

Undergraduate Biochemistry Research

Colette Toomer (right), BS Biochemistry '98, explains her research carried out at UC San Francisco Medical Center. After graduation Colette entered the Ph.D. program in chemistry at Ohio State University.

Photo courtesy of Chemistry and Biochemistry Department

Acoustic Tube

Ray Lee, Physics senior, demonstrates the wave patterns created by sound in an acoustic gas tube at Cal Poly's Open House. A speaker attached to the tube varies the frequency of sound provided by a signal generator, and the row of gas pilot flames shows a visible wave pattern.

*Photo courtesy of Todd Rigg,
Society of Physics Students*

College of
Science
& *Mathematics*

College of *Science and Mathematics*

Faculty Offices East (25), Room 229
(805) 756-2226

Philip S. Bailey, Dean
Roxy L. Peck, Associate Dean

ACADEMIC PROGRAMS

Biochemistry	<i>BS</i>
Biological Sciences	<i>BS, MS</i>
Biotechnology.....	<i>Minor</i>
Chemistry	<i>BS</i>
Ecology and Systematic Biology ..	<i>BS</i>
Kinesiology.....	<i>BS, MS</i>
Mathematics.....	<i>BS, MS, Minor</i>
Microbiology	<i>BS</i>
Physical Science	<i>BS</i>
Physics	<i>BA, BS</i>
Statistics	<i>BS, Minor</i>

The mission of the College of Science and Mathematics is to facilitate learning, understanding, and appreciation of science and mathematics as a basis for creative endeavors, intellectual pursuits, careers, and critical consideration of issues confronting society. The College has two equally important roles: (1) to provide specialized coursework for students enrolled in the College's undergraduate, graduate and minor programs, and (2) to provide support and breadth courses in science and mathematics for all students of the university. In cooperation with the University Center for Teacher Education, the College also offers programs leading to teaching credentials in mathematics, physical education, and three subjects in science – biology, chemistry and physics.

The College of Science and Mathematics has a tradition and reputation for excellence in teaching and is dedicated to undergraduate instruction. The College provides a student-centered learning environment consistent with the University's "learn by doing" philosophy. In laboratories, students have access to modern instrumentation and computer technology. Classroom instruction is done in relatively small classes so that a personal approach by instructors is possible. Because of its large role in offering support courses to the rest of the university community, the number of faculty in each department is relatively large and favors student-faculty interaction, both inside and outside of the classroom.

STUDENT SERVICES

The College Office acts on various student-initiated petitions (change of major, curriculum substitutions,

withdrawal from the university). In addition, the office has the dual function of counseling those on academic probation and notifying those undergraduate students who are eligible each quarter for the Dean's Honor List.

FACULTY ADVISING

Faculty members take an active role in academic and career advising. Students are encouraged to obtain academic advising prior to registration each quarter. The adviser-student relationship becomes important especially when the student needs a letter of reference for a potential employer or needs career advice.

ADVISING CENTER

Cynthia Jelinek, Director
Science North (Bldg. 53), Room 218
(805) 756-2615

The College of Science and Mathematics Advising Center provides academic advising services to all students within the college. These services include help with scheduling classes and developing long-range academic plans; career advising; information on university policies and procedures; special programming to facilitate student success; referral of students to other campus offices.

The Advising Center also has a library of materials for student use. This includes information on the health professions, graduate schools, job opportunities, internships, study abroad, and catalogs from junior colleges and other four-year institutions. Most student-related forms – curriculum substitutions, concentration forms, graduation evaluation forms – are also available.

APPLYING TO GRADUATE SCHOOL

College of Science and Mathematics faculty have earned master's and doctoral degrees from a wide variety of universities and are excellent sources for information and advice about graduate programs, prerequisites and application procedures. Applications to graduate programs should be made in the fall for admission to the following fall term. The Graduate Record Exam (GRE) should be taken early in the application cycle. Generally, two or more letters of reference from faculty are required. Most Ph.D. granting institutions offer financial support in the form of teaching assistantships and research fellowships.

ACCESS TO HEALTH CAREERS

Ursula Bishop, Director
 Science North (Bldg. 53), Room 219
 (805) 756-2840

The Access to Health Careers Program provides advising to all students at Cal Poly interested in entering a health professions career. Support includes health careers advising, assistance in applying to internships, summer programs and research opportunities, and development of the application to professional school. Pre-health professions students are also advised to contact the Health Professions Peer Advisers and the members of the Health Professions Resource Committee. Please see Health Sciences–Preprofessional Preparation, page 35, for more information.

Students applying to professional schools in the health sciences have need of current information in order to be competitive for admission. A Health Professions Resource Committee has been established to assist students, regardless of their major, in all phases of their preparation. Please see Health Professions, page 35, for more information.

BIOTECHNOLOGY MINOR

The Biotechnology Minor consists of a core of required courses and restricted elective courses. Advising for students in the Biotechnology minor will take place in the student's major department, including selection of restricted electives and preparation of an agreement form listing specific courses to satisfy the requirements for the minor.

Biological Sciences students preparing for the minor should take CHEM 216, 217, and 371 to fulfill the organic chemistry and biochemistry requirements in their major.

Biochemistry students preparing for the minor should take MCRO 224 and BIO 303 as part of the General Education and Breadth science electives in their major.

Core courses (14-18)	<i>Units</i>
BIO 375/CHEM 375 Molecular Biology Laboratory.....	2
CHEM 474 Protein Laboratory Techniques	2
BIO 351 Classical and Molecular Genetics <i>or</i>	
CHEM 373 Molecular Biology	3–5
ZOO 426 Serology and Immunology <i>or</i>	
CHEM 473 Immunochemistry	3–4
Select one course from the following:.....	4–5
¹ BIO 452 Cell Biology (4)	
BOT 425 Plant Virology (4)	
BOT 450 Plant Biotechnology (5)	
¹ MCRO 402 General Virology (5)	
¹ MCRO 424 Bacterial Cytology (5)	
MCRO 433 Industrial Microbiology and Biotechnology (4)	

Restricted electives 6–10

To be selected from the list of courses given below.

The number of units taken from the Restricted Electives list, when added with the units earned in the Core Courses, must total at least 24 units.

Biochemistry Majors

BIO 311, 322, 324, 352;
 BOT 323, 425, 450;
 BRAE 448;
 CHEM 377, 439, 477;
 DSCI 450;
 MCRO 225, 402, 404, 421, 423, 424, 433;
 SCM 451;
 STAT 218

Biological Science Majors

BIO 311, 322, 324, 352, 433;
 BOT 323, 425, 450;
 BRAE 448;
 CHEM 331, 372, 377, 439, 477;
 DSCI 450;
 MCRO 225, 402, 404, 421, 423, 424, 433;
 SCM 451

Microbiology Majors

BIO 311, 322, 324, 433;
 BOT 323, 425, 450;
 BRAE 448;
 CHEM 372, 377, 439, 477;
 DSCI 450;
 SCM 451

¹ Not open to Microbiology majors.

