, Recruitment and Financial Aid
 B.A., California Polytechnic State University, San Luis Obispo, 2004. Financial
 Aid Counselor.
- MEDINA, ELSA (2000) Mathematics
 B.S., California Polytechnic State University, San Luis Obispo, 1994; M.S., 1996;
 Ph.D., University of Northern Colorado, 2000. Professor.
- MEDIZADE, MASON (1984) Mechanical Engineering
 B.S., Abadan Institute of Technology, 1978; M.S., University of Southern
 California, 1980; Ph.D., 1984. Professor.
- MEHIEL, ERIC A. (2004) Aerospace Engineering
 B.S., University of California, Santa Barbara, 1998; M.S., University of Colorado,
 2001; Ph.D., 2003. Associate Professor and Department Chair.
- MEISENHEIMER, KRISTEN (2009) Chemistry and Biochemistry
 B.S., California Polytechnic State University, San Luis Obispo, 1992; Ph.D.,
 University of Colorado, Boulder, 1998. Assistant Professor.
- MELLO, JOSEPH D. (1998) Mechanical Engineering
 B.S., California Polytechnic State University, 1983; M.S., 1989; Ph.D., University
 of California, Davis, 1996. Professor.
- MENDES, ANTHONY A. (2004) Mathematics
 B.S., University of California, Irvine, 2000; M.A., University of California, San
 Diego, 2001; Ph.D., 2004. Associate Professor.
- MENON, UNNY (1978) Industrial and Manufacturing Engineering
 A.P., Sheffield Polytechnic, England, 1969; M.Phil., 1972; Ph.D. University of
 Nottingham, 1985. Professor Emeritus. Registered Professional Engineer, Great
 Britain.
- METCALF, LYNN E. (1986) Marketing
 B.A., University of Oregon, 1978; M.I.M., American Graduate School of
 International Management, 1981; Ph.D., University of South Carolina, 1986.
 Professor and Area Chair.
- MIKLOWITZ, PAUL S. (1988) Philosophy
 B.A., University of California, Santa Cruz, 1977; M.A., University of Chicago,
 1979; M.Phil., Ph.D., Yale University, 1988. Professor.
- MILICH, TOM (2006) Intercollegiate Athletics
 B.S., California State University, Long Beach, 1978. Head Coach, M/W
 Swimming and Diving.
- MILLÁN, JOSÉ A. (1998) Student Academic Services
 B.S., California Polytechnic State University, San Luis Obispo, 1991; M.A., 2006.
 Academic Advisor/Coordinator, Supplemental Workshops in Math.
- MILLER, ADRIENNE (2006) Office of Student Rights and Responsibilities
 B.A., University of California at Berkeley, 1974; M.A., 1977; J.D., Hastings
 College of the Law, 1977. Director.
- MILLER, CHARLES R. (Tad) (1987) Accounting
 B.A., College of Wooster, 1970; M.B.A., University of Arizona, 1980; Ph.D.,
 1987. Professor. Certified Public Accountant.
- MILLER, MICHAEL BARTON (1997) Art and Design
 B.A., University of California, Irvine, 1986; M.F.A., University of Southern
 California, 1988. Professor.
- MILLER, MICHAEL D. (2006) University Library
 B.A., Long Island University, 1971; M.S., 1972; M.P.S., New York University,
 1993. Dean of Library Services.
- MILLER, SANDRA D. (1984) Architecture
 B.A., Oberlin College, 1963; M.Arch., University of California, Berkeley, 1978.
 Professor Emeritus. AIA, Registered Architect, California.
- MILOSEVIC, MARY (1980) Health Services
 B.A., Sonoma State College, 1977; M.A., California Polytechnic State University,
 San Luis Obispo, 1988. Information Technology Consultant.
- MIMNAUGH, FAITH (1996) Intercollegiate Athletics
 B.A., Loyola University of Chicago, 1986; M.S., North Carolina State, 1994. Head
 Coach, Women's Basketball.
- MINTZ, STEVEN (2006) Accounting
 B.S., Long Island University, 1967; M.B.A., Syracuse University, 1969; D.B.A.,
 George Washington University, 1978. Professor.
- MITCHELL, DAVID (2004) Physics
 B.S., George Washington University, 1998; M.A., University of California, San
 Diego, 2001; Ph.D., 2004. Associate Professor.
- MITCHELL, JUDY A. (2010) International Education and Programs
 B.A., California State University, Fullerton, 1979; M.A., Azusa Pacific University,
 1982. Associate Director, International Students and Scholars.
- MOAZZAMI, SARA (1991) Civil and Environmental Engineering
 B.S., George Washington University, 1981; M.S., University of California,
 Berkeley, 1982; Ph.D., 1987. Professor.
- MOCK, RODNEY (2008) Accounting
 J.D., University of Oregon School of Law, 2002; L.L.M., University of
 Washington School of Law, 2004. Associate Professor.
- MOCKFORD, JASON (2008) Student Life and Leadership
 B.S., California Polytechnic State University, San Luis Obispo, 2005; M.A., 2008.
 Assistant Coordinator, Orientation Programs.
- MOLINE, MARK A. (1998) Biological Sciences
 B.A., St. Olaf College, 1987; Ph.D., University of California, Santa Barbara, 1996.
 Professor.
- MOELTER, MATTHEW J. (1998) Physics
 B.S., University of California, Irvine, 1981; Sc.M., Brown University, 1983;
 Ph.D., 1989. Professor and Department Chair.

- MONGE, VALERIE (2007).....Health Services
B.A., California Polytechnic State University, San Luis Obispo, 1997; M.M.Sc.,
Emory University School of Medicine, 2001. Physician Assistant.
- MONTECALVO, JOSEPH (1983)Food Science and Nutrition
B.S., University of Rhode Island, 1972; M.S., 1975; Ph.D., 1979. Professor
Emeritus.
- MONTGOMERY, WAYNE R. (1982)..... University Library
A.B., University of California, Berkeley, 1977; M.L.S., University of California,
Los Angeles, 1981; M.A., California Polytechnic State University, San Luis
Obispo, 1988. Senior Assistant Librarian.
- MOODY, LYNN E. (1999)..... Earth and Soil Sciences
B.S., University of Cincinnati, 1974; M.S., California Polytechnic State
University, San Luis Obispo, 1989; Ph.D., University of California, Riverside,
1993. Professor and Department Head.
- MOORE, CAROLE M. (1980) Career Services
B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A., 1978.
Career Counselor.
- MOORE, MATTHEW J. (2006) Political Science
B.A., Eugene Lang College, 1997; Ph.D., Johns Hopkins University, 2004.
Associate Professor.
- MORENO, DEBBIE (2000)..... Admissions, Recruitment and Financial Aid
B.A., California Polytechnic State University, San Luis Obispo, 1998; M.A., 2006.
Process Analyst/Trainer.
- MORENO, J. KELLY (1991).....Psychology and Child Development
B.S., University of California, Santa Barbara, 1980; M.S., University of Utah,
1985; Ph.D., 1988. Professor. Licensed Psychologist, California.
- MORRIS, ANDREW D. (1998)..... History
B.S., Harvey Mudd College, 1991; M.A., University of California, San Diego,
1996; Ph.D., 1998. Professor and Department Chair.
- MORRISON, KENT E. (1979) Mathematics
B.A., University of California, Santa Cruz, 1971; Ph.D., 1977. Professor Emeritus.
- MORTON, CORNEL N. (2002) Student Affairs
B.S., Tennessee State University, 1970; M.A., 1974; Ph.D., Kent State University,
1983. Vice President for Student Affairs.
- MOSS, ROBB E. S. (2006) Civil and Environmental Engineering
B.S., North Carolina State University, 1995; M.S., Utah State University, 1997;
Ph.D., University of California, Berkeley, 2003. Associate Professor. Registered
Professional Engineer, California.
- MOTTMANN, JOHN (1974)..... Physics
B.A., University of California, Los Angeles, 1966; M.A., 1967; Ph.D., 1972.
Professor Emeritus.
- MOZ, RUBY (2007)..... Office of the Registrar
B.A., California Polytechnic State University, San Luis Obispo, 2004. Academic
Progress Counselor.
- MUELLER, JAMES R. (1980) Mathematics
B.A., University of Wisconsin, 1975; Ph.D., California Institute of Technology,
1982. Professor.
- MULETA, MISGANA (2008) Civil and Environmental Engineering
B.S., Arbaminch University, 1996; M.S., National University of Ireland, Galway,
1999; Ph.D., Southern Illinois University, Carbondale, 2003. Assistant Professor.
Registered Professional Engineer, California.
- MULLER, MAUREEN E. (2006)..... Office of the Registrar
B.S., California Polytechnic State University, San Luis Obispo, 1989; M.A., 2009.
Associate Registrar.
- MULLER, TINA (2007)..... University Housing
B.A., Pacific Lutheran University, 1998; M.A., University of Southern California,
2004. Learning Community Coordinator.
- MULLIGAN, PATRICIA A. (1988)..... School of Education
B.A., Arizona State University, 1971; M.Ed., Kent State University, 1977; M.A.,
Northern Arizona University, 1978; Ph.D., Arizona State University, 1987.
Professor.
- MULLISEN, RONALD S. (1977) Mechanical Engineering
B.S., California State Polytechnic College, 1969; M.Eng., 1976; Ph.D., Colorado
State University, 1983. Professor Emeritus. Registered Professional Engineer,
California.
- MUÑOZ-CHRISTIAN, KAREN (2007) Modern Languages and Literatures
B.S., Iowa State University, 1981; M.A., Wichita State University 1985; Ph.D.,
University of California, Irvine, 1994. Assistant Professor.
- MURPHY, BONNIE D. (2007) Cal Poly Corporation
B.A., Oglethorpe University, 1982; M.B.A., Mercer University, 1999. Executive
Director.
- MURPHY, KATHLEEN S. (2007)..... History
B.A., University of Virginia, 2001; M.A., Johns Hopkins University, 2003; Ph.D.,
2007. Assistant Professor.
- MURRAY, WILLIAM R. (1999) Mechanical Engineering
B.S., University of Texas, Austin, 1975; M.S., 1976; Ph.D., Massachusetts
Institute of Technology, 1988. Professor.
- MURTHA, GINA (1995) Associated Students, Incorporated
B.A., California Polytechnic State University, San Luis Obispo, 2003. Coordinator
– Accounting.
- MWANGI, JAMES (2003) Architectural Engineering
B.Sc., University of Nairobi, Kenya, 1984; MSc., University of Lagos, Nigeria;
Ph.D., University of California, Davis, 2001. Associate Professor. Registered
Structural Engineer and Professional Engineer, California.
- NADEL, JEFF (1991)..... College of Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1989; M.A., 1991;
D.P.A., University of La Verne, 2004. Director, Information Technology.
- NAFISI, AHMAD (1983) Electrical Engineering
B.S., Arya Mehr University of Technology, Iran, 1975; M.S., University of
Southern California, 1977; Ph.D., 1983. Professor.
- NAKAMURA, ROYDEN (1978)..... Biological Sciences
B.A., University of Hawaii, 1961; M.S., 1965; Ph.D., University of British
Columbia, 1970. Professor.
- NAZMI, AYDIN (2009)..... Food Science and Nutrition
B.S., University of California, Davis, 1998; M.S., University of London, U.K.;
2004; Ph.D., Federal University of Pelotas, Brazil, 2007. Assistant Professor.
- NEEL, JOEL (2002) Administration and Finance
B.A., California State University, Hayward, 1989; MCRP, California Polytechnic
State University, San Luis Obispo, 1993. Assistant Director, Capital and
Environmental Planning, Facilities Planning and Capital Projects.
- NEFF, GRACE ANN (1995) Chemistry and Biochemistry
B.S., New Mexico State University, 1989; Ph.D., University of Oregon, 1998.
Associate Professor.
- NEILL, DAWN (2008)..... Social Sciences
B.A., Louisiana State University, 1996; M.A., 1999; M.A., University of
Washington, 2004; Ph.D., 2007. Assistant Professor.
- NEILL, STERN (2008) Marketing
B.A., Louisiana State University, 1992; M.B.A., Southeastern Louisiana
University, 1994; Ph.D., Louisiana State University, 2000. Associate Professor.
- NELSON, CRAIG J. (1994)..... University Advancement
B.S., California Polytechnic State University, San Luis Obispo, 2000. Director,
Cal Poly Fund and Advancement Services.
- NELSON, JILL (2008)..... Architectural Engineering
B.S., University of Nevada, Reno, 1978; M.S., University of Washington, 1982.
Assistant Professor. Registered Structural and Civil Engineer, California and
Washington; LEED AP.
- NELSON, YARROW M. (1999) Civil and Environmental Engineering
B.S., University of California, Berkeley, 1979; M.S., Cornell University, 1992;
Ph.D., 1997. Professor.
- NEUENHOFER, ANSGAR (2001) Architectural Engineering
B.S., Technical University at Aachen, Germany, 1988; M.S., University of
California, Berkeley, 1991; Ph.D., Technical University at Aachen, Germany,
1994. Associate Professor. Registered Civil Engineer, California.
- NEUHAUS, TOM (1998)..... Food Science and Nutrition
B.S., Oberlin College, 1975; M.S., University of Maryland, 1982; Ph.D., Cornell
University, 2000. Associate Professor Emeritus.
- NEVEU, MARC J. (2007)..... Architecture
B.Arch., Wentworth Institute of Technology, 1995; M.Arch., McGill University,
Montreal, 2000; Ph.D., 2006. Assistant Professor.