Biological Sciences

Department Office
Fisher Science Hall (33), Room 273
(805) 756-2788
Email address: bio@calpoly.edu
www.calpoly.edu/~bio/BS_Intro.html

Department Chair, V. L. Holland

Frederick P. Andoli	Christopher L. Kitts
Leslie S. Bowker	Anthony E. Knable
Robert J. Brown	George N. Knecht
Raul J. Cano	Mark Kubinski
Jaime S. Colomé	Kingston L. Leong
Alan F. Cooper	Elena Levine
Alvin A. De Jong	Mark A. Moline
Susan L. Elrod	Royden Nakamura
Maria Florez-Duquet	Maria E. Ortiz
Dennis F. Frey	Lee R. Parker
Roger D. Gams	Elizabeth K. Perryman
David V. Grady	Thomas L. Richards
Michael T. Hanson	Francis X. Villablanca
Dennis N. Homan	Dirk R. Walters
Peter Jankay	Archie M. Waterbury
David J. Keil	Michael A. Yoshimura

ACADEMIC PROGRAMS

BS, MS Biological Sciences
BS Ecology and Systematic Biology
BS Microbiology

The department offers complete undergraduate programs leading to Bachelor of Science degrees in Biological Sciences, Ecology and Systematic Biology, and Microbiology. For qualified students, a graduate program is available leading to the Master of Science degree. In addition, courses are offered to satisfy biology requirements in other academic majors.

The department is housed in modern facilities equipped with up-to-date instrumentation. Cal Poly's geographical setting offers unusual opportunities for studying representative plants and animals of both Northern and Southern California. Graduates of the various programs enter fields in teaching; medical and biological laboratory technology; public health; wildlife management; agriculture; industry; and private, state and national park and forest services. A significant number enter graduate or professional schools for advanced study of botany, entomology, microbiology, plant pathology, zoology, marine sciences, veterinary science, medicine and dentistry. The department offers courses required for preprofessional training in medicine and paramedical fields. In the teaching area, all state requirements may be met with an academic major in biological sciences leading to a credential in secondary teaching.

The department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see Study Abroad Programs.

Biological Sciences Major

With the several curricular concentrations described below, this degree offers students a broad education in biology. It is suitable for preprofessional preparation in the bio-medical fields, as a base for work toward postbaccalaureate studies, and for technical competency in the concentrations offered.

Curricular Concentrations

Anatomy-Physiology. Designed for students who are interested in the biological sciences with an emphasis in the structure and function of animals and for preprofessional students interested in the health sciences.

Biology. Gives the student a broad training in biology and provides a background for entry level jobs, graduate study or a single-subject teaching credential in biological sciences.

Individualized Course of Study. Designed to allow students who do not select either of the above concentrations to design their own career track with approval of their faculty advisers.

Ecology And Systematic Biology Major

The four-year program in Ecology and Systematic Biology leads to a Bachelor of Science degree. Emphasis is placed on the study of the diversity of living organisms, their relationships to each other, and to their environment. The concentrations described below enable the student to tailor his or her curriculum towards specific career objectives.

CURRICULAR CONCENTRATIONS

Marine Biology and Fisheries. Prepares students for advanced training or professional employment in public or private agencies concerned with marine sciences, freshwater ecology, fisheries biology, fisheries management, or related fields. By judicious selection of electives, the student will be academically prepared to apply for professional certification as a Fisheries Biologist by the American Fisheries Society.

Wildlife Biology. Prepares students for advanced training or professional employment in public or private agencies concerned with the biology and management of both game and nongame terrestrial wildlife species. By judicious selection of electives, the student will be academically prepared to apply for professional certification as an Associate Wildlife Biologist by the Wildlife Society.

Individualized Course of Study. Allows students, in consultation with their advisers, the flexibility to design courses of study that prepare them for a diversity of career opportunities in ecology and systematic biology. Ecology stresses a broad understanding of the interactions of organisms with their environment; systematics stresses the identification and classification of living organisms. With this foundation, graduates may pursue careers in education, ecology, environmental impact analysis, environmental monitoring or management, museums, herbaria, zoos and botanical gardens. A graduate will be academically prepared for professional certification as an Associate Ecologist by the Ecological Society of America.

Microbiology Major

The undergraduate program leading to the Bachelor of Science degree in Microbiology involves the study of microorganisms such as bacteria, viruses, algae, protozoa, and fungi. Special emphases are placed on their structure and function as well as their interactions with each other and with human beings.

Students are encouraged to select one of six available career tracks. Students with unique career goals are encouraged to design their own track in consultation with their adviser.

Biotechnology Minor

For information regarding the Biotechnology Minor, please see College of Science and Mathematics Section.

BS BIOLOGICAL SCIENCES

- 60 units upper division GWR
 2.0 GPA USCP

* = Satisfies General Education requirement

MAJOR COURSES

BIO 151 Introduction to Biology (B1b)*	5
BIO 152 Biology of Plants & Fungi (Area B)*	5
BIO 153 Biology of Animals (Area B)*	5
MCRO 224 General Microbiology I (E2)*	5
BIO 351 Classical and Molecular Genetics	5
BIO 414 Evolution.....	4
BIO 452 Cell Biology	4
BIO 461 Senior Project.....	3
Ecology. Select one course from:	4
BIO 325 or BOT 326 (Area B)*	

Botany. Select one course from:.....	4
BOT 223, 323, 335 (Area B)*	
Zoology. Select one course from:.....	4
ZOO 321, 322, 323, 329, 335, 336, 341, 425	
Physiology. Select one course from:	4
BIO 431, 434, 435	
Concentration <i>or</i> individualized course of study (see below)	27-30
	79-82

SUPPORT COURSES

CHEM 127 General Chemistry (B1a)*	4
CHEM 128 General Chemistry (Area B)*	4
CHEM 129 General Chemistry (Area B)*	4
MATH 120 Pre-Calculus Algebra and Trigonometry (B2)*	5
(MATH 118 & 119, or MATH 141 substitute)	
PHYS 121 College Physics (Area B)*	4
PHYS 122 College Physics (Area B)*	4
PHYS 123 College Physics (Area B)*	4
STAT 218 Appl Statistics-Life Sciences (B2)*	4
Computer literacy elective (F1)*	3
(CSC 110 or 113 recommended)	
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GENERAL EDUCATION (GE)

45
72 units required; 27 of these units are in Major/Support.
→See page 79 for complete GE course listing.
→Minimum of 3 GE courses required at the 300-400 level.

Area A Communication (minimum 11 units)

Take one course from each Area A category:

- A1 Expository Writing
- A2 Critical Thinking
- A3 Speech

If less than 11 units, take one additional course in:

- A4 Argumentative Writing

Area B Science and Mathematics (no additional units required)

20 units are in Major/Support.

- B1a Physical Sciences *see Major
- B1b Life Sciences *see Major
- B2 Mathematics and/or Statistics *see Major
- Area B * see Major

Area C Arts and Humanities (minimum 15 units)

Take one course from each Area C category:

- C1 Literature
- C1 Philosophy
- C2 Fine/Performing Arts
- C3 Lit/Phil/Arts (300-400 level)

If less than 15 units, take one additional course from C1, C2, C3

Area D Social, Political, Economic Inst. (minimum 15 units)

No more than one course in any Area D category.