- NICHOLSON, CHARLES (2009) Agribusiness
B.A., University of California, Davis, 1982; M.S., Cornell University, 1990; Ph.D., 1996. Associate Professor.
- NICHOLSON, LISA M. (2001) Food Science and Nutrition
B.S., California State University, Northridge, 1985; M.S., 1987; Ph.D., University of Southern California, 1999. Professor. Registered Dietitian.
- NICKELSEN, NONA (NICKY) (2000) Parent Program
B.S., California Polytechnic State University, San Luis Obispo, 1995. Parent Program Coordinator.
- NICO, PHILLIP L. (2000) Computer Science, Computer Engineering
B.A., University of California, Berkeley, 1991; M.S., University of California, Davis, 1994; Ph.D., 2000. Associate Professor.
- NIKU, SAEED B. (1983) Mechanical Engineering
B.S., Tehran Polytechnic University, 1975; M.S., Stanford University, 1976; Ph.D., University of California, Davis, 1982. Professor. Registered Professional Engineer, California.
- NOEL, JAY E. (1990) Agribusiness
B.S., University of California, Davis, 1973; M.S., 1974; Ph.D., 1979. Professor.
- NOLAND, JAYMIE J. (1999) Animal Science
B.S., Colorado State University, 1981; D.V.M., Colorado State University, 1987. Professor.
- NOORI, MOHAMMAD (2005) Mechanical Engineering
B.S., University of Illinois at Urbana-Champaign, 1977; M.S., Oklahoma State University, 1980; Ph.D., University of Virginia, 1984. Professor.
- NOTERMANN, ELLEN M. (1979) College of Architecture and Environmental Design
B.S., California Polytechnic State University, San Luis Obispo, 1990; M.A., 1999. Director of Advising Center.
- NUÑEZ, ALBERT A., JR., (1995) Admissions, Recruitment and Financial Aid
B.A., California Polytechnic State University, San Luis Obispo, 1996. Associate Director of Communications.
- NUTTALL, BRENT (2003) Architectural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1986; M.S., University of California, Berkeley, 1987. Associate Professor. Registered Structural and Civil Engineer, California.
- NUWORSOO, CORNELIUS K. (2005) City and Regional Planning
B.S., University of Science and Technology, Ghana, 1981; M.S., Morgan State University, 1986; MCP, University of California, Berkeley, 2002; Ph.D., 2004. Associate Professor. American Institute of Certified Planners. Institute of Transportation Engineers.
- OBERHELMAN, DONALD J. (2011) Intercollegiate Athletics
B.S., Kansas State University, 1993; M.S., Florida State University, 1996. Director of Athletics.
- O'BRIEN, JENNIFER (2008) International Education and Programs
B.S., California Polytechnic State University, San Luis Obispo, 1984; M.A., University of Arizona, 1992. Supervisor, Pacific Programs.
- O'BRYANT, CAMILLE P. (1999) Kinesiology
B.A., Smith College, 1983; M.S., 1986; Ph.D., Ohio State University, 1996. Professor and Department Chair.
- O'CLAIR, KATHERINE (2009) University Library
B.S., Nazareth College of Rochester, 2001; M.S.L.I.S., Florida State University, 2004. Senior Assistant Librarian.
- O'HARA, CHRISTINE E. (2008) Landscape Architecture
B.A., Stanford University, 1987; M.L.A. University of Washington, 2002. Assistant Professor. Certificate in Preservation Planning.
- OKADA, DARYL (2006) Associated Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 1997. IT Programmer.
- OLIVAS, SUSAN M. (2005) Office of the Registrar
B.S., California Polytechnic State University, San Luis Obispo, 1990. Interim Associate Registrar.
- OLIVER, JOHN Y. (2007) Computer Engineering, Electrical Engineering
B.S., Boston University, 1998; M.S., University of California, Davis, 2006; Ph.D., 2007. Assistant Professor.
- OLSEN, ERIC (2004) Industrial Technology
B.S., University of Maine at Orono, 1979; M.B.A., Virginia Polytechnic Institute and State University, 1987; Ph.D., The Ohio State University, 2004. Associate Professor.
- OLVERA, NELDA (1993) Student Academic Services
B.A., California Polytechnic State University, San Luis Obispo, 1993; M.A., 1994. Director, Educational Talent Search.
- OPAVA-STITZER, SUSAN (1993) Research and Graduate Programs
B.S., College of Mt. St. Vincent, New York, 1968; Ph.D., University of Michigan, 1972. Dean.
- ORJI, JOHN (1987) History
B.A., University of Nigeria, 1967; M.A., Rutgers University, 1975; Ph.D., Rutgers University, 1977. Professor.
- ORTH, JOEL J. (2003) History
B.A., California Polytechnic State University, San Luis Obispo, 1996; M.A., Iowa State University, 1998; Ph.D., 2004. Assistant Professor.
- OWEN, FRANKLIN C. (1998) Mechanical Engineering
BSME, Mississippi State University, 1978; MSME, Oregon State University, 1983; Ph.D., University of Texas, 1998. Associate Professor. Registered Professional Engineer, Maine.
- PAL, NIRUPAM (1995) Civil and Environmental Engineering
B.S., Calcutta University, India, 1984; M.S., 1986; Ph.D., New Jersey Institute of Technology, 1993. Professor.
- PALANDOKEN, HASAN (2009) Chemistry and Biochemistry
B.S., California State University, Chico, 1993; M.S., University of California, Davis, 1997; Ph.D., 2006. Assistant Professor.
- PALMER, ROBERT (2009) Health Services
B.A., DePauw University, 1967; M.D., Indiana University of School of Medicine, 1971. Psychiatrist.
- PAN, JIANBIAO (2003) Industrial and Manufacturing Engineering
B.E., Xidian University, Xian, China, 1990; M.S., Tsinghua University, Beijing, China, 1996; Ph.D., Lehigh University, 2000. Associate Professor.
- PANDE, ANURAG (2008) Civil and Environmental Engineering
B.Tech., Indian Institute of Technology, Bombay, 2002; M.S., University of Central Florida, 2003; Ph.D., 2005. Assistant Professor.
- PAPATHAKIS, PEGGY (2006) Food Science and Nutrition
B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., University of California, Davis, 2000; Ph.D., 2005. Associate Professor. Registered Dietitian.
- PAQUIN, DANA (2008) Mathematics
B.S., Davidson College, 2002; Ph.D., Stanford University, 2007. Assistant Professor.
- PARKER-KENNEDY, CHRIS (1989) Disability Resource Center
B.A., University of Kansas, Lawrence, 1975; M.Ed., California Polytechnic State University, San Luis Obispo, 1999. Access Specialist (Deaf/Hard of Hearing; Health and Mobility Impairments).
- PARKS, DENNIS R. (2000) Admissions, Recruitment and Financial Aid
B.A., Baldwin-Wallace College, 1975; M.A., Kent State University, 1977; Ed.D., University of Virginia, 1982. Assistant Vice President for University/Community Engagement.
- PARKS, ROSEANN N. (2001) University Library
B.M.E., Baldwin-Wallace College, 1977; M.Ed., University of Virginia, 1981; Ed.S., 1982. Director of Library Advancement.
- PASCUAL, CHRISTOPHER C. (2000) Mechanical Engineering
B.S., Cornell University, 1985; M.S., Georgia Institute of Technology, 1996; Ph.D., 1999. Professor. Registered Professional Engineer, California.
- PATTERSON, W. KEITH (1998) Horticulture and Crop Science
B.S., B.A., University of Arkansas, 1969; M.S., 1978; Ph.D., University of Missouri, 1985. Professor.
- PATTON, LINDA J. (1991) Mathematics
B.A., University of California, San Diego, 1985; M.A., 1987; Ph.D., 1991. Professor.
- PEDERSEN, MARY E. (1981) College of Agriculture, Food and Environmental Sciences
B.A., University of California, Santa Barbara, 1973; M.S., University of California, Los Angeles, 1976; Ph.D., 1980. Associate Dean.

- PEDROTTI, JENNIFER TERAMOTO (2003) ...Psychology and Child Development
B.A., University of California, Davis, 1996; M.S., University of Kansas, 2000;
Ph.D., 2003. Associate Professor.
- PENALOZA, OCTAVIO (2009)Health Services
B.S., University of La Verne, 1987; PA-C, Duke University PA School of
Medicine, 1990. Physician Assistant.
- PENDERGAST, WILLIAM R. (2000)Management
B.A., University of Notre Dame, 1966; M.A., Columbia University, 1968; Ph.D.,
1971. Professor.
- PERACCA, MARY L. (2001)Counseling Services
M.A., Antioch University, 1991; MFT, 1997. Counselor/Drug and Alcohol
Specialist.
- PERRINE, JOHN D. (2008)Biological Sciences
B.S., Vanderbilt University, 1991; M.S., Miami University, Ohio, 1995; Ph.D.,
University of California, Berkeley, 2005. Assistant Professor.
- PETERS, TROY (2007)Architecture
B.A., University of Illinois, 1989; M.Arch., University of Oregon, 2003. Assistant
Professor. AIA, Registered Architect, Illinois and Wisconsin.
- PETERSEN, GEORGE J. (2004)School of Education
B.A., Pontificia Studiorum Universitas A.S. Thoma A.Q. In Urbe, Rome, Italy,
1981; B.A., University of California, Santa Barbara, 1986; M.A., 1991; Ph.D.,
1993. Professor.
- PETERSON, DANIEL G. (2003)Animal Science
B.S., University of California, Davis, 1999; Ph.D., Cornell University, 2003.
Associate Professor.
- PETERSON, JOHN C. (2007)Horticulture and Crop Science
B.S., University of Rhode Island, 1974; Ph.D., Rutgers University, 1978. Professor
and Department Head.
- PETRAY, MARNIE JO (2006)English
B.A., Arkansas Tech University, 1988; M.A., Purdue University, 1991; Ph.D.,
2004. Assistant Professor.
- PHELAN, SUZANNE (2008)Kinesiology
B.A./B.S., University of Colorado at Boulder, 1989; M.A., MCP Hahnemann
University, 1999; Ph.D., 2001. Associate Professor.
- PHILLIPS, JOHN C. (1974)Horticulture and Crop Science
B.S., Washington State University, 1967; M.S., Colorado State University, 1969;
Ph.D., Oregon State University, 1974. Professor Emeritus. Pest Control Advisor,
California.
- PHILLIPS, STEPHEN J. (2005)Architecture
B.A.Arch., Yale, 1991; M.Arch., University of Pennsylvania Graduate School of
Architecture, 1994; M.A., Princeton, 2003; Ph.D., 2008. Associate Professor.
Registered Architect., California.
- PIERCE, MELISSA (2001)Admissions, Recruitment and Financial Aid
B.S., California Polytechnic State University, San Luis Obispo, 1998; M.A., 2000.
Admissions Officer.
- PIERCE, TODD J. (2005)English
B.A., Southern California College, 1988; M.A., Oregon State University, 1992;
M.F.A., University of California, Irvine, 1995; Ph.D., Florida State University,
2003. Associate Professor.
- PIRTO, DOUGLAS D. (1985)Natural Resources Management
B.S., University of Nevada, Reno, 1970; M.S., Colorado State University, 1971;
Ph.D., University of California, Berkeley, 1977. Professor and Department Head.
Registered Professional Forester, California.
- PILKINGTON, WAYNE (2005)Electrical Engineering
B.S., Lafayette College, 1981; M.S., Rochester Institute of Technology, 1989;
M.S., University of Rochester, 1999; Ph.D., 2005. Associate Professor.
- PILLSBURY, NORMAN H. (1974)Natural Resources Management
B.S., Humboldt State College, 1968; M.S., Humboldt State University, 1972;
Ph.D., Colorado State University, 1976. Professor Emeritus. 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.
- PIPAL, GAIL (2010)Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1980; M.A.,
Chapman University, 2002. Associate Director for Project Management, Facility
Services. Registered Architect, California.
- PLUMMER, WILLIAM E. (1979)Animal Science
B.S., North Carolina State University, 1970; M.S., 1976; Ph.D., Utah State
University, 1979. Professor.
- POHL, JENS G. (1973)Architecture
B.Arch., University of Melbourne, Australia, 1964; M.Bldg.Sci., University of
Sydney, 1967; Ph.D., 1970. Professor Emeritus, Graduate Coordinator. Registered
Architect, Australia.
- POLING, JOHN E. (1976)Physics
B.A., University of Chicago, 1965; M.S., University of Iowa, 1969; Ph.D., 1975.
Professor Emeritus.
- PONCE, PATRICIA (1988-1993) (1998)Office of the President
B.A., San Diego State University, 1985; M.S., University of Rhode Island, 1987;
M.A., University of California, Los Angeles, 1995; Ph.D., 2002. Associate
Ombuds.
- PORUMAMILA, HEMANTH (2008)Mechanical Engineering
B.E., BMS College of Engineering, Bangalore, India, 2000; M.S., Iowa State
University, 2003; Ph.D., 2007. Assistant Professor.
- POURAGHABAGHER, A. REZA (1979)Industrial and Manufacturing
Engineering
B.S., University of Colorado, 1972; M.S., University of California, 1973; Ph.D.
University of Iowa, 1977. Professor. Certified in Production and Inventory
Management (CPIM).
- POWELL, BECKY M. (1977, 1991)Research and Graduate Programs
B.S., California Polytechnic State University, San Luis Obispo, 1972. Graduate
Programs Coordinator.
- PRANATA, HERLINA (2008)Counseling Services
B.S., University of Utah, 1997; Ph.D., 2002. Counselor.
- 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.
- PRODANOV, VLADIMIR (2009)Electrical Engineering
M.S., State University of New York, Stony Brook, 1995; Ph.D., 1997. Assistant
Professor.
- PUIG-SUARI, JORDI (1998)Aerospace Engineering
B.S., Purdue University, 1988; M.S., 1990; Ph.D., 1993. Professor.
- PULITANO, ELVIRA (2006)Ethnic Studies
Laurea (B.A.), Università di Messina, Italy, 1993; University of New Mexico,
1997; Ph.D., 2002. Associate Professor.
- QENANI-PETRELA, EIVIS (2002)Agribusiness
B.S., University of Tirana, Albania, 1987; M.A., Washington State University,
1998; Ph.D., 2002. Associate Professor.
- QU, BING (2008)Civil and Environmental Engineering
B.S., Tongji University (China), 2001; M.S., 2004; Ph.D., State University of New
York at Buffalo, 2008. Assistant Professor.
- QUARLES, MARKEL (1999)Career Services
B.S., California Polytechnic State University, San Luis Obispo, 1998; M.S., 2003;
Ed.D., University of California, Santa Barbara, 2010. Career Counselor.
- QUIJANO, EDDY (2004)Orfalea College of Business
B.A., University of New Orleans, 1970; J.D., Loyola University School of Law,
1971. Advancement Director.
- RABBAN, MIRIAM (1996)International Education and Programs
B.S., California Polytechnic State University, San Luis Obispo, 1995. London
Coordinator.
- RAGSDALE, DAVID O. (1991)Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1984. Registered
Environmental Health Specialist. Environmental Health and Safety Manager, Risk
Management.
- RAGSDALE, JOSEPH J. (2002)Landscape Architecture
B.A., University of California, Berkeley, 1991; M.L.A., University of Virginia,
2000. Associate Professor. Registered Landscape Architect, California.