Take one course from D1a and one from D1b

- D1a HIST 202 (USCP) or HIST 204 or LS 211
- D1b POLS 110 or LS 212

Take three courses from D2, D3, D4a, D4b

- D2 History (300-400 level)
- D3 Economics
- D4a Social Institutions
- D4b Social Institutions (300-400 level)

Area E Life Understanding (no additional units required)

4 units are in Major.

E2 Self Development *see Major

Area F Technology (no additional units required)

3 units are in Support.

F1 Computer Literacy *see Support

Additional GE Courses (minimum 4 units)

To complete 72-unit requirement, select additional courses from Areas A, C, D, E. No more than one additional course per area.

ELECTIVES 23-26

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Concentration or Individualized Course of Study (Select One)

Anatomy and Physiology Concentration

CHEM 216 Organic Chemistry.....	4
CHEM 217 Organic Chemistry.....	5
CHEM 371 Biochemical Principles.....	5
CHEM 372 Metabolism.....	3
Select three of the following courses:	12-13
BIO 432 Vertebrate Systems Physiology	
BIO 433 Endocrin/Reproductive Physiology	
BIO 434 Environmental Physiology	
ZOO 405 Vertebrate Development	
ZOO 422 Functional Histology	
	<u>29-30</u>

Biology Concentration

Select one course from each of the following areas. A course cannot fulfill the requirements for the Major and the Concentration.

<i>Botany</i>	4
BOT 223, 323, 333, 334, 335, 457	
<i>Zoology</i>	4
ZOO 321, 322, 323, 329, 335, 336, 341, 425	
<i>Anatomy/Physiology</i>	4-5
BIO 431, 432, 433, 434, 435; BOT 335;	
MCRO 424; ZOO 240, 241	
<i>Organic Chemistry</i>	5
CHEM 212 or CHEM 216 & 217	
<i>Biochemistry</i>	5
CHEM 313 or CHEM 371 & 372	
Adviser approved electives	6
	<u>28-29</u>

Individualized Course of Study

CHEM 212 Survey of Organic Chemistry	5
CHEM 216 & 217 may be substituted.	
CHEM 313 Survey of Biochemistry	5
CHEM 371 & 372 may be substituted.	
Adviser approved electives	17
(13 units must be 300/400 level)	
To be selected with adviser approval from 200, 300, 400-level BIO, BOT, MCRO, ZOO courses excluding BIO 220, 253, 300, 302, 306.	
	<u>27</u>

BS ECOLOGY AND SYSTEMATIC BIOLOGY

- 60 units upper division GWR
- 2.0 GPA USCP

* = Satisfies General Education requirement

MAJOR COURSES

BIO 151 Introduction to Biology (B1b)*	5
BIO 152 Biology of Plants and Fungi (Area B)*	5
BIO 153 Biology of Animals (Area B)*	5
MCRO 221 Survey of Microbiology (E2)*.....	4
BIO 303 Survey of Genetics <i>or</i>	
BIO 351 Classical and Molecular Genetics (Area B)*.....	3-5
BIO 325 General Ecology <i>or</i>	
BOT 326 Plant Ecology (Area B)*	4
BIO 414 Evolution <i>or</i>	
BIO 415 Biogeography	4
<i>Physiology</i> . Select one course from:	
BIO 431, BIO 434, BIO 435	4
BIO 461 Senior Project.....	3
BIO 462 Senior Project.....	2
BOT 223 Introductory Plant Taxonomy (Area B)* .	4
BOT 333 Field Botany.....	4
ZOO 335 General Entomology <i>or</i>	
ZOO 336 Invertebrate Zoology	4
ZOO 437 Animal Behavior	4
Concentration courses or adviser approved electives (see below)	<u>20-26</u>
	<u>75-83</u>

SUPPORT COURSES

¹ CHEM 127 General Chemistry (B1a)*	4
CHEM 128 General Chemistry (Area B)*	4
CHEM 212 Survey of Organic Chem (Area B)*	5
FNR 416 Environmental Impact Analysis & Mgt <i>or</i>	
FNR/LA 318 Applic of GIS in Natural Resources	3/4
² MATH 120 Pre-Calculus Algebra and Trig. (B2)* .	5
³ PHYS 121 College Physics (Area B)*	4
SS 121 Introductory Soil Science (F2)*	4
STAT 218 Stat Methods in the Life Sciences (B2)*	4
STAT 313 Applied Experimental Design and Regression Models (Area B)*	4
⁴ Computer literacy elective (F1)*	3
(CSC 110 or CSC 113 recommended)	
	<u>40-41</u>

GENERAL EDUCATION (GE) 45

72 units required; 27 of these units are in Major/Support.

→See page 79 for complete GE course listing.

→Minimum of 3 GE courses required at the 300-400 level.

Area A Communication (minimum 11 units)

Take one course from each Area A category:

A1 Expository Writing

A2 Critical Thinking

A3 Speech

If less than 11 units, take one additional course in:

A4 Argumentative Writing

Area B Science and Mathematics (no additional units required)

20 units are in Major/Support.

B1a Physical Sciences *see Support

B1b Life Sciences *see Major

B2 Mathematics and/or Statistics *see Support

Area B * see Major

Area C Arts and Humanities (minimum 15 units)

Take one course from each Area C category:

C1 Literature

C1 Philosophy

C2 Fine/Performing Arts

C3 Lit/Phil/Arts (300-400 level)

If less than 15 units, take one additional course from C1, C2, C3

Area D Social, Political, Economic Inst. (min 15 units)

No more than one course in any Area D category.

Take one course from D1a and one from D1b

D1a HIST 202 (USCP) or HIST 204 or LS 211

D1b POLS 110 or LS 212

Take three courses from D2, D3, D4a, D4b

D2 History (300-400 level)

D3 Economics

D4a Social Institutions

D4b Social Institutions (300-400 level)

Area E Life Understanding (no additional units required)

4 units are in Major.

E2 Self Development *see Major

Area F Technology (no additional units required)

3 units are in Support.

F2 Technology elective *see Support

Additional GE Courses

To complete 72-unit requirement, select additional courses from Areas A, C, D, E. No more than one additional course per area.

ELECTIVES17-26**186****CONCENTRATION OR INDIVIDUALIZED COURSE OF STUDY (select one)****Marine Biology and Fisheries Concentration**

BIO 328 Marine Biology or

BIO 334 Limnology 4

BOT 437 Phycology..... 4

ZOO 320 Fishery Resource Management or

ZOO 423 Fisheries Science and Resource

Conservation..... 4

ZOO 322 Ichthyology 4

ZOO 436 Functional Invertebrate Zoology 4

Select with adviser approval from:..... 4

BIO 227, 328, 334, 435, 437, 444;

FNR 203, 335;

ZOO 320, 321, 341, 421, 423

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Wildlife Biology Concentration

BIO 227 Wildlife Conservation Biology..... 4

BIO 228 Wildlife Biology Laboratory 1

BIO 327 Wildlife Biology Methods..... 5

BIO 427 Wildlife Management..... 4

ZOO 321 Mammalogy 4

ZOO 323 Ornithology 4

Select with adviser approval from:..... 4

BIO 207, 334, 444;

FNR 203, 335, 435;

ZOO 341, 421

For students seeking certification, select FNR

203, 302, 406 in lieu of free electives.

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Individualized Course of Study

Choose one of the following 4-5

BIO 328 Marine Biology (4)

BIO 334 Limnology (4)

BOT 437 Phycology (4)

MCRO 342 Sanitary Microbiology (4)

MCRO 436 Microbial Ecology (5)

ZOO 320 Fisheries Science and Resource

Conservation (4)

ZOO 423 Freshwater Fisheries Biology (4)

Adviser approved electives 16

20-21

¹ CHEM 129 and 313 are recommended for students planning postgraduate training.² MATH 118 and 119, or 141 will substitute.³ PHYS 122, 123 are recommended for students planning postgraduate training.⁴ Students are expected to have completed their computer literacy requirement by the end of their sophomore year.

BS MICROBIOLOGY

- 60 units upper division GWR
- 2.0 GPA USCP

* = Satisfies General Education requirement

MAJOR COURSES

BIO 151 Introduction to Biology (B1b)*	5
BIO 351 Classical and Molecular Genetics (Area B)*	5
BIO/CHEM 375 Molecular Biology Laboratory	2
BIO 461 Senior Project.....	3
MCRO 224 General Microbiology I (E2)*.....	5
MCRO 225 General Microbiology II (Area B)*.....	5
MCRO 402 General Virology.....	5
MCRO 421 Food Microbiology	4
MCRO 423 Medical Microbiology.....	5
MCRO 424 Microbial Physiology	5
CHEM 127 General Chemistry (B1a)*.....	4
CHEM 128 General Chemistry (Area B)*.....	4
CHEM 129 General Chemistry (Area B)*.....	4
¹ MATH 118 Pre-Calculus Algebra (B2)*.....	4
PHYS 121 College Physics (Area B)*.....	4
PHYS 122 College Physics (Area B)*.....	4
PHYS 123 College Physics (Area B)*.....	4
² STAT 218 Applied Statistics-Life Sciences (B2)* ..	4
ZOO 426 Immunology and Serology.....	4
³ Restricted electives	16

To be selected in consultation with adviser.
Students must select one of the following career tracks: Biotechnology, Medical Technology, Public Health, Applied Microbiology, Pre-Health Professions, or Postgraduate Studies.

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SUPPORT COURSES

Courses to complete Career Track:
Medical Technology and Public Health
Microbiology Career Tracks:
 BIO 153, CHEM 212, 231, 313
Applied Microbiology, Biotechnology, Post-Graduate Studies, and Pre-Health Professions Career Tracks:
 CHEM 216, 217, 318, 371, 372, 374

20-24

GENERAL EDUCATION (GE) 48

72 units required; 24 of these units are in Major/Support.
 →See page 79 for complete GE course listing.
 →Minimum of 3 GE course required at the 300-400 level.

Area A Communication (minimum 11 units)

Take one course from each Area A category:

- A1 Expository Writing
- A2 Critical Thinking
- A3 Speech

If less than 11 units, take one additional course in:

- A4 Argumentative Writing

Area B Science and Mathematics (no additional units required)

20 units are in Major/Support.

- B1a Physical Sciences *see Major
- B1b Life Sciences *see Major
- B2 Mathematics and/or Statistics *see Major
- Area B * see Major

Area C Arts and Humanities (minimum 15 units)

Take one course from each Area C category:

- C1 Literature
- C1 Philosophy
- C2 Fine/Performing Arts
- C3 Lit/Phil/Arts (300-400 level)

If less than 15 units, take one additional course from C1, C2, C3

Area D Social, Political, Economic Inst. (min 15 units)

No more than one course in any Area D category.

Take one course from D1a and one from D1b

- D1a HIST 202 (USCP) or HIST 204 or LS 211
- D1b POLS 110 or LS 212

Take three courses from D2, D3, D4a, D4b

- D2 History (300-400 level)
- D3 Economics
- D4a Social Institutions
- D4b Social Institutions (300-400 level)

Area E Life Understanding (no additional units required)

4 units are in Major.

- E2 Self Development *see Major

Area F Technology (minimum 2 units)

Take one course from F1 or F2

- F1 Computer Literacy
- F2 Technology elective

Additional GE Courses (minimum 5 units)

To complete 72-unit requirement, select additional courses from Areas A, C, D, E. No more than one additional course per area.

ELECTIVES 18-22

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¹ MATH 119 or 120 will substitute.

² MATH 141 will substitute.

³ To be selected with written consent of instructor based on choice of career track. Up to 4 units of BIO 450 may be used to satisfy the restricted electives requirement.

MASTER OF SCIENCE DEGREE IN BIOLOGICAL SCIENCES

General Characteristics

This degree offers a broad background in the biological sciences. The program is designed to offer sufficient breadth and depth to strengthen the student's academic understanding and improve competence for (a) many types of biological work which require advanced training beyond the bachelor's degree, (b) employment in industry and/or civil service, (c) teaching biological sciences at the elementary, secondary and community college levels, (d) independent research in the field of specialization, or (e) continued graduate work at other institutions.

Prerequisites

Admission as a conditionally classified or classified student in this program requires a minimum grade point average of 3.0 in the last 90 quarter units attempted, satisfactory scores on the Graduate Record Examination, and letters of recommendation from persons knowing your academic potential. Advancement to candidacy requires a satisfactory background in biology, and completion of 12 units of courses specified in an informal study plan with a minimum grade point average of 3.0.

Information pertaining to specific departmental requirements for admission to graduate standing—classified or graduate standing—conditionally classified may be obtained from the Director of the Graduate and Research Committee (Graduate Coordinator) of the Biological Sciences Department.

Program of Study

The formal program of study for the degree must include 45 units of committee-approved graduate work, at least 30 units of which must be at the 500 level. At least 18 units of the formal program of study must be completed after the student has been advanced to candidacy. A grade point average of 3.0 or better is required in all courses taken as a graduate student. Two approaches to the M.S. degree in Biological Sciences are possible. The requirements for these two approaches are listed below.

CURRICULUM FOR MS BIOLOGICAL SCIENCES

	Thesis Plan	Coursework Plan
BIO 501 Cellular Biology	4	4
BIO 502 Biology of Organisms	4	4
BIO 503 Population Biology	4	4
BIO 590 Seminar in Biology	3	3
BIO 599 Thesis, including oral defense of thesis	9	—
BIO 500 Individual Study, including written report	—	4
Comprehensive Exam:		
GRE Advanced Biology	Yes	Yes
Essay	No	Yes
Electives from 500-level courses ...	6	11
Electives from 400- and 500-level courses	15	15
	45	45

All 45 units must be acceptable for graduate credit and in accordance with Graduate Guidelines of the Biological Sciences Department. For further information students should communicate with the Chair of the Biological Sciences Department or with the Director of the Graduate and Research Committee.