- RAHIM, ASHRAF (2003) Civil and Environmental Engineering
B.S., University of Mansoura, Egypt, 1986; M.S., 1991; Ph.D., University of Mississippi, Oxford, 2001. Associate Professor.
- RAHMAN, SHIKHA (2007)..... Civil and Environmental Engineering
B.S., Bangladesh University of Engineering and Technology (BUET), 1995; M.S., 1998; Ph.D., Georgia Institute of Technology, 2002. Associate Professor.
Registered Professional Engineer, Mississippi.
- RAINEY, PAUL E. (1987)..... Industrial and Manufacturing Engineering,
Materials Engineering
B.S.M.E., B.S.Met.E., Purdue University, 1967; M.S., Massachusetts Institute of Technology, 1968; Ph.D., Texas A & M University, 1981. Professor Emeritus.
Registered Professional Engineer, Texas.
- RAMEZANI, CYRUS A. (1999)Finance
B.A., University of California, Santa Cruz, 1984; M.S., 1988; M.S., University of California, Berkeley, 1991; Ph.D., 1992. Professor and Area Chair.
- RAMIREZ, MARISA (2007)..... University Library
B.S., The University of Texas at Austin, 1999; M.L.S., The University of North Carolina-Chapel Hill, 2005. Senior Assistant Librarian.
- RAMIREZ, RICHARD M. (1975)..... Administration and Finance
B.B.A., New Mexico State University, 1971; M.B.A., California Polytechnic State University, San Luis Obispo, 1998. Associate Vice President for Finance.
- RAMOS, GEORGE (2003)Journalism
B.S., California Polytechnic State University, San Luis Obispo, 1969. Professor.
- RAMOS DOYLE, ELAINE M. (1972, 1976)..... Research and Graduate Programs
B.S., California Polytechnic State University, San Luis Obispo, 1981; M.S., 1994. Senior Grants Analyst.
- RAWLINGS, DON P. (1979)..... Mathematics
B.S., Arizona State University, 1974; M.A., University of California, San Diego, 1976; Ph.D., 1978. Professor and Department Chair.
- REAVES, SCOTT (2003)Food Science and Nutrition
B.S., California Polytechnic State University, San Luis Obispo, 1991; Ph.D., University of Arizona, 1995. Associate Professor.
- REGIER, RONALD (1987)College of Liberal Arts
B.A., University of Puget Sound, 1973; M.F.A., Michigan State University, 1977; M.A., University of Wisconsin, 1987. Managing Director, Performing Arts Center.
- REICH, JONATHAN (2001) Architecture
B.A., University of Washington, Seattle, 1979; B.A.E.D., 1979; M.Arch., University of California, Berkeley, 1983. Professor. AIA, Registered Architect, California and Washington.
- REIN, STEVEN (1998)Statistics
B.A., University of California, Los Angeles, 1987; M.A., University of California, Berkeley, 1989; Ph.D., 1993. Associate Professor.
- RETSEK, DYLAN Q. (2003)..... Mathematics
B.S., California Polytechnic State University, San Luis Obispo, 1996; M.A., Washington University, 1997; Ph.D., 2001. Associate Professor.
- RICE, MARGARET (PEGGY) S. (1996)..... Chemistry and Biochemistry
B.S., University of California, Los Angeles, 1979; Ph.D., University of Oregon, 1990. Professor.
- RICE, THOMAS J., JR. (1981)..... Earth and Soil Sciences
B.S., University of Wisconsin, Madison, 1974; M.S., Montana State University, 1976; Ph.D., North Carolina State University, 1981. Professor Emeritus. Certified Professional Soil Scientist.
- RICHERT, BENJAMIN P. (2003)..... Mathematics
B.S., Wheaton College, 1995; Ph.D., University of Illinois, Urbana-Champaign, 2000. Associate Professor.
- RICHISON, JEANNINE (2000) School of Education
B.A., Point Loma College, 1974; M.A., California State University, San Bernardino, 1979; Ph.D., New York University, 1995. Associate Professor.
- RIDGELY, JOHN R. (2001)Mechanical Engineering
B.S., University of California, Berkeley, 1986; M.S., 1988; Ph.D., 2001. Associate Professor.
- RIETKERK, ESMERALDA (1999)Health Services
B.S., California State University, Fresno, 1981. Clinical Laboratory Scientist.
- RILEY, KATE J. (2003)..... Mathematics
B.S., South Dakota State University, 1980; M.S., Montana State University, 1992; Ph.D., 2003. Associate Professor.
- RINALDA, CHARLOTTE (1999)..... Career Services
B.A., Southern Connecticut State University, New Haven, 1990; M.A., California Polytechnic State University, San Luis Obispo, 1994. Career Counselor.
- RINZLER, PAUL (1997) Music
B.A., University of California at Santa Barbara, 1977; M.A., 1980; D.A., University of Northern Colorado, 1988. Professor.
- RITCHIE, GERRY (2008)Food Science and Nutrition
B.S., University of Reading, UK, 1974; Ph.D., University of Western Australia, 1981; B.S., University of Adelaide, Australia, 1995. Professor.
- RITTER, MATTHEW K. (2003) Biological Sciences
B.S., University of California, Santa Barbara, 1996; Ph.D., University of California, San Diego, 2002. Associate Professor.
- ROBBINS, MARIAN E. (2004)Mathematics
B.A., Agnes Scott College, 1986; M.S., University of Virginia, 1989; Ph.D., 1992. Professor.
- ROBERTS, MATTHEW J. (1997)Office of the President
B.S., California Polytechnic State University, San Luis Obispo, 1981; M.B.A., Golden Gate University, 1986. Interim Chief of Staff.
- ROBILLARD, JUSTIN (2008) Testing Services
B.A., University of California, Los Angeles, 2001. Testing Coordinator. Certified Test Center Administrator.
- ROBINS, LORI (2008) Chemistry and Biochemistry
B.S., Brandeis University, 2002; Ph.D., University of California, Davis, 2007. Assistant Professor.
- ROBINSON, PATRICIA (2008).....Health Services
B.S., California State University, Los Angeles, 1993; M.D., University of California, Davis, 1999. Physician.
- ROCHE, HERVÉ (2007).....Finance
B.S., University Pierre and Marie Curie, France, 1989; M.S., Ecole Nationale des Ponts et Chaussées, France, 1990; M.A., Institute d'Etudes Politiques de Paris, France, 1991; M.A., University of Paris Dauphine, France, 1994; Ph.D., University of Pennsylvania, 2000. Associate Professor.
- ROLDAN, GREG M. (2006)College of Engineering
B.A., California Polytechnic State University, San Luis Obispo, 2001; M.A., 2010. Academic Advisor.
- ROLLINS, BARBARA A. (2004) Admissions, Recruitment and Financial Aid
B.A., California State University, San Marcos, 1993; M.A., California Polytechnic State University, San Luis Obispo, 1996. Financial Aid Counselor.
- RONG, XIAOYING (2005) Graphic Communication
B.E., Beijing Institute of Printing, 1992; M.B.A., Beijing Institute of Technology, 1999; M.S., Western Michigan University, 2003; Ph.D., Western Michigan University, 2007. Associate Professor.
- ROSENBERG, LOUIS B. (2005)Mechanical Engineering, School of Education
B.S., Stanford University, 1991; M.S., 1993; Ph.D., 1994. Associate Professor.
- ROSS, DAVID D. (1999)..... Information Technology Services
B.S., Pepperdine University, 1990; M.S., California State University, Sacramento, 1998. Manager, Service Desk.
- ROSSMAN, ALLAN J. (2001)Statistics
B.A., Geneva College, 1984; M.S., Carnegie Mellon University, 1986; Ph.D., 1989. Professor.
- ROY, SOMA (2008).....Statistics
B.Sc., Delhi University, 2000; M.Sc., 2002; M.S., The Ohio State University, 2005; Ph.D., 2008. Assistant Professor.
- RUBBA, JOHANNA E. (1995) English
B.A., Rutgers University, 1975; M.A., Southern Illinois University, 1986; Ph.D., University of California, San Diego, 1993. Professor.
- RUCAS, STACEY L. (2005) Social Sciences
B.A., University of Texas, Arlington, 1998; M.A., 2000; Ph.D., University of New Mexico, 2004. Associate Professor.
- RUEF, MICHAEL (1999) School of Education
B.A., University of San Francisco, 1966; M.A., San Diego State University, 1992; Ph.D., University of Kansas, 1997. Professor.
- RUMMELL, KATHRYN (1997) English
B.A., Centre College, 1990; M.A., University of North Carolina at Chapel Hill, 1992; Ph.D., 1997. Professor and Department Chair.

- RUSSELL, CRAIG H. (1982)..... Music
B.M., University of New Mexico, 1973; M.M., 1976; Ph.D., University of North Carolina, 1981. Professor.
- RUTHERFORD, ROBERT T. (1974)..... Animal Science
B.S., University of California, Davis, 1970; M.S., California Polytechnic State University, San Luis Obispo, 1976. Professor.
- RYAN, KATHLEEN A. (1981)..... Psychology and Child Development
B.A., San Diego State University, 1975; M.A., Bowling Green State University, 1978; Ph.D., 1980. Professor Emeritus.
- RYUJIN, DONALD H. (1989)... Ethnic Studies, Psychology and Child Development
B.A., Stanford University, 1968; M.A., University of Michigan, 1972; Ph.D., 1983. Professor and Acting Department Chair.
- SAENZ, RICHARD A. (1980)..... Physics
A.B., University of California, Berkeley, 1972; M.S., Cornell University, 1975; Ph.D., 1977. Professor Emeritus.
- SAGHRI, JOHN A. (2000)..... Electrical Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1973; M.S., Oregon State University, 1975; Ph.D., Rensselaer Polytechnic Institute, 1979. Associate Professor.
- SALAS, NATALIE K. (2006)..... Admissions, Recruitment and Financial Aid
B.A., Fresno Pacific University, 2003. Financial Aid Counselor.
- SALIKLIS EDMOND P. (2005)..... Architectural Engineering
B.S., University of Illinois, Chicago, 1984; M.S., Syracuse University, 1988; Ph.D., University of Wisconsin, Madison, 1992. Associate Professor. Registered Civil Engineer, California.
- SANDOVAL, EMILY (2008)..... University Housing
B.A., University of California, Riverside, 2002; M.Ed., University of Southern California, 2004. Learning Community Coordinator.
- SAUNDERS, KARL F. (2004)..... Physics
B.S., Dublin City University, 1996; Ph.D., University of Oregon, 2001. Associate Professor.
- SAVAGE, ARLINE (2004)..... Accounting
B.Com., University of Port Elizabeth, South Africa, 1977; B.Com. Honours, 1986; M.Com., 1993; D.Commerce, 1999. Professor.
- SAVAGE, RICHARD (2002)..... Materials Engineering
B.S., Juniata College, 1975; Ph.D., Indiana University, 1979. Professor.
- SCARAMOZZINO, JEANINE (2008)..... University Library
B.A., University of California, Santa Cruz, 1995; M.A., 2000; M.L.I.S., San Jose State University, 2005. Senior Assistant Librarian.
- SCHAFFER, CAROLE L. (1987)..... University Housing
B.A., Alfred University, 1985; M.S., 1987. Associate Director of Housing/Director of Residential Life and Education.
- SCHAFFNER, ANDREW (1997)..... Statistics
B.S., California Polytechnic State University, San Luis Obispo, 1992; M.S., University of Washington, 1994; Ph.D., 1997. Professor.
- SCHECHTER, MONICA (2000)..... International Education and Programs
B.A., University of Minnesota, 1984; M.P.A., University of Colorado, Denver, 1993. Associate Director, Study Abroad and CSU International Programs.
- SCHINCK, AMÉLIE (2009)..... Mathematics
B.Sc., Concordia University, 1999; M.Sc., 2001; Ph.D., University of North Carolina at Charlotte, 2009. Assistant Professor.
- SCHLEMER, LIZABETH T. (1993)..... Industrial and Manufacturing Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1981; M.S., University of Southern California, 1986; M.B.A., 1986; Ph.D., University of California, Santa Barbara, 2007. Associate Professor.
- SCHNUPP, ALVIN J. (1988)..... Theatre and Dance
B.S., Millersville State College, 1974; M.A., Bowling Green State University, 1979; Ph.D. University of California, Los Angeles, 1985. Professor.
- SCHOONOVER, ROD W. (1994)..... Chemistry and Biochemistry
B.S., University of Kansas, Lawrence, 1986; M.S., University of Michigan, Ann Arbor, 1989; Ph.D., 1993. Professor.
- SHORTELL, ROBERT R. (2011)..... Horticulture and Crop Science
B.S., Rutgers University, 2004; Ph.D., 2009. Assistant Professor.
- SCHROETER, CHRISTIANE (2007)..... Agribusiness
B.S., Justus-Liebig University, 1997; M.S., 2001; M.S., Kansas State University, 2000; Ph.D., Purdue University, 2005. Assistant Professor.
- SCHULTZ, CRAIG J. (1989)..... Information Technology Services
B.S., California Polytechnic State University, Pomona, 1982; B.S., San Jose State University, 1989; M.B.A., California Polytechnic State University, San Luis Obispo, 1992. Director, User Support Services.
- SCHULTZ, NED W. (1976)..... Psychology and Child Development
B.S., Pennsylvania State University, 1973; M.A., 1975; Ph.D., Ohio State University, 1976. Professor.
- SCHUSTER, PETER J. (2003)..... Mechanical Engineering
B.A., Cornell University, 1991; M.S., Stanford University, 1992; Ph.D., Michigan Technology University, 2000. Professor.
- SCHWARTZ, DEBORA (1996)..... English
A.B., Bryn Mawr College, 1982; M.A., Princeton University, 1986; Ph.D., 1994. Associate Professor.
- SCHWARTZ, PETER V. (2000)..... Physics
B.S., Massachusetts Institute of Technology, 1986; M.S., Princeton University, 1993; Ph.D., 1998. Associate Professor.
- SCOTT, GREG (2011)..... Chemistry and Biochemistry
B.S., Davidson College, 2004. Assistant Professor.
- SCOTT, KENNETH C. (1975)..... Agribusiness
B.S., Brigham Young University, 1970; Ph.D., Washington State University, 1975. Professor Emeritus.
- SCRIVEN, TAL (1980)..... Philosophy
B.A., University of South Florida, 1976; M.A., 1977; Ph.D., University of Southern California, 1980. Professor and Department Chair.
- SELBY, MICHAEL J. (1991)..... Psychology and Child Development
B.S., University of California, Santa Barbara, 1971; M.S., California Polytechnic State University, San Luis Obispo, 1981; Ph.D., Memphis State University, 1988. Professor. Licensed Psychologist, California.
- SELF, BRIAN P.(2006)..... Mechanical Engineering
B.S., Virginia Polytechnic Institute and State University, 1988; M.S., 1991; Ph.D., University of Utah, 1996. 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.
- SENG, JOHN S. (2003)..... Computer Science, Computer Engineering
B.S., Northwestern University, 1997; M.S., University of California, San Diego, 1999; Ph.D., 2003. Associate Professor.
- SETTLE, ALLEN K. (1970)..... Political Science
B.A., University of California, Santa Barbara, 1966; M.A., 1967; Ph.D., 1970. Professor.
- SHABAN, ALI O. (1984)..... Electrical Engineering
B.S., University of Tripoli, 1974; M.S., University of Southern California, 1978; Ph.D., Oregon State University, 1985. Professor.
- SHAFFER, MARY K. (1980)..... Information Technology Services
B.A., Sonoma State University, 1974. Policy and Program Assurance Specialist, E&IT Campus Compliance Officer, Office of the CIO.
- SHAFRAN, ARIC (2007)..... Economics
B.S., Cornell University, 1999; M.A., University of Colorado, 2003; Ph.D., 2007. Assistant Professor.
- SHANI, ABRAHAM B. (Rami) (1983)..... Management
B.A., University of Tel Aviv, 1972; M.A., 1978; Ph.D., Case Western Reserve University, 1981. Professor.
- SHAPIRO, JONATHAN (1998)..... Mathematics
B.A., University of California, Berkeley, 1988; Ph.D., 1995. Professor.
- SHARPE, JOHN P. (1995)..... Physics
B.Sc., Edinburgh University, 1985; Ph.D., 1989. Professor.
- SHELTON, MARK D. (1982)..... College of Agriculture, Food and Environmental Sciences
B.S., University of Idaho, 1977; M.S., Purdue University, 1980; Ph.D., Utah State University, 1989. Associate Dean. Registered Professional Entomologist.

- SHERMAN, MORGAN P. (2008)..... Mathematics
B.A., Knox College, 1999; M.A., Columbia University, 2000; M.Phil., 2004;
Ph.D., 2005. Assistant Professor.
- SHIBATA, MARTIN (1990)..... Career Services
B.A., University of California, Los Angeles, 1975; M.P.A., California State
University, Los Angeles, 1983; Executive Management Program, University of
Southern California, 1985. Director.
- SHOLLENBERGER, KIM A. (2002)..... Mechanical Engineering
B.S., Cornell University, 1989; M.S., University of California, Berkeley, 1991;
Ph.D., 1994. Professor.
- SHORE, AMY (2001)..... Admissions, Recruitment and Financial Aid
B.A., California Polytechnic State University, San Luis Obispo, 1993. Senior
Admissions Advisor.
- SIEMBIEDA, WILLIAM J. (1997)..... City and Regional Planning
B.A., University of California, Berkeley, 1965; MCRP, University of California,
Berkeley, 1967; MPA, California State University, San Diego, 1970; Ph.D.,
University of California, Los Angeles, 1990. Professor. American Institute of
Certified Planners.
- SIGMUND, SARA (2005)..... Admissions, Recruitment and Financial Aid
B.S., Columbia College, 2003. Senior Admissions Advisor.
- SILVESTRI, MICHAEL G. (1978)..... Chemistry and Biochemistry
B.S., University of California, Santa Barbara, 1973; Ph.D., University of
California, Santa Cruz, 1977. Professor.
- SIMON, ANDREAS (2008)..... Accounting
M.A., University of Applied Sciences, Germany, 2003; Ph.D., University of
Queensland, Australia, 2008. Assistant Professor.
- SIMONIAN, LONNY G. (2003)..... Construction Management
B.S., California Polytechnic State University, San Luis Obispo, 1978; M.S.,
University of California, Berkeley, 1992. Associate Professor. Registered
Professional Engineer, Certified Project Management Professional.
- SINGH, JAGJIT (Jay) (2003)..... Industrial Technology
B.S., Poona University, Pune, India, 1992; M.S., Michigan State University, 1998;
Ph.D., 2002. Professor.
- SINK, SCOTT E. (2009)..... Natural Resources Management
B.S., Northern Arizona University, 2004; M.S., University of Alaska – Fairbanks,
2006; Ph.D., North Carolina State University, 2009. Assistant Professor.
- SINTON, MEGAN (2011)..... College of Engineering
B.A., California Polytechnic State University, San Luis Obispo, 2003; M.E.A.,
University of California, San Diego, 2008. Assistant Director of Advancement..
- SIROIS, DAWN M. (1995)..... College of Engineering
B.A., University of Rhode Island, 1995. Assistant Coordinator for Advising
Services.
- SKAMFER, RON (2003)..... Associated Students, Incorporated
B.S., California Polytechnic State University, San Luis Obispo, 1997; M.S., San
Jose State University, 2001. Associate Director.
- SKLAR, JEFF C. (2005)..... Statistics
B.A.S., University of California, Davis, 1995; M.A., University of California,
Santa Barbara, 1998; Ph.D., 2003. Associate Professor.
- SKLAR, MARIA D. (2006)..... College of Engineering
B.A., University of California, Los Angeles, 2005. Academic Advisor.
- SLIVOVSKY, LYNNE A. (2003)..... Electrical Engineering, Computer Engineering
B.S., Purdue University, 1992; M.S., 1993; Ph.D., 2001. Associate Professor.
- SMIDT, ROBERT K. (1978)..... Statistics
B.S., Manhattan College, 1971; M.S., Rutgers University, 1973; Ph.D., University
of Wyoming, 1976. Professor and Department Chair.
- SMILKSTEIN, TINA (2009)..... Computer Engineering, Electrical Engineering
B.S., Nanzan University, 1989; M.S., University of California, Berkeley, 2003;
Ph.D., 2007. Assistant Professor.
- SMITH, DALE A. (1973)..... Animal Science
B.S., University of California, Davis, 1971; D.V.M., 1973. Professor Emeritus.
- SMITH, ERLING A. (2008)..... Academic Programs, Institutional Planning and
Analysis, College of Engineering
B.S., University of Leeds, 1969; Ph.D., University of Durham, 1975. Vice Provost
for Programs and Planning and Acting Dean, College of Engineering.
- SMITH, HUGH M. (2000)..... Computer Science, Computer Engineering
B.S., Xavier University, 1985; M.S., Michigan State University, 1994; Ph.D.,
1999. Associate Professor.
- SMITH, KENT D. (1981)..... Statistics
B.A., University of Utah, 1967; M.S., Air Force Institute of Technology, 1969;
M.S., University of California, Riverside, 1979; Ph.D., 1981. Professor Emeritus.
- SMITH, TERRY L. (1980)..... Earth and Soil Sciences
B.S., University of Nebraska, Lincoln, 1972; M.S., 1975; Ph.D., Iowa State
University, 1980. Professor.
- SPARLING SUSAN (1978)..... Student Academic Services
B.S., University of Texas, 1970; M.A., California Polytechnic State University,
San Luis Obispo, 1978. Academic Advisor. Director.
- SPENCE, CHIP (2010)..... Admissions, Recruitment and Financial Aid
B.S., Miami University, 1998; M.Ed., DePaul University, 2010. Financial Aid
Counselor.
- SPILLER, ROBERT (1989)..... Animal Science
B.S., California State Polytechnic College, 1969; M.S., 1971; Ph.D., Oregon State
University, 1974. Professor.
- SPILLER, WILLIAM T. (1991)..... Music
B.M., University of Washington, 1981; M.M., Indiana University, 1983; D.M.A.,
University of Southern California, 1991. Professor and Department Chair.
- SPRADLIN, WENDY (1978)..... College of Liberal Arts
B.A., California Polytechnic State University, San Luis Obispo, 1978; M.A., 1984.
Academic Advisor, College of Liberal Arts.
- SPRAGUE, EUMI (1991)..... Cal Poly Corporation
B.S., California Polytechnic State University, San Luis Obispo, 1991. IT Manager.
- STALEY, CLINTON A. (1988)..... Computer Science
B.A., Principia College, 1980; M.S., University of California, Santa Barbara,
1982; Ph.D., 1987. Professor.
- STANKUS, MARK (1998)..... Mathematics
B.S., Rensselaer Polytechnic Institute, 1987; Ph.D., University of California, San
Diego, 1993. Associate Professor.
- STANLEY, L. JUNE (2002)..... Health Services
B.S., Ohio State University, Columbus, 1975; M.S. and Family Nurse Practitioner
Certification, California State University, Fresno, 1993. Nurse Practitioner. ANCC
Board Certified, 1998.
- STANNARD, SANDRA (2001)..... Architecture
B.A., University of California, Berkeley, 1987; M.Arch., University of
Washington, 1992. Professor. AIA, Registered Architect, California and Idaho.
- STANTON, DIANA L. (2000)..... Theatre and Dance
B.A., University of California, Irvine, 1994; M.F.A., University of Colorado,
Boulder, 1997. Assistant Professor.
- STARZYK, GREGORY F. (2009)..... Construction Management
B.S., University of Illinois, Urbana-Champaign, 1982; M.S., Northwestern
University, 2001; J.D., William Howard Taft University, Santa Ana, 2010.
Assistant Professor.
- STEERS, DENNIS (2003)..... College of Engineering
B.A., California Polytechnic State University, San Luis Obispo, 1981.
Communications Specialist.
- STEGNER, PAUL DUSTIN (2007)..... English
B.A., University of San Francisco, 2000; M.A., The Pennsylvania State
University, 2002; Ph.D., 2007. Assistant Professor.
- STEINMAUS, SCOTT J. (1998)..... Biological Sciences
B.S., University of California, Davis, 1984; Ph.D., 1996. Professor. Pest Control
Advisor, California.
- STETS, ROBERT D. (2006)..... University Advancement
B.A., Muhlenberg College, 1975; J.D., Duke University Law School, 1978;
M.B.A., St. Josephs University, 2005. Associate Vice President for University
Advancement, Operations and Finance.
- STEVENSON, JON (2005)..... Intercollegiate Athletics
B.A., University of California, Santa Barbara, 1980. Head Coach, Volleyball.
- STEWART, SUSAN (1983)..... Student Academic Services
B.A., California Polytechnic State University, San Luis Obispo, 1983. Information
Technology Manager.