Chemistry and Biochemistry

Department Office
Faculty Offices East Bldg. (25), Room 125B
(805) 756-2693

Department Chair, Albert C. Censullo

Christina A. Bailey	John C. Maxwell
Philip S. Bailey	Neil J. Moir
Robert S. Cichowski	Margaret (Peggy) S. Rice
Lee C. Coombs	William C. Rife
Leland S. Endres	Mary (Sam) N. Rigler
Thomas G. Frey	Rod W. Schoonover
John W. F. Goers	Michael G. Silvestri
Derek E. Gragson	Jan W. Simek
Ralph A. Jacobson	Russell L. Tice
Dane R. Jones	Theresa A. Torres
David L. Keeling	Nanine A. Van Draanen
Martin A. Kellerman	James D. Westover
Kevin B. Kingsbury	Max T. Wills
John F. Marlier	

ACADEMIC PROGRAMS

BS Biochemistry BS Chemistry

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 an American Chemical Society (A.C.S.) certified concentration in Polymers and Coatings, the Bachelor of Science in Biochemistry, and the Bachelor of Science in Biochemistry with an A.C.S. certified concentration in Polymers and Coatings. The B.S. in Chemistry is certified by the American Chemical Society.

The baccalaureate curricula in biochemistry and chemistry include required courses in general chemistry, analytical chemistry, inorganic chemistry, organic chemistry, and physical chemistry. Advanced undergraduates choose electives from courses which cover a broad range of specialized topics, such as clinical chemistry, environmental chemistry, geochemistry, glass chemistry, immunochemistry, industrial catalysis, nuclear chemistry,

nutritional biochemistry, pharmacology, and polymer chemistry.

The Polymers and Coatings concentration includes the required courses in the chemistry or biochemistry curriculum and electives in the area of polymers, coatings, surface chemistry and materials engineering.

The curriculum emphasizes laboratory work, especially work with many kinds of current instrumentation, across the fields of chemistry. It also emphasizes project work: every undergraduate completes a senior project, an intensive research project designed and carried out by the student and supervised by a faculty adviser. A senior project may be pure or applied research in chemistry or biochemistry or it may be interdisciplinary work which combines chemistry with another field such as art, biology, civil or environmental engineering, psychology, or soil science. Under the department's cooperative education program, many bachelor's degree candidates work full-time in industry or government for one or two quarters, for pay and academic credit.

Career opportunities for chemists are increasing. There are openings in traditional areas such as clinical chemistry, environmental analysis, the health professions, industrial research and production, pharmacology, product quality control, and teaching at the secondary or university level; newer opportunities lie in such related areas as library science, market research, patent law, and safety engineering.

The concentration in polymers and coatings gives students the background and practical experience to move into a rewarding career in a wide range of fields including textiles, paints and varnishes, rubber, plastics, adhesives and resins.

There is a rapidly increasing number of career opportunities in the expanding fields of biotechnology and polymers and coatings. A major in biochemistry or chemistry or a minor in biotechnology prepares students for direct entry into these careers, as well as for postgraduate education in a professional specialty.

Biotechnology Minor

For information regarding the Biotechnology minor, see College of Science and Mathematics section.

BS CHEMISTRY

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

* = Satisfies General Education requirement

MAJOR COURSES

CHEM 127 General Chemistry (B1a)*	4
CHEM 128 General Chemistry (Area B)*	4
CHEM 129 General Chemistry (Area B)*	4
CHEM 156 General Chemistry Laboratory	1
CHEM 216 Organic Chemistry I (Area B)*	4
CHEM 217 Organic Chemistry II (Area B)*	5
CHEM 231 Quantitative Analysis I (Area B)*	5
CHEM 313 Survey of Biochemistry and Biotechnology or CHEM 371 Biochemical Principles	5
CHEM 318 Organic Chemistry III (Area B)*	5
CHEM 332 Quantitative Analysis II	3
CHEM 351 Physical Chemistry I (Area B)*	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 359 Chemical Literature	2
CHEM 439 Instrumental Analysis	5
CHEM 459 Undergraduate Seminar	2
CHEM 460/461/462 Senior Project	1-2
CHEM 481 Inorganic Chemistry	3
CHEM 483 Inorganic Synthesis	1
Advanced adviser approved chemistry electives to complete major, or concentration	18

84-85**SUPPORT COURSES**

Life Sciences: (B1b)* Select one course from:
 BIO 111, 115, 151; BOT 121; MCRO 221, 224 . 4-5

CSC 110/111/113/234 (F1)*	3
MATH 141, 142, 143 Calculus I, II, III (B2) (Area B)*	4,4,4
MATH 241 Calculus IV (B2)(Area B)*	4
MATH 242 or 200-400 level STAT or CSC course	4
PHYS 131 General Physics (Area B)*	4
PHYS 132 General Physics (Area B)*	4
PHYS 133 General Physics (Area B)*	4
Physics elective (200-level and above except PHYS 215)	3

42-43**GENERAL EDUCATION (GE) 49**

72 units required; 23 of these units are in Major/Support.

→See page 79 for complete GE course listing.

→Minimum of 3 GE course required at the 300-400 level.

Area A Communication (minimum 11 units)

Take one course from each Area A category:

A1 Expository Writing

A2 Critical Thinking

A3 Speech

If less than 11 units, take one additional course in:

A4 Argumentative Writing

Area B Science and Mathematics (no additional units required)

20 units are in Major/Support.

B1a Physical Sciences *see Major

B1b Life Sciences *see Support

B2 Mathematics and/or Statistics *see Support

Area B * see Major

Area C Arts and Humanities (minimum 15 units)

Take one course from each Area C category:

C1 Literature

C1 Philosophy

C2 Fine/Performing Arts

C3 Lit/Phil/Arts (300-400 level)

If less than 15 units, take one additional course from C1, C2, C3

Area D Social, Political, Economic Inst. (min 15 units)

No more than one course in any Area D category.

Take one course from D1a and one from D1b

D1a HIST 202 (USCP) or HIST 204 or LS 211

D1b POLS 110 or LS 212

Take three courses from D2, D3, D4a, D4b

D2 History (300-400 level)

D3 Economics

D4a Social Institutions

D4b Social Institutions (300-400 level)

Area E Life Understanding (minimum 3 units)

No more than one course in any Area E category.

Take one course from E1 or E2

E1 PSY 201/PSY 202

E2 Self Development

Area F Technology (no additional units required)

3 units are in Support.

F1 Computer Literacy *see Support

Additional GE Courses (minimum 5 units)

To complete 72-unit requirement, select additional courses from Areas A, C, D, E. No more than one additional course per area.