- STONEMAN, PATRICIA-ANN (1990).....Cal Poly Continuing Education
B.A., California State University at Northridge, 1974; M.A., 1978. Director,
Academic Programs.
- STRAND, CHRISTY (2007) Biological Sciences
B.A., Concordia University 1992; Ph.D., Arizona State University, 2007. Assistant
Professor.
- STRAWN, TIM (2010) University Library
B.A., University of California, Santa Barbara, 1978; M.S.L.I.S., Simmons College,
2002. Director.
- STUBLER, CRAIG P. (1997) Earth and Soil Sciences
B.S., California Polytechnic State University, San Luis Obispo, 1996. Technician.
- STYLES, STUART W. (1984)..... BioResource and Agricultural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1984; M.B.A.,
1988; D.Eng., University of California, Davis, 2001. Professor. Registered Civil
Engineer, California.
- SUN, CHENG (1989)..... Electrical Engineering
B.S., National Taiwan University, Taiwan, 1958; M.S., Cornell University, 1962;
Ph.D., 1965. Professor Emeritus.
- SUNATA, CEM (2009)..... Office of the Registrar
B.S., University of Nevada, Las Vegas, 1996; M.S.E.E., 2006. University
Registrar.
- SUNGAR, NILGUN (1989)..... Physics
B.S., Middle East Technical University, Turkey, 1979; Ph.D., University of
Missouri, 1985. Professor.
- SWAN, BENJAMIN G. (2010)..... Agricultural Education and Communication
B.S., California Polytechnic State University, San Luis Obispo, 1997; M.S., 2001;
Ph.D., The Ohio State University, 2005. Assistant Professor.
- SWEARINGEN, DON E. (1974) Architecture
B.Arch., Oklahoma State University, 1968; M.Arch., University of Illinois, 1972.
Professor Emeritus. Registered Architect, Arizona.
- SWEATT, LISA I. (2000) Psychology and Child Development
B.S., University of California, Irvine, 1989; M.A., Ohio State University, 1992;
Ph.D., Loyola University Chicago, 1999. Assistant Professor. Licensed
Psychologist, California.
- SYDNOR, WILLIAM E. (1981) Student Academic Services
B.A., Whittier College, 1971; M.A., University of California, Riverside, 1974;
M.A., California Polytechnic State University, San Luis Obispo, 1986.
Coordinator, Academic Skills Center; Coordinator, Study Session; Study Skills
Advisor, Academic Skills Center.
- SZE, LAWRENCE (1998) Mathematics
B.S., Louisiana State University, Baton Rouge, 1986; M.A., University of
California, Los Angeles, 1989; Ph.D., Penn State University, 1998. Associate
Professor.
- SZLAVIK, ROBERT (2006)..... Biomedical and General Engineering
B.Eng., McMaster University, 1991; M.Eng., 1994; Ph.D., 1999. Associate
Professor.
- TAUFIK (1999)..... Electrical Engineering
B.S., Northern Arizona University, 1993; M.S. University of Illinois at Chicago,
1995; Dr.Eng., Cleveland State University, 1999. Professor.
- TAYLOR, EMILY N. (2005)..... Biological Sciences
B.A., University of California, Berkeley, 1998; Ph.D., Arizona State University,
2005. Associate Professor.
- TAYLOR, J. KEVIN (1999) Kinesiology
B.A., Newcastle and Sunderland Polytechnic, Newcastle, England, 1986; M.S.,
Central Washington University, 1990; Ph.D., University of South Carolina, 1994.
Professor.
- TEJANI, JAMES (2009) History
B.A., University of California, San Diego, 1998; M.A., Columbia University,
2003; Ph.D., 2009. Assistant Professor.
- TERRY, RAYMOND D. (1974)..... Mathematics
B.S., State University of New York, 1966; M.S., Michigan State University, 1968;
Ph.D., 1972. Professor Emeritus.
- TEUFEL, BRADY (2006)..... Journalism
B.A., University of California, Santa Cruz, 1997; M.A., University of Missouri,
2003. Assistant Professor.
- THATCHER, TRACY (2005)..... Civil and Environmental Engineering
B.S., University of California, Davis, 1984; M.S., University of California,
Berkeley, 1991; Ph.D., 1996. Associate Professor. Registered Professional
Engineer, California.
- THOMAS, GREGORY (2008) Health Services
B.A., Hampshire College, 1976; M.P.H., University of California, Berkeley, 1980;
M.D., University of California, San Francisco, 1980. Physician.
- THOMPSON, JOHN JAY (1998)..... Modern Languages and Literatures
B.A., University of California, Santa Barbara, 1986; M.A., Yale University, 1987;
M.Phil., 1989; Ph.D., 1993. Professor and Interim Department Chair.
- THOMPSON, RICHARD P. (1990) Natural Resources Management
B.S., Oklahoma State University, 1974; M.S., 1978; Ph.D., Texas A&M
University, 1990. Professor. Registered Professional Forester, California and
Oklahoma.
- THORNCROFT, GLEN E. (1998)..... Mechanical Engineering
BSE, University of Central Florida, 1988; MSME, 1991; Ph.D., University of
Florida, 1997. Professor.
- THULIN, ANDREW J. (1998)..... Animal Science
B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S.,
Kansas State University, Manhattan, 1979; Ph.D., 1985. Professor and Department
Head.
- TIETJE, BRIAN C. (1999)..... Cal Poly Continuing Education
B.S.B.A., Bowling Green State University, 1988; M.B.A., University of Hawaii,
1994; Ph.D., University of Washington, 1999. Dean and Professor.
- TILLEY, MARCIA L. (2006) Agribusiness
B.S., Iowa State University, 1970; M.A., University of Florida, 1976; J.D., 1979.
Professor.
- TIMMS, BENJAMIN F. (2007) Social Sciences
B.A., University of New Mexico, 1997; M.A., Indiana University, 1999; Ph.D.,
2007. Assistant Professor.
- TODOROV, TODOR D. (2003) Mathematics
B.S., University of Sofia, 1975; Ph.D., University of Sofia and Bulgarian
Academy of Sciences, 1982. Associate Professor.
- TOKER, UMUT (2005) City and Regional Planning
B.Arch., Middle East Technical University, Ankara, 1996; M.C.P., 1999; Ph.D.,
North Carolina State University, 2003. Associate Professor.
- TOLIN, JEFFREY (2009) Accounting
B.S., New York University, 1971; J.D., Brooklyn Law School, 1975; LL.M., New
York University, 1981. Associate Professor.
- TOMANEK, LARS (2005) Biological Sciences
B.S., University of Konstanz, Germany, 1995; M.S., 1995; Ph.D., Oregon State
University, 1999. Associate Professor.
- TOMILSON, DOROTHY (1983) Testing Services
B.A., University of the State of New York Regents College, 1991. Test Program
Coordinator. Certified Test Center Administrator.
- TONG, PHILLIP S. (1988) Dairy Science
B.S., University of California, Davis, 1977; M.S., Cornell University, 1982; Ph.D.,
1986. Professor and Director of the Dairy Products Technology Center.
- TORNATZKY, LOU (2006) Industrial Technology
B.A., Ohio State University, 1964; Ph.D., Stanford University, 1969. Professor
and Area Chair.
- TORRES-BUSTAMANTE, CÉSAR (2010) Landscape Architecture
B.Arch., Universidad de las Américas, Puebla, 2000; M.L.A., RMIT University,
2005; Ph.D., 2009. Assistant Professor.
- TREXLER, GRANT (2010)..... Cal Poly Corporation
B.S., California Polytechnic State University, San Luis Obispo, 1983; M.B.A.,
1985. Associate Executive Director, Finance and Business Operations.
- TRICE, TOM R. (2002) History
B.A., Louisiana College, 1981; M.A., Louisiana State University, 1987; Ph.D.,
University of Illinois, 1998. Associate Professor.
- TRIPP, SUSAN (2002) International Education and Programs
B.A., California State University, Fullerton, 1986; M.P.P., California Polytechnic
State University, San Luis Obispo, 2007. SEVIS Specialist, International Students
and Scholars.

- TROXEL, PATRICIA (1990) English
 B.A., Whitman College, 1978; M.A., University of California, Davis, 1981; M.A.,
 Princeton University, 1983; Ph.D., 1986. Associate Professor.
- TSO, JIN (1988) Aerospace Engineering
 B.S., National Taiwan University, 1971; M.S., 1973; Ph.D., Johns Hopkins
 University, 1983. Professor.
- TURNER, CLARK S. (1999) Computer Science
 B.S., Kings College, 1979; M.A., Pennsylvania State University, 1981; J.D.,
 University of Maine, 1986; Ph.D., University of California, Irvine, 1999.
 Professor.
- UYTTEWAAL, JOHAN M. (2000) Administration and Finance
 B.S., Lycée Louis Le Grand, Paris-France, 1977; M.S.C.E., School of Public
 Works, Paris-France, 1980; M.S.C.E., University of California, Berkeley, 1982;
 M.B.A., University of California, Los Angeles, 1989. Assistant Director, Building
 Design and Construction, Facilities Planning and Capital Projects. Registered
 Professional Engineer, California.
- UYTTEWAAL, KIMBERLY C. (1998) Office of the President
 B.A., University of California, Berkeley, 1983; M.A., New York University, 1988.
 Executive Assistant.
- VAHEY, TERRY (1984) Administration and Finance
 B.A., University of San Francisco, 1995. Director of Information Technology
 Services.
- VAKALIS, IGNATIOS (2006) Computer Science
 B.S., University of Patras, Greece, 1982; M.S., Western Michigan University,
 1988; Ph.D., 1992. Professor and Department Chair.
- VALENCIA-LAVER, DEBRA L. (1991) College of Liberal Arts, Psychology and
 Child Development
 B.S., University of California, Irvine, 1983; M.S., The Claremont Graduate
 University, 1988; Ph.D., 1992. Professor and Associate Dean.
- VALLE, VICTOR (1992) Ethnic Studies
 B.A., California State University, Long Beach, 1974; M.A., 1978; M.S.J.,
 Northwestern University, 1981. Professor Emeritus.
- VANASUPA, LINDA S. (1991) Materials Engineering
 B.S., Michigan Technological University, 1985; M.S., Stanford University, 1987;
 Ph.D., 1991. Professor.
- VAN DRAANEN, NANINE A. (1996) Chemistry and Biochemistry
 B.S., California Polytechnic State University, San Luis Obispo, 1985; Ph.D.,
 University of California, Berkeley, 1992. Professor.
- VAVRA, RANDY (2003) Student Academic Services
 B.S., California State University, Long Beach, 1972. Information Technology
 Consultant.
- VELÁSQUEZ, GLORIA (1985) Modern Languages and Literatures
 B.A., University of Northern Colorado, 1978; M.A., Stanford University, 1980;
 Ph.D., 1985. Professor.
- VERNON, J. SCOTT (1991) Agricultural Education and Communication
 B.S., California Polytechnic State University, San Luis Obispo, 1983; M.S., 1985;
 Ph.D., Texas A&M University, 1991. Professor.
- VESTERMARK, JESSE (2010) University Library
 B.F.A., University of Minnesota, Twin Cities, 1997; M.A., University of
 Wisconsin-Madison, 2002; M.F.A., 2003; M.A., 2007. Senior Assistant Librarian.
- 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 Emeritus. Registered
 Professional Engineer, California, Diplomate of the Academy of Environmental
 Engineers.
- VILKITIS, JAMES R. (1980) Natural Resources Management
 B.S., Michigan State University, 1965; M.S., University of Idaho, 1968; Ph.D.,
 University of Massachusetts, 1970; additional graduate study 1973-74. Professor.
- VILLABLANCA, FRANCIS X. (1999) Biological Sciences
 B.S., California Polytechnic State University, San Luis Obispo, 1987; Ph.D.,
 University of California, Berkeley, 1993. 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.
- VISCI, JOSEPH "CHIP" M. (2009) University Advancement
 B.A., Ohio Wesleyan University, 1975; M.A., The Ohio State University, 1977.
 Associate Vice President for University Advancement, Strategic Communications.
- VIX, MARLIN DALE (1977) Agribusiness
 B.S., San Jose State College, 1968; M.S., California Polytechnic State University,
 San Luis Obispo, 1977. Associate Professor Emeritus.
- VORST, KEITH L. (2005) Industrial Technology
 B.S., Purdue University, 1977; M.S., Michigan State University, 2002; Ph.D.,
 2005. Associate Professor.
- VREDEVOE, LARISA K. (1999) Biological Sciences
 B.S., University of California, Davis, 1992; Ph.D., 1998. Professor.
- VUOTTO, FRANK (2002) University Library
 B.A., Berklee College of Music, 1983; M.A., Northern Illinois University, 1987;
 M.L.I.S., Rosary College/Dominican University, 1990. Associate Librarian.
- WACK, PAUL (1997) City and Regional Planning
 B.A., San Fernando Valley State College, 1969; M.A., California State University,
 Northridge, 1974; MPA, University of Southern California, 1976. Professor.
 American Institute of Certified Planners.
- WAITINAS, CATHERINE (2006) English
 B.A., St. Bonaventure University, 1996; M.A., University of Illinois at Urbana-
 Champaign, 1999; Ph.D., 2006. Assistant Professor.
- WALDEN, NANCY J. (1996) Health Services
 B.S., California State University, Fresno, 1982; N.P., 1986. Nurse Practitioner.
- WALDORF, DANIEL (1998) Industrial and Manufacturing Engineering
 B.S., University of Illinois at Urbana-Champaign, 1989; M.S., 1991; Ph.D., 1996.
 Professor. Registered Professional Engineer, California.
- WALKER, JOHN L. (2001) Statistics
 B.S., University of Chicago, 1988; M.S., Cornell University, 1993; Ph.D., 1995.
 Professor.
- WALKER, KATHY Office of the Registrar
 B.A., Point Loma Nazarene University, 1989; M.S., National University, 1991.
 Academic Progress Counselor.
- WALLACE, WILLIAM (2010) Office of the Registrar
 B.A., California State University, Northridge, 1998; M.S., University of La Verne,
 2003. Academic Progress Counselor.
- WALLS, VICTORIA (2000) Orfalea College of Business
 B.S., California Polytechnic State University, San Luis Obispo, 2000; M.B.A.,
 2004. Assistant Director of Graduate Programs.
- WALSH, DANIEL W. (1986) Biomedical and General Engineering,
 and Materials Engineering
 B.S., Rensselaer Polytechnic Institute, 1973; M.S., 1976; Ph.D., 1985. Professor.
- WALSH, TIM (2009) Intercollegiate Athletics
 B.A., University of California, Riverside, 1977. Head Coach, Football.
- WALTER, VIRGINIA R. (1974) Horticulture and Crop Science
 B.S., Ohio State University, 1970; M.S., 1972. Professor.
- WARNICK-WAIT, PATRICIA (1997) Office of the Registrar
 B.S., California Polytechnic State University, San Luis Obispo, 2001. Assistant to
 the Director/Registrar.
- WATABE-BELZEL, MADOKA (1993) Food Science and Nutrition
 B.S., Illinois State University, 1982; M.S., 1983; Ed.D., Pepperdine University,
 1991. Professor Emeritus. Registered Dietitian.
- WATTON, WILLIAM E. (2002) Administration and Finance
 B.A., University of Redlands, 1980. University Police Chief and Director,
 University Police.
- WATTS, DAVID J. (2007) Landscape Architecture
 B.S.L.A., University of Wisconsin-Madison, 1980; M.S.L.A., 2006. Assistant
 Professor. Registered Landscape Architect, Wisconsin.
- WEATHERFORD, ALAN M. (1986) Finance
 B.A., Louisiana State University, 1969; A.D., Northwestern State University,
 1977; M.B.A., University of Dallas, 1981; Ph.D., The University of Texas, Dallas,
 1985. Associate Professor Emeritus.
- WEBB, KAREN (1995) Administration and Finance
 B.A., University of California, Los Angeles, 1978. Assistant Vice President,
 Administration and Finance.