ELECTIVES 9-11**186****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

BS BIOCHEMISTRY

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

* = Satisfies General Education requirement

MAJOR COURSES

CHEM 127 General Chemistry (B1a)*	4
CHEM 128 General Chemistry (Area B)*	4
CHEM 129 General Chemistry (Area B)*	4
CHEM 216 Organic Chemistry I (Area B)*	4
CHEM 217 Organic Chemistry II (Area B)*	5
CHEM 231 Quantitative Analysis I (Area B)*	5
CHEM 318 Organic Chemistry III.....	5
CHEM 359 Chemical Literature	2
CHEM 351 Physical Chemistry I (Area B)*	3
CHEM 352 Physical Chemistry II	3
CHEM 353 Physical Chemistry III	3
CHEM 354 Physical Chemistry Laboratory	2
CHEM 371 Biochemical Principles (Area B)*	5
CHEM 372 Metabolism (Area B)*	3
CHEM 373 Molecular Biology.....	3
Select one course from:	
CHEM 344, 374, 375, 474	1-2
Select one course from:	
CHEM 344, 374, 375, 439 ¹ , 474, BIO 432 ¹	2
CHEM 459 Undergraduate Seminar	2
CHEM 460/461/462	1-2
Advanced adviser approved electives to complete Biochemistry major or concentration	8-18
	69-81

SUPPORT COURSES

BIO 151 Introduction to Biology (B1b)*	5
CSC 110/111/113/234 (F1)*	3
MATH 141, 142, 143 Calculus I, II, III (B2)*	4,4,4
PHYS 121, 122, 123 College Physics <i>or</i> PHYS 131, 132, 133 General Physics (Area B)* ..	4,4,4
Life science elective (MCRO 221 or MCRO 224 or 300-level)	4-5
	36-37

GENERAL EDUCATION (GE) 49

72 units required; 23 of these units are in Major/Support.

→See page 79 for complete GE course listing.

→Minimum of 3 GE course required at the 300-400 level.

Area A Communication (minimum 11 units)

Take one course from A1, A2, A3:

- A1 Expository Writing
 A2 Critical Thinking
 A3 Speech

If less than 11 units, take one additional course in:

- A4 Argumentative Writing

Area B Science and Mathematics (no additional units required)

20 units are in Major/Support.

- B1a Physical Sciences *see Major
 B1b Life Sciences *see Support
 B2 Mathematics and/or Statistics *see Support
 Area B * see Major

Area C Arts and Humanities (minimum 15 units)

Take one course from each Area C category:

- C1 Literature
 C1 Philosophy
 C2 Fine/Performing Arts
 C3 Lit/Phil/Arts (300-400 level)

If less than 15 units, take one additional course from C1, C2, C3

Area D Social, Political, Economic Inst. (min 15 units)

No more than one course in any Area D category.

Take one course from D1a and one from D1b

- D1a HIST 202 (USCP) *or* HIST 204 *or* LS 211
 D1b POLS 110 *or* LS 212

Take three courses from D2, D3, D4a, D4b

- D2 History (300-400 level)
 D3 Economics
 D4a Social Institutions
 D4b Social Institutions (300-400 level)

Area E Life Understanding (minimum 3 units)

No more than one course in any Area E category.

Take one course from E1 *or* E2

- E1 PSY 201/PSY 202
 E2 Self Development

Area F Technology (no additional units required)

3 units are in Support.

- F1 Computer Literacy *see Support

Additional GE Courses (minimum 5 units)

To complete 72-unit requirement, select additional courses from Areas A, C, D, E. No more than one additional course per area.

ELECTIVES 19-32
186

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 Excess units will count as approved Chemistry electives.

Mathematics

Department Office
Faculty Offices East Bldg. (25), Room 208
(805) 756-2206
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Department Chair, Kent E. Morrison

- | | |
|---------------------|------------------------|
| Steven J. Agronsky | Martin T. Lang |
| Estelle L. Basor | George M. Lewis |
| Michael R. Colvin | George W. Luna |
| H. Arthur DeKleine | Jean M. McDill |
| James E. Delany | James R. Mueller |
| Gary M. Epstein | Paul F. Murphy |
| Gerald P. Farrell | Thomas D. O'Neil |
| Jack E. Girolo | Linda J. Patton |
| D. Edward Glassco | Don P. Rawlings |
| Stuart Goldenberg | Jonathan E. Shapiro |
| Harvey C. Greenwald | Mark Stankus |
| Caixing Gu | H. Bernard Strickmeier |
| Donald G. Hartig | Lawrence Sze |
| Alan W. Holz | Raymond D. Terry |
| J. Myron Hood | John Van Eps |
| Rex L. Hutton | Robin Ward |
| Goro C. Kato | Stephen T. Weinstein |
| Euel W. Kennedy | Robert S. Wolf |

ACADEMIC PROGRAMS

**BS, MS Mathematics
 Mathematics Minor**

The Mathematics Department offers a complete undergraduate program of courses leading to a Bachelor of Science degree in mathematics. It also offers a program of courses for students who wish to minor in mathematics, as well as graduate courses for programs of study leading to a Master of Science degree. The applied flavor of these courses increases both the usefulness of and the demand for the graduates with a degree in mathematics. In addition, the Mathematics Department offers courses that serve all departments in the university.

The undergraduate program for math majors contains a central core of courses. These courses give a solid basis for advanced work that is tailored to fit the needs and objectives of each individual student. Advanced course-work is chosen in close consultation with faculty advisers.

The rich variety of courses available in the department permits the student not only to obtain a broad exposure to those fields of mathematics which are most useful in the physical sciences and engineering, but also to obtain experience with the mathematics that is used in business, management sciences, and operations research.

Students wishing to prepare for a teaching career in junior or senior high school may make a selection of courses

especially designed to satisfy California single subject credential requirements. All of these programs provide a strong mathematical foundation for the student contemplating the pursuit of an advanced degree in mathematics.

MATHEMATICS MINOR

Students may earn a minor in mathematics by completing a coordinated course of study. The program consists of a core of required courses, followed by two tracks of advanced work, to be chosen in concert with a student's career objectives. Interested students should contact the Mathematics Department for individual advisement.

I. Required courses	8
MATH 206 Linear Algebra I (4)	
MATH 248 Methods of Proof in Mathematics (4)	
II. Complete at least two of the following tracks	16
A track consists of at least two courses from the following groups of courses. Completion of all four courses in the last group is considered two tracks. Some tracks have additional mathematics prerequisites such as MATH 242.	
MATH 304 Vector Analysis (4)	
MATH 317/318 Engineering Math (4)	
MATH 418 Partial Differential Equations (4)	
MATH 306 Linear Algebra II (4)	
MATH 406 Linear Algebra III (4)	
MATH 335 Graph Theory (4)	
MATH 336 Combinatorial Mathematics (4)	
MATH 437 Game Theory (4)	
MATH 408 Functions of a Complex Variable (4)	
MATH 409 Complex Analysis (4)	
MATH 412 Introduction to Analysis I (4)	
MATH 413 Introduction to Analysis II (4)	
MATH 431 Mathematical Optimization I (4)	
MATH 432 Mathematical Optimization II (4)	
MATH 442 Euclidean Geometry (4)	
MATH 443 Modern Geometries (4)	
MATH 341 Theory of Numbers (4)	
MATH 419 Intro. to History of Mathematics (4)	
MATH 481 Abstract Algebra I (4)	
MATH 482 Abstract Algebra II (4)	
III. Mathematics electives	6
	<hr/> 30