- WEBER, PAUL A. (1999)..... Construction Management
B.S., California Polytechnic State University, San Luis Obispo, 1981; B.Arch.,
1983; M.B.A., 1992; Ph.D., Colorado State University, 2000. Associate Professor.
Registered Architect, California. Licensed Building Contractor (B), California.
- WEDDIGE, KRISTI S. (2004)..... College of Science and Mathematics
B.S., University of Tennessee, Knoxville, 1994; M.A., California Polytechnic
State University, San Luis Obispo, 2004. Director of Advising Center and
Academic Advisor.
- WEHNER, DAVID J. (1994)..... College of Agriculture, Food and
Environmental Sciences
B.S., University of Notre Dame, 1972; M.S., Pennsylvania State University, 1975;
Ph.D., 1979. Dean.
- WEISENTHAL, HOWARD (1984)..... Architecture
B. Arch., University of Florida, 1972; M. Arch., 1974. Professor. Registered
Architect, Florida.
- WENDT, DEAN E. (2002)..... College of Science and Mathematics,
Biological Sciences
B.S., California Polytechnic State University, San Luis Obispo, 1993; A.M.,
Harvard University, 1995; Ph.D., 1999. Associate Dean and Professor.
- WESTPHAL, RUSSELL (2008)..... Mechanical Engineering
B.S., Washington State University, 1978; M.S., Stanford University, 1979; Ph.D.,
1983. Professor.
- WETZEL, S. JEAN (1996)..... Art and Design
B.A., Rockford College, 1982; M.A., University of Kansas, 1985; M.Phil., 1986;
Ph.D., 1991. Associate Professor.
- WHITE, DONALD E. (1987)..... Industrial and Manufacturing Engineering
B.S., University of California, Berkeley, 1965; M.S., Stevens Institute of
Technology, 1967; Ph.D., Case Western Reserve University, 1971; M.B.A.,
Pepperdine University, 1980. Professor Emeritus.
- WHITE, MATTHEW E. (2001)..... Mathematics
B.S., Cornell University, 1990; M.S., California Polytechnic State University, San
Luis Obispo, 1994; Ph.D., University of California, Santa Barbara, 2000.
Associate Professor.
- WHITEFORD, MARY A. (1982)..... Academic Programs
B.S., New York University, 1978. Academic Programs Analyst, and LSAMP
Coordinator.
- WIDMANN, JAMES M. (2004)..... Mechanical Engineering
BSME, Michigan Technological University, 1987; MSME, Stanford University,
1988; Ph.D., Stanford University, 1995. Professor.
- WILD, ROSEMARY (1999)..... Management
B.A., University of Arizona, 1980; M.A., 1981; M.S., 1985; Ph.D., 1989.
Professor and Area Chair.
- WILEMON, CARRIE (2002)..... Administration and Finance
B.A., California Polytechnic State University, San Luis Obispo, 1999. Human
Resources Manager.
- WILLIAMS, JASON A. (2008)..... Psychology and Child Development
B.A., University of California, Riverside, 1989; Ph.D., University of California,
Santa Cruz, 2001. Assistant Professor.
- WILLIAMS, JEAN M. (2000)..... Political Science, Women's and Gender Studies
B.A., Pomona College, 1988; M.A., The Johns Hopkins University, 1996; Ph.D.,
1998. Professor.
- WILLIAMS MEAD, JOANNE (1991)..... Cal Poly Corporation
B.S., California Polytechnic State University, San Luis Obispo, 1987. Director,
Human Resources.
- WINEBRENNER, TERRENCE C. (1983)..... Communication Studies
B.S., Southwest Missouri State University, 1971; M.A., 1972; Ph.D., Ohio State
University, 1985. Professor and Department Chair.
- WINSTEAD, CANDACE R. (2005)..... Biological Sciences
B.A., Augustana College, 1991; Ph.D., Loyola University, 1999. Assistant
Professor.
- WOLF, MARIANNE McGARRY (1994)..... Agribusiness
B.A., The Johns Hopkins University, 1976; M.S., 1977; Ph.D., 1979. Professor.
- WOLFE, CHRISTINA (2006)..... Office of the Registrar
B.S., Slippery Rock University, 1998. Academic Progress Counselor.
- WONG, JEFFREY C. (2002)..... Horticulture and Crop Science
B.S., Saint Mary's College of California, 1994; M.S., University of Illinois at
Champaign, 1999; Ph.D., 2002. Associate Professor. The J. G. Boswell Foundation
of Pasadena Endowed Chair.
- WONG, KINSLEY (1989)..... University Housing
B.S., California Polytechnic State University, San Luis Obispo, 1990. Assistant
Director for Housing Information Systems.
- WOOD, JOHN (2006)..... University Housing
B.S., Oklahoma State University, 1985; M.M.F.T., Abilene Christian University,
1991. Community Standards and Programming Coordinator.
- WOOD, ZOË J. (2003)..... Computer Science
B.A., University of California, Santa Cruz, 1992; B.S., 1997; M.S., California
Institute of Technology, 2000; Ph.D., 2003. Associate Professor.
- WRIGHT, IV, HAROLD L. (2009)..... University Housing
B.S., California Polytechnic State University, San Luis Obispo, 1991. Director of
Finance and Business Operations.
- WU, XI (2005)..... Mechanical Engineering
M.S., Chong Qing University, 1991; Dr. Eng., Cleveland State University, 2005.
Associate Professor.
- YANG, TAO H. (1987)..... Industrial and Manufacturing Engineering
B.S., Tunghai University, Taiwan, 1978; M.S., San Jose State University, 1982;
Ph.D., Arizona State University, 1987. Professor.
- YBARRA, ANA (2010)..... Admissions, Recruitment and Financial Aid
B.A., University of Washington, 2003; M.A., Seattle University, 2006. Financial
Aid Counselor.
- YEH, GRACE I. (2007)..... Ethnic Studies
B.A., Duke University, 1995; M.A., Georgetown University, 2000; M.A.,
University of California, Los Angeles, 2003; Ph.D., 2007. Assistant Professor.
- YBARRA, ANA (2010)..... Admissions, Recruitment and Financial Aid
B.A., University of Washington, 2003; M.A., Seattle University, 2006. Financial
Aid Counselor.
- YEUNG, PO SAI MARIE (2006)..... Biological Sciences
B.Sc., The Chinese University of Hong Kong, 1995; M.S., California Polytechnic
State University, San Luis Obispo, 2001; Ph.D., Cornell University, 2004.
Assistant Professor.
- YIP, CHRISTOPHER L. (1988)..... Architecture
B.A., University of California, Berkeley, 1971; M. Arch., 1977; Ph.D., 1985.
Professor.
- YONG, YUEN-CJEN (1978)..... Mechanical Engineering
B.E., University of Malaya, 1969; M.E., University of California, Davis, 1977;
Ph.D., 1984. Professor Emeritus. Registered Professional Engineer, Great Britain
and Malaysia.
- YORK, JONATHAN (2008)..... Industrial Technology
B.A., Yale University, 1973; M.A., Michigan State University, 1976; Ph.D., 1979.
Associate Professor.
- YOSHIMURA, MICHAEL A. (1975)..... Biological Sciences
B.A., Stanford University, 1970; M.S., University of Hawaii, 1972; Ph.D.,
University of Arizona, 1975. Professor Emeritus.
- YOSHINOBU, STAN (2009)..... Mathematics
B.A., University of California, San Diego, 1995; M.A., University of California,
Los Angeles, 1997; Ph.D., 2000. Associate Professor.
- YU, XIAO-HUA (HELEN) (2000)..... Electrical Engineering
B.S., TianJin University, People's Republic of China, 1988; M.S., Temple
University, 1992; Ph.D., University of California, Irvine, 1998. Professor.
- ZACHMEYER, DRU (2008)..... Administration and Finance
B.A., California Polytechnic State University, San Luis Obispo, 1999; J.D.,
University of California, Los Angeles, 2003. Member, California Bar Association.
Licensed California Real Estate Broker. Contracts Manager, Contracts,
Procurement and Risk Management Services.
- ZAMBRANO, EDUARDO (2007)..... Economics
B.A., Universidad Católica Andrés Bello, Venezuela, 1993; M.A., Cornell
University, 1998; Ph.D., Cornell University, 1999. Associate Professor.
- ZAMMIT, RONALD E. (1986)..... Physics
B.S., Louisiana State University, 1969; M.S., Purdue University, 1971; Ph.D.,
1975. Professor Emeritus.

ZEUSCHNER, RAYMOND F. (1980)International Education and Programs
 A.B., University of California, Berkeley, 1966; M.A., San Francisco State College,
 1968; Ph.D., University of California, Los Angeles, 1973. Professor Emeritus;
 Interim Director, International Education and Programs.

ZHANG, XIAOZHENG (JANE) (2003) Electrical Engineering
 Diplom, University of Erlangen-Nuremberg, Germany, 1997; Ph.D., Georgia
 Institute of Technology, 2002. Associate Professor.

ZOHNS, MARK A. (1986)BioResource and Agricultural Engineering
 B.S., California Polytechnic State University, San Luis Obispo, 1981; M.S.,
 University of California, Davis, 1983; D.Engr., 1986. Professor. Registered
 Mechanical Engineer, California.