BS MATHEMATICS

- 60 units upper division GWR
- 2.0 GPA USCP

* = Satisfies General Education requirement

MAJOR COURSES

MATH 141 Calculus I (B2)*	4
MATH 142 Calculus II (Area B)*	4
MATH 143 Calculus III (Area B)*	4
MATH 202 Orientation to the Mathematics Major..	1
MATH 206 Linear Algebra I (Area B)*	4
MATH 241 Calculus IV (Area B)*	4
MATH 242 Differential Equations (Area B)*	4
MATH 248 Methods of Proof in Mathematics	4
MATH 336 Combinatorial Mathematics.....	4
MATH 412 Introduction to Analysis I.....	4
MATH 459 Undergraduate Seminar	4
MATH 461 Senior Project.....	2
MATH 462 Senior Project.....	2
MATH 481 Abstract Algebra I	4
¹ Advanced Work in Major	20-28
	69-77

SUPPORT COURSES

CSC 101 Fundamentals of Computer Science I (F1)*	4
CSC 102 Fundamentals of Computer Science II.....	4
² CSC 103/MATH 300/MATH 350.....	3
PHYS 131 General Physics (B1a)*.....	4
PHYS 132 General Physics (Area B)*.....	4
PHYS 133 General Physics (Area B)*.....	4
STAT 321 Probability and Statistics for Engineers and Scientists (B2)*.....	4
STAT 322 Statistical Analysis for Engineers & Scientists.....	4
¹ Advanced Work in Support.....	8-0
	39-31

GENERAL EDUCATION (GE) 50

72 units required; 22 of these units are in Major/Support.
 →See page 79 for complete GE course listing.
 →Minimum of 3 GE course required at the 300-400 level.

Area A Communication (minimum 11 units)

Take one course from A1, A2, A3:

- A1 Expository Writing
- A2 Critical Thinking
- A3 Speech

If less than 11 units, take one additional course in:

- A4 Argumentative Writing

Area B Science and Mathematics (minimum 2 units)

18 units are in Major.

Take one course from B1b:

- B1a Physical Sciences *see Major
- B1b Life Sciences elective
- B2 Mathematics and/or Statistics *see Major
- Area B * see Major

Area C Arts and Humanities (minimum 15 units)

Take one course from each Area C category:

- C1 Literature
- C1 Philosophy
- C2 Fine/Performing Arts
- C3 Lit/Phil/Arts (300-400 level)

If less than 15 units, take one additional course from C1, C2, C3

Area D Social, Political, Economic Inst. (min 15 units)

No more than one course in any Area D category.

Take one course from D1a and one from D1b

- D1a HIST 202 (USCP) or HIST 204 or LS 211
- D1b POLS 110 or LS 212

Take three courses from D2, D3, D4a, D4b

- D2 History (300-400 level)
- D3 Economics
- D4a Social Institutions
- D4b Social Institutions (300-400 level)

Area E Life Understanding (minimum 3)

No more than one course in any Area E category.

Take one course from E1 or E2

- E1 PSY 201/PSY 202
- E2 Self Development

Area F Technology (no additional units required)

4 units are in Support.

- F1 Computer Literacy *see Support

Additional GE Courses (minimum 4 units)

To complete 72-unit requirement, select additional course from Areas A, C, D, E. No more than one additional course per area.

ELECTIVES 28

186

¹ Advanced Work in Major and Support are to total 28 units.

² Students planning to seek the Single Subject Credential in Mathematics should take MATH 300, 341, 419, 442, and 443.

ADVANCED WORK IN THE BS MATHEMATICS CURRICULUM

Select 28 units from the advanced study tracks or from the list of additional electives below. Three advanced study tracks must be completed, *at least two* of which are to be chosen from the first four tracks listed.

Advanced Study Tracks

Select a minimum of two tracks from the following:

MATH 306, 406 Linear Algebra II, III (4) (4)

MATH 341 Theory of Numbers (4),
MATH 482 Abstract Algebra II (4)

MATH 413, 414 Introduction to Analysis II, III (4) (4)

MATH 431, 432 Mathematical Optimization I, II (4) (4)

Additional study tracks:

MATH 304 Vector Analysis (4),
MATH 404 Introduction to Differential Geometry
and Topology (4)

MATH 304 Vector Analysis (4),
MATH 418 Partial Differential Equations (4)

MATH 335 Graph Theory (4),
MATH 437 Game Theory (4)

MATH 408 Functions of a Complex Variable (4),
MATH 409 Complex Analysis (4)

MATH 442 Euclidean Geometry (4),
MATH 443 Modern Geometries (4)

Additional electives in Major. Select from:

MATH 333, 417, 419, 433, 470

Additional electives in Support. Select from:

CSC 349, 361

IME 301, 305

PHYS 301, 405, 408

STAT 425, 426, 427

MASTER OF SCIENCE DEGREE IN MATHEMATICS

General Characteristics

The master of science program in mathematics prepares students to enter careers in government, industry or teaching. A student who completes the degree will be qualified and eligible to teach at the community college level. Many of the graduates of the program also pursue further graduate study at Ph.D. granting institutions.

Prerequisites

Prerequisite to entering the program with a classified or conditionally classified status, the student must have a bachelor's degree from an accredited institution with a minimum grade point average of 2.5 in the last 90 quarter units attempted. Applicants with majors in other areas or applicants with deficiencies in their undergraduate background may be admitted conditionally. For information concerning additional departmental requirements, the student should contact the Graduate Coordinator in the Mathematics Department.

Advancement to candidacy requires completion of 12 units of an approved study plan with a minimum grade point average of 3.0 and satisfactory completion of the preliminary examinations in analysis and algebra.

CURRICULUM FOR MS MATHEMATICS Units

Required courses 24

MATH 540 Introduction to Topology (4)

MATH 550 Real Analysis (4)

MATH 560 Field Theory (4)

Complete one of the following two tracks:

MATH 520, 521, 522 Applied

Analysis I, II, III (12)

MATH 530, 531, 532 Graduate Discrete

Mathematics with Applications I, II, III (12)

MATH, CSC, STAT electives 12

Select 400–500 level MATH, CSC, or STAT courses as approved by the advising committee.

Electives 9

Select additional units at the 400 or 500 level as approved by the advising committee.

Satisfactorily complete the comprehensive examinations.

45

Physical Education & Kinesiology

Department Office
Physical Education Bldg. (43), Room 453
(805) 756-2545
www.calpoly.edu/~pek/

Department Head, Position Vacant

C. Andrea Brown	Dwayne Head
Victor Buccola	Raymond Nakamura
Steven C. Davis	Andrew J. Proctor
Gerald E. DeMers	Michael A. Sutliff
Sonja S. Glassmeyer	James L. Webb
Kellie G. Hall	

ACADEMIC PROGRAMS

BS, MS Kinesiology

The Physical Education and 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, physical education and first aid/CPR courses. Because of an ideal geographical location, the university has become a center for workshops held by some of the state's health and physical education organizations.