ZULFACAR, MALIHA (2002)Social Sciences
 B.A., Western College, 1971; M.A., University of Cincinnati, 1973; M.S., 1973;
 Ph.D., Paderborn University, Germany, 1997. Associate Professor.

ZWEIFEL, K. RICHARD (1972)..... College of Architecture and
 Environmental Design
 B.S.L.A., University of Wisconsin, 1970; M.S.L.A., 1975. Professor and Associate
 Dean. Registered Landscape Architect, California. Fellow, American Society of
 Landscape Architects.

Appendix

HIGHER EDUCATION ACT (HEA)

Under the Higher Education Act of 1965 (HEA) and its many amendments, Cal Poly is required to make certain disclosures and institutional information "readily available" to prospective and enrolled students, employees, the general public and the department of education on an annual basis (20 U.S.C. Section 1092(a)). For additional information, please contact the Dean of Students Office at 805 756-0327.

Privacy Rights of Students in Education Records

www.ess.calpoly.edu/_records/stu_info/ferpa_use.htm

The federal Family Educational Rights and Privacy Act (FERPA) of 1974 (20 U.S.C. 1232g) and regulations adopted thereunder (34 C.F.R. 99) set out requirements designed to protect students' privacy in their records maintained by the campus. The statute and regulations govern access to student records maintained by the campus and the release of such records. The law provides that the campus must give students access to most records directly related to the student, and must also provide opportunity for a hearing to challenge the records on the grounds that they are inaccurate, misleading or otherwise inappropriate. The right to a hearing under this law does not include any right to challenge the appropriateness of a grade determined by the instructor. The law generally requires the institution to receive a student's written consent before releasing personally identifiable data about the student. The institution has adopted a set of policies and procedures governing implementation of the statute and the regulations. Copies of these policies and procedures may be obtained at the Office of Academic Records or the Educational Equity Services Office. Among the types of information included in the campus statement of policies and procedures are:

- 1) the types of student records maintained and the information they contain;
- 2) the official responsible for maintaining each type of record;
- 3) the location of access lists indicating persons requesting or receiving information from the record;
- 4) policies for reviewing and expunging records;
- 5) student access rights to their records;
- 6) the procedures for challenging the content of student records;
- 7) the cost to be charged for reproducing copies of records; and
- 8) the right of the student to file a complaint with the Department of Education. The Department of Education has established an office and review board to investigate complaints and adjudicate violations. The designated office is: Family Policy Compliance Office, U.S. Department of Education, 400 Maryland Avenue, SW, Washington, D.C. 20202-5920.

The campus is authorized under the Act to release "directory information" concerning students. "Directory information" may include the student's name, address, telephone listing, electronic mail address, photograph, date and place of birth, major field of study, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, grade level, enrollment status, degrees, honors, and awards received, and the most recent previous educational agency or institution attended by the student. The above-designated information is subject to release by the campus at any time unless the campus has received prior written objection from the student specifying what information the student requests not be released. Written objections should be sent to the University Registrar.

The campus is authorized to provide access to student records to campus officials and employees who have legitimate educational interests in such access. These persons have responsibilities in the campus' academic, administrative or service functions and have reason for accessing student records associated with their campus or other related academic responsibilities. Student records may also be disclosed to other persons or organizations under certain conditions

(e.g., as part of accreditation or program evaluation; in response to a court order or subpoena; in connection with financial aid; or to other institutions to which the student is transferring).

Completion/Graduation Rates

www.ipa.calpoly.edu/publications_reports/ret_grad/persistence_0111.pdf
In 2010, the graduation rate for Cal Poly freshmen who entered the University in the Fall of 2004 was 74.6%. For more detailed information, please contact Institutional Planning and Analysis at 805 756-2204.

Equity in Athletics Disclosure Act (EADA)

www.ipa.calpoly.edu/publications_reports/ret_grad/ncaaid.html

The Equity in Athletics Disclosure Act requires co-educational institutions of postsecondary education that participate in a Title IV, federal student financial assistance program, and have an intercollegiate athletic program, to prepare an annual report to the Department of Education on athletic participation, staffing, and revenues and expenses, by men's and women's teams.

In compliance with this requirement, information contained in the current report for Cal Poly San Luis Obispo is available on the US Department of Education's web site at <http://ope.ed.gov/athletics> (select "Get data for one institution"). Alternatively, a link is also available to this and other publications through Cal Poly's Institutional Planning & Analysis web site (see link at top of this section). A paper copy of the report is available upon request.

Campus Security Report (Clery Act)

www.Police.calpoly.edu

Crime statistics for Cal Poly are provided for all prospective and current students, faculty and staff on the website, along with critical updates and prevention advisories. These statistics are reported monthly to the Federal and State Departments of Justice as well as annually to the Office of the Chancellor of the CSU. Crime statistics are published to inform the campus community and to meet mandated reporting requirements. A printed copy of the Campus Security Report is available by request at the University Police Department.

Institutional and Financial Assistance Information

Student Financial Assistance. Director, Financial Aid, Admin. 212, 805 756-2927:

1. A description of the federal, state, institutional, local, and private student financial assistance programs available to students who enroll at Cal Poly;
2. For each aid program, a description of procedures and forms by which students apply for assistance, student eligibility requirements, criteria for selecting recipients from the group of eligible applicants, and criteria for determining the amount of a student's award;
3. A description of the rights and responsibilities of students receiving financial assistance, including federal Title IV student assistance programs, and criteria for continued student eligibility under each program;
4. The satisfactory academic progress standards that students must maintain for the purpose of receiving financial assistance and criteria by which a student who has failed to maintain satisfactory progress may reestablish eligibility for financial assistance;
5. The method by which financial assistance disbursements will be made to students and the frequency of those disbursements;
6. The terms of any loan received as part of the student's financial aid package, a sample loan repayment schedule, and the necessity for repaying loans;
7. The general conditions and terms applicable to any employment provided as part of the student's financial aid package;
8. The responsibility of Cal Poly for providing and collecting exit counseling information for all student borrowers under the federal student loan programs; and
9. The terms and conditions for deferral of loan payments for qualifying service under the Peace Corps Act, the Domestic Volunteer Service Act of 1973, or comparable volunteer community service.

Return of Federal Title IV student assistance funds. Director, Financial Aid, Admin. 212, 805 756-2927.

Cost of Attending Cal Poly. Director, Financial Aid, Admin. 212, 805 756-2927: fees and tuition (where applicable); the estimated costs of books and supplies; estimates of typical student room, board, and transportation costs; and, if requested, additional costs for specific programs.

Refund Policies. Assistant Director, Student Financial Services, Admin. 211, 805 756-1428: return of unearned tuition and fees or other refundable portions of institutional charges.

Facilities and Services available to Students with Disabilities. Director, Disability Resource Center, Student Services Bldg. (124), 805 756-1395.

Reporting Criminal Actions or Other Emergencies. University Police, Building 74, 805 756-2281.

Prevention of Drug and Alcohol Abuse and Rehabilitation Programs. Office of the Vice President for Student Affairs, Admin. 209, 805 756-1521.

Grievance Procedures for Students. The Dean of Students Office, Bldg 124, Rm 125, 805 756-0327.

Teacher Certification Examinations, pass rates, teacher preparation programs. School of Education, Bldg 2, Rm 120, 805 756-2126.

CAMPUS SMOKING POLICY

Please view the revised smoking policy for the Cal Poly campus implemented January 2, 2004 at <http://policy.calpoly.edu/cap/100/cap170.htm>.

CAREER PLACEMENT

The Career Services office (805-756-2501) may furnish, upon request, information about the employment of students who graduate from the academic programs. This information includes data concerning the median starting salary and the percentage of previously enrolled students who obtained employment or continued into graduate or professional schools.

MILITARY SELECTIVE SERVICE ACT

The federal Military Selective Service Act (the "Act") requires most males residing in the United States to present themselves for registration with the Selective Service System within thirty days of their eighteenth birthday. Most males between the ages of 18 and 25 must be registered. Males born after December 31, 1959 may be required to submit a statement of compliance with the Act and regulations in order to receive any grant, loan, or work assistance under specified provisions of existing federal law. In California, students subject to the Act who fail to register are also ineligible to receive any need-based student grants funded by the state or a public postsecondary institution. Selective Service registration forms are available at any U.S. Post Office, and many high schools have a staff member or teacher appointed as a Selective Service Registrar. Applicants for financial aid can also request that information provided on the Free Application for Federal Student Aid (FAFSA) be used to register them with the Selective Service. Information on the Selective Service System is available and the registration process may be initiated online at <http://www.sss.gov>.

DETERMINATION OF RESIDENCE FOR NONRESIDENT TUITION PURPOSES

University requirements for establishing residency are independent from those of other types of residency, such as for tax purposes, or other state or institutional residency. These regulations were promulgated not to determine whether a student is a resident or nonresident of California, but rather to determine whether a student should pay tuition on an in-state or out-of-state basis. A resident for tuition purposes is someone who meets the requirements set forth in the Uniform Student Residence Requirements. These laws governing residence for tuition purposes at the California State University (CSU) are California Education Code sections 68000-68090, 68120-68134, and 89705-89707.5, and California Code of Regulations, Title 5, Subchapter 5, Article 4, sections 41900-

41916. This material can be viewed on the Internet by accessing the CSU's website at www.calstate.edu/GC/resources.shtml.

Each campus's Admissions Office is responsible for determining the residence status of all new and returning students based on the Application for Admission, Residency Questionnaire, Reclassification Request Form, and, as necessary, other evidence furnished by the student. A student who fails to submit adequate information to establish eligibility for resident classification will be classified as a nonresident.

Generally, establishing California residence for tuition purposes requires a combination of physical presence and intent to remain indefinitely. An adult who, at least one full year prior to the residence determination date for the term in which enrollment is contemplated, can demonstrate physical presence in the state combined with evidence of intent to remain in California indefinitely, may establish California residence for tuition purposes. A minor normally derives residence from the parent(s) they reside with or most recently reside with.

Evidence demonstrating intent may vary from case to case but will include, and is not limited to, the absence of residential ties to any other state, California voter registration and voting in California elections, maintaining California registration and driver's license, maintaining active California bank accounts, filing California income tax returns and listing a California address on federal tax returns, owning residential property or occupying or renting an apartment where permanent belongings are kept, maintaining active memberships in California professional or social organizations, and maintaining a permanent military address and home of record in California.

Nonresident students seeking reclassification are required to complete a supplemental questionnaire that includes questions concerning their financial dependence on parents or others who do not meet University requirements for classification as residents for tuition purposes. Financial independence is required, along with physical presence and intent, to be eligible for reclassification.

Non-citizens establish residence in the same manner as citizens, unless precluded by the Immigration and Nationality Act from establishing domicile in the United States.

Exceptions to the general residence requirements are contained in California Education Code sections 68070-68084 and California Code of Regulations, Title 5, Subchapter 5, Article 4, sections 41906-41906.5, and include, but are not limited to, members of the military and their dependents, certain credentialed employees of school districts and most students who have attended high school in California and graduated or attained the equivalent. Whether an exception applies to a particular student cannot be determined before the submission of an application for admission and, as necessary, additional supporting documentation. Because neither campus nor Chancellor's Office staff may give advice on the application of these laws, applicants are strongly urged to review the material for themselves and consult with a legal advisor.

Residence determination dates

Fall	September 20	Spring	April 1
Winter	January 5	Summer	July 1

Students classified as non-residents may appeal a final campus decision within 120 days of notification by the campus. A campus residence classification appeal must be in writing and submitted to:

The California State University, Office of General Counsel,
401 Golden Shore, 4th Floor, Long Beach, CA 90802-4210

The Office of General Counsel can either decide the appeal or send the matter back to the campus for further review.

Students incorrectly classified as residents or incorrectly granted an exception from nonresident tuition are subject to reclassification as nonresidents and payment of nonresident tuition in arrears. If incorrect classification results from false or concealed facts, the student is also subject to discipline pursuant to Section 41301 of Title 5 of the California Code of Regulations.

Resident students who become nonresidents or who no longer meet the criteria for an exception must immediately notify the Admissions Office.

Changes may have been made in the rate of nonresident tuition and in the statutes and regulations governing residence for tuition purposes in California between the time this information is published and the relevant residence determination date. Students are urged to review the statutes and regulations stated above.

USE OF SOCIAL SECURITY NUMBER

Applicants are required to include their correct social security numbers in designated places on applications for admission pursuant to the authority contained in Section 41201, Title 5, *California Code of Regulations*, and Section 6109 of the Internal Revenue Code (26 U.S.C. 6109). The University uses the social security number to identify students and their records including identification for purposes of financial aid eligibility and disbursement and the repayment of financial aid and other debts payable to the institution. Also, the Internal Revenue Service requires the University to file information returns that include the student's social security number and other information such as the amount paid for qualified tuition, related expenses, and interest on educational loans. This information is used by the IRS to help determine whether a student, or a person claiming a student as a dependent, may take a credit or deduction to reduce federal income taxes.

STUDENT CONDUCT

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:

41301. Standards for Student Conduct.

(a) Campus Community Values

The University is committed to maintaining a safe and healthy living and learning environment for students, faculty, and staff. Each member of the campus community should choose behaviors that contribute toward this end. Students are expected to be good citizens and to engage in responsible behaviors that reflect well upon their university, to be civil to one another and to others in the campus community, and contribute positively to student and university life.

(b) Grounds for Student Discipline

Student behavior that is not consistent with the Student Conduct Code is addressed through an educational process that is designed to promote safety and good citizenship and, when necessary, impose appropriate consequences. The following are the grounds upon which student discipline can be based:

- (1) Dishonesty, including:
 - (A) Cheating, plagiarism, or other forms of academic dishonesty that are intended to gain unfair academic advantage.
 - (B) Furnishing false information to a University official, faculty member, or campus office.
 - (C) Forgery, alteration, or misuse of a University document, key, or identification instrument.
 - (D) Misrepresenting one's self to be an authorized agent of the University or one of its auxiliaries.
- (2) Unauthorized entry into, presence in, use of, or misuse of University property.
- (3) Willful, material and substantial disruption or obstruction of a University-related activity, or any on-campus activity.
- (4) Participating in an activity that substantially and materially disrupts the normal operations of the University, or infringes on the rights of members of the University community.
- (5) Willful, material and substantial obstruction of the free flow of pedestrian or other traffic, on or leading to campus property or an off-campus University related activity.

(6) Disorderly, lewd, indecent, or obscene behavior at a University related activity, or directed toward a member of the University community.

(7) Conduct that threatens or endangers the health or safety of any person within or related to the University community, including physical abuse, threats, intimidation, harassment, or sexual misconduct.

(8) Hazing, or conspiracy to haze. Hazing is defined as any method of initiation or pre-initiation into a student organization or student body, whether or not the organization or body is officially recognized by an educational institution, which is likely to cause serious bodily injury to any former, current, or prospective student of any school, community college, college, university or other educational institution in this state (Penal Code 245.6), and in addition, any act likely to cause physical harm, personal degradation or disgrace resulting in physical or mental harm, to any former, current, or prospective student of any school, community college, university, or other educational institution. The term "hazing" does not include customary athletic events or school sanction events.

Neither the express or implied consent of a victim of hazing, nor the lack of active participation in a particular hazing incident is a defense. Apathy or acquiescence in the presence of hazing is not a neutral act, and is also a violation of this section.

(9) Use, possession, manufacture, or distribution of illegal drugs or drug-related paraphernalia, (except as expressly permitted by law and University regulations) or the misuse of legal pharmaceutical drugs.

(10) Use, possession, manufacture, or distribution of alcoholic beverages (except as expressly permitted by law and University regulations), or public intoxication while on campus or at a University related activity.

(11) Theft of property or services from the University community, or misappropriation of University resources.

(12) Unauthorized destruction, or damage to University property or other property in the University community.

(13) Possession or misuse of firearms or guns, replicas, ammunition, explosives, fireworks, knives, other weapons, or dangerous chemicals (without the prior authorization of the campus president) on campus or at a University related activity.

(14) Unauthorized recording, dissemination, or publication of academic presentations (including handwritten notes) for a commercial purpose.

(15) Misuse of computer facilities or resources, including:

- (A) Unauthorized entry into a file, for any purpose.
- (B) Unauthorized transfer of a file.
- (C) Use of another's identification or password.
- (D) Use of computing facilities, campus network, or other resources to interfere with the work of another member of the University community.
- (E) Use of computing facilities and resources to send obscene or intimidating and abusive messages.
- (F) Use of computing facilities and resources to interfere with normal University operations.
- (G) Use of computing facilities and resources in violation of copyright laws.
- (H) Violation of a campus computer use policy.

(16) Violation of any published University policy, rule, regulation or presidential order.

(17) Failure to comply with directions of, or interference with, any University official or any public safety officer while acting in the performance of his/her duties.

(18) Any act chargeable as a violation of a federal, state, or local law that poses a substantial threat to the safety or well-being of members of the University community, to property within the

University community or poses a significant threat of disruption or interference with University operations.

- (19) Violation of the Student Conduct Procedures, including:
- (A) Falsification, distortion, or misrepresentation of information related to a student discipline matter.
 - (B) Disruption or interference with the orderly progress of a student discipline proceeding.
 - (C) Initiation of a student discipline proceeding in bad faith.
 - (D) Attempting to discourage another from participating in the student discipline matter.
 - (E) Attempting to influence the impartiality of any participant in a student discipline matter.
 - (F) Verbal or physical harassment or intimidation of any participant in a student discipline matter.
 - (G) Failure to comply with the sanction(s) imposed under a student discipline proceeding.
- (20) Encouraging, permitting, or assisting another to do any act that could subject him or her to discipline.

(c) Procedures for Enforcing this Code

The Chancellor shall adopt procedures to ensure students are afforded appropriate notice and an opportunity to be heard before the University imposes any sanction for a violation of the Student Conduct Code.

(d) Application of this Code

Sanctions for the conduct listed above can be imposed on applicants, enrolled students, students between academic terms, graduates awaiting degrees, and students who withdraw from school while a disciplinary matter is pending. Conduct that threatens the safety or security of the campus community, or substantially disrupts the functions or operation of the University is within the jurisdiction of this Article regardless of whether it occurs on or off campus. Nothing in this Code may conflict with Education Code section 66301 that prohibits disciplinary action against students based on behavior protected by the First Amendment.

(e) Summary of Civil and Criminal Penalties for Violation of Federal Copyright Laws

As referenced earlier in Section 41301 (b) (15) (G), the penalties for copyright infringement include civil and criminal penalties. In general, anyone found liable for civil copyright infringement may be ordered to pay either actual damages or “statutory” damages affixed at not less than \$750 and not more than \$30,000 per work infringed. For “willful” infringement, a court may award up to \$150,000 per work infringed. A court can, in its discretion, also assess costs and attorneys’ fees. For details, see Title 17, United States Code, Sections 504, 505. Willful copyright infringement can also result in criminal penalties, including imprisonment of up to five years and fines of up to \$250,000 per offense.

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, safe-guard 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.

IMMIGRATION REQUIREMENTS FOR LICENSURE

The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (P.L. 104-193), also known as the Welfare Reform Act, includes provisions to eliminate eligibility for federal and state public benefits for certain categories of lawful immigrants as well as benefits for all illegal immigrants. Students who will require a professional or commercial license provided by a local, state, or federal government agency in order to engage in an occupation for which the CSU may be training them must meet the immigration requirements of the Personal Responsibility and Work Opportunity Reconciliation Act to achieve licensure. Information concerning these requirements is available from the Office of the Registrar, Admin. 222, 805 756-2531.

AVERAGE SUPPORT COST PER FULL-TIME EQUIVALENT STUDENT AND SOURCES OF FUNDS

The total support cost per full-time equivalent student (FTES) includes the expenditures for current operations, including payments made to students in the form of financial aid, and all fully reimbursed programs contained in state appropriations. The average support cost is determined by dividing the total cost by the number of FTES. The total CSU 2010-11 final budget amounts were \$2,617,435,000 from state General Fund appropriations (not including capital outlay funding), \$1,244,603,000 from net basic tuition fee revenue, and \$320,211,000 from other fee revenues and reimbursements for a total of \$4,182,249,000. The number of projected 2010-11 FTES is 339,873 resident and 14,509 non-resident students. FTES is determined by dividing the total academic student load by 15 units per term (the figure used here to define a full-time student’s academic load).

The 2010-11 average support cost per FTES based on General Fund appropriation and net basic tuition fee revenue only is \$11,213 and when including all sources as indicated below is \$12,117. Of this amount, the average net basic tuition fee revenue and other income and reimbursements per FTES is \$4,416, which includes all fee revenue in the CSU Operating Fund (e.g., tuition fees, application fees, other miscellaneous fees, and reimbursements).

2010-11	Amount	Average Cost Per FTES	%
Total Support Cost	\$4,182,249,000	\$12,117	100
-State Appropriation ¹	2,617,435,000	7,701	64
-Net Basic Tuition Fee Revenue ²	1,244,603,000	3,512	29
-Other Income and Reimbursements ^{2,3}	320,211,000	904	7

¹ “State Appropriation includes a decrease of \$106 million reflecting a shift of costs on a one-time basis to the federal American Recovery and Reinvestment Act State Fiscal Stabilization Fund.”

² Net Basic Tuition fee revenue and other income represents campus 2010-11 budgets submitted November 2010.

³ Other income and reimbursements represent campus “other fee” 2010-11 final budget revenues submitted, as well as reimbursements in the CSU Operating Fund.

The average CSU 2010-11 academic year, resident, undergraduate student basic tuition fee and other mandatory fees required to apply to, enroll in, or attend the university is \$5,285. However, the costs paid by individual students will vary depending on campus, program, and whether a student is part-time, full-time, resident, or nonresident.

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Cal Poly

San Luis Obispo, CA 93407

DIRECTORY OF CAL POLY FACILITIES

BUILDING NAME, NUMBER, GRID LOCATION

Alphabetical with Aliases

19 Metro Station	19	M 10	Dairy Science	18V	F 4	North Mountain Residence Halls	100	N 8
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CAL POLY

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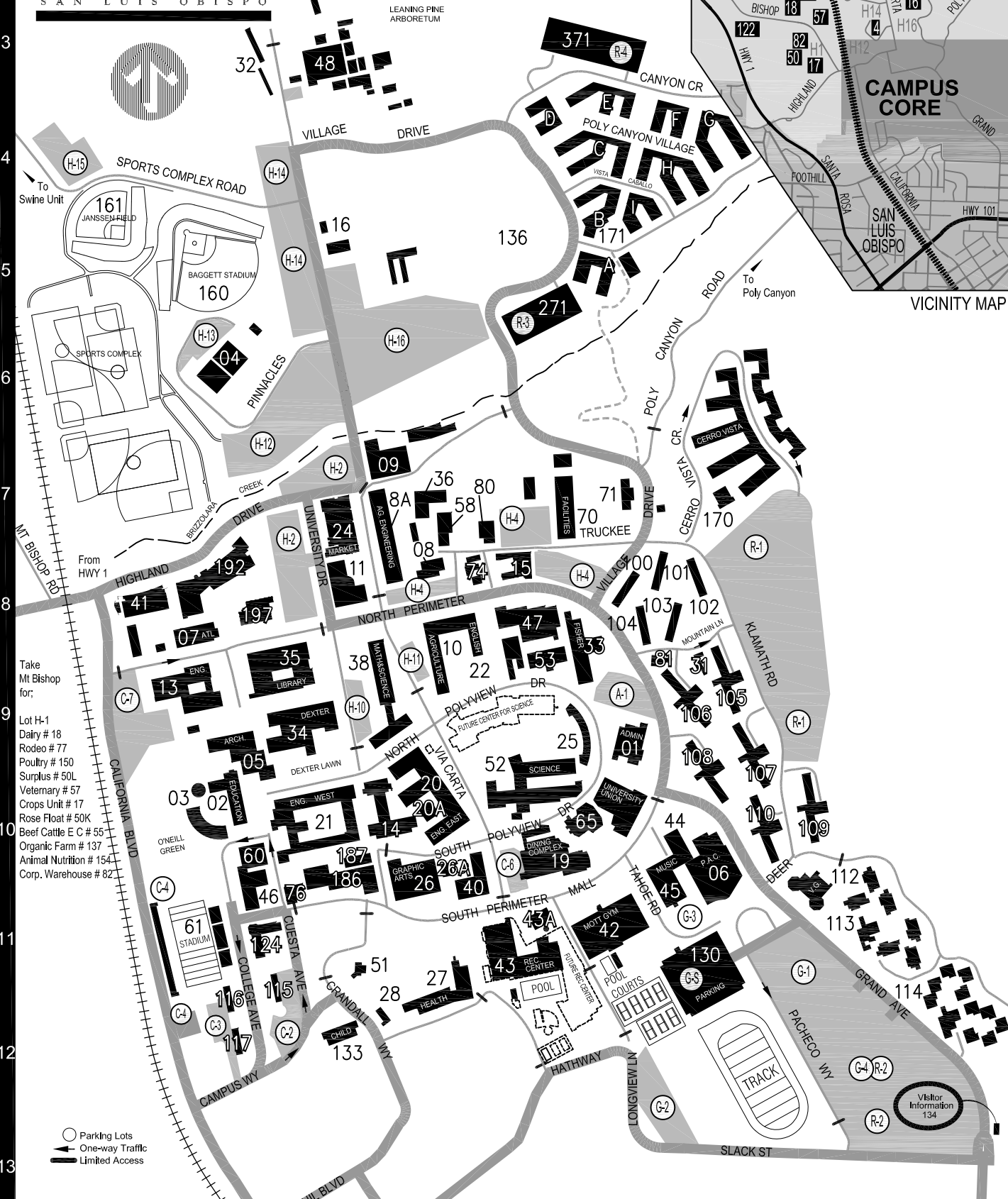


LEANING PINE ARBORETUM

CAMPUS CORE

VICINITY MAP

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13



To Swine Unit

To Poly Canyon

Take Mt Bishop for:

- Lot H-1
- Dairy # 18
- Rodeo # 77
- Poultry # 150
- Surplus # 50L
- Veterinary # 57
- Crops Unit # 17
- Rose Float # 50K
- Beef Cattle E C # 55
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