The new Recreation Center, which opened in 1993, provides state-of-the-art laboratory, activity and office space for the department. Campus facilities accommodate an extensive physical education instructional program as well as full-scale athletic, intramural, and recreational sports programs.

The B.S. in Kinesiology is a broad based program offering students curricular choices for a wide range of career opportunities. Concentrations include teaching, health education, clinical and worksite health promotion, and pre-physical therapy. Students also have the option of choosing an individualized course of study.

CURRICULAR CONCENTRATIONS

Clinical and Worksite Health Promotion

Incorporates basic knowledge of business and managerial skills with the scientific and clinical knowledge of exercise physiology, human chemistry, psychology and nutrition. Graduates work in a wide range of enterprises which include: worksite health promotion in public, private and governmental fitness facilities; and various clinical and rehabilitation programs.

Health Education. Prepares students for careers in education, public and private health-related agencies and for graduate school in the health sciences. Coursework focuses on working with others to enhance the quality of life through physical and mental health.

Pre-Physical Therapy. Prepares students for admission to a graduate program in physical therapy. The course of study focuses on the biological and physical concepts underlying the practice of physical therapy. Physical therapy professionals work with persons of all ages with movement dysfunction's in public and private therapy settings, in hospitals and homes, and as consultants to businesses and health promotion programs.

Teaching. Prepares students to meet subject matter competency required for application to the Single Subject Credential program in Physical Education. Also see Teaching Credential Programs.

Individualized Course of Study. Students may choose one of the above mentioned concentrations or pursue an individualized course of study. 36 units of coursework to be selected with adviser approval.

CERTIFICATES

Aquatic Certificate. Provides students from all disciplines an opportunity to develop knowledge and skills necessary for employment as aquatic facility managers or directors. National certifications are available as water safety instructor, lifeguard instructor, and certified pool operator.

Coaching Certificate. Provides teaching credential students, who are in a discipline other than physical education, an opportunity to develop knowledge and skills necessary for effective coaching. The program benefits those students who wish to coach individual or team sports at the high school or junior high level or who wish to coach non-school related sports.

BS KINESIOLOGY

- 60 units upper division GWR
- 2.0 GPA USCP

* = Satisfies General Education requirement

MAJOR COURSES

KINE 206–KINE 229 Professional Activity.....	6
KINE 250 Health Education (E2)* <i>or</i>	
KINE 255 Personal Health: A Multicultural Approach (E2)* (USCP).....	4
KINE 252 Introduction to Athletic Training.....	2
KINE 280 Responding to Emergencies: First Aid/CPR.....	3
KINE 302 Biomechanics	4
KINE 303 Physiology of Exercise	4
KINE 307 Adapted Physical Activity for Special Populations.....	4
KINE 317 Computer Applications in Kinesiology ..	2
KINE 319 Measurement and Evaluation in Kinesiology	4
KINE 401 Managing Physical Education and Health Promotion Programs	3
KINE 402 Motor Learning and Control.....	4
KINE 404 Motor Development	3
¹ KINE 411 Psycho/Social Aspects Physical Act <i>or</i>	
² KINE 434 Contemporary Approaches to Health Promotion Programs	3-4
KINE 461 Senior Project.....	2
KINE 462 Senior Project.....	1
Concentration courses (see below)	36-45
	85-95

SUPPORT COURSES

³ CHEM 110 World of Chemistry–Essentials <i>or</i>	
⁴ CHEM 111 General Chemistry <i>or</i>	
⁵ CHEM 127 General Chemistry (B1a)*.....	4-5
FSN 210 Nutrition (Area E)*.....	4
MATH 118 Pre-Calculus Algebra (B2)* (MATH 116 and MATH 117 are equivalent)	4
STAT 217 Applied Statistics-Liberal Arts <i>or</i>	
STAT 218 Appl Statistics-Life Sciences (B2)* ..	4
⁵ BIO 151/BIO 115/BIO 111 (B1b)*.....	4-5
ZOO 240, ZOO 241 Human Anatomy and Physiology (Area B)*	5,5
ZOO 340 Human Muscle Anatomy	1
	31-33

GENERAL EDUCATION (GE) 44

72 units required; 28 of these units are in Major/Support.
 →See page 79 for complete GE course listing.
 →Minimum of 3 GE course required at the 300-400 level.

Area A Communication (minimum 11 units)

Take one course from A1, A2, A3:

- A1 Expository Writing
- A2 Critical Thinking
- A3 Speech

If less than 11 units, take one additional course in:

- A4 Argumentative Writing

Area B Science & Mathematics (no additional units required)
 20 units are in Support.

- B1a Physical Sciences *see Support
- B1b Life Sciences * see Support
- B2 Mathematics and/or Statistics *see Support
- Area B * see Support

Area C Arts and Humanities (minimum 15 units)

Take one course from each Area C category:

- C1 Literature
- C1 Philosophy
- C2 Fine/Performing Arts
- C3 Lit/Phil/Arts (300-400 level)

If less than 15 units, take one additional course from C1, C2, C3

Area D Social, Political, Economic Inst. (min 15 units)

No more than one course in any Area D category.

Take one course from D1a and one from D1b

- D1a HIST 202 (USCP) *or* HIST 204 *or* LS 211
- D1b POLS 110 *or* LS 212

Take three courses from D2, D3, D4a, D4b

- D2 History (300-400 level)
- D3 Economics
- D4a Social Institutions
- D4b Social Institutions (300-400 level)

Area E Life Understanding (no additional units required)

8 units are in Major/Support.

Area E *see Major/Support

Area F Technology (minimum 2 units)

Take one course from F1 *or* F2

- F1 Computer Literacy
- F2 Technology elective

Additional GE Courses (minimum 1 units)

To complete 72-unit requirement, select additional course from Areas A, C, D. No more than one additional course per area.

ELECTIVES 15-27

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- ¹ Teaching concentration, Individualized Course of Study.
- ² Pre-Physical Therapy, Health Education, and Clinical and Worksite Health Promotion concentrations.
- ³ Teaching and Health Education concentrations.
- ⁴ Clinical and Worksite Health Promotion concentration.
- ⁵ Pre-Physical Therapy concentration.

CONCENTRATIONS (select one)

Clinical and Worksite Health Promotion

KINE 218 Aquatics..... 2

KINE 445 Electrocardiography 3

KINE 451 Nutrition for Fitness and Sport 5

KINE 452 Testing & Exercise Prescription for Fitness Specialists 4

KINE 463 Clinical and Worksite Health Promotion Internship 3

SPC 301 Business and Professional Communication 4

IME 319 Human Factors Engineering 3

Choose one of the following tracks:..... 18

Clinical Health Promotion Track

CHEM 212, 313; KINE 446; PHYS 104/121

Worksite Health Promotion Track

KINE 408, 450; JOUR 312; BUS 387/488; Adviser approved electives (4)

42

Health Education Concentration

KINE 218 Aquatics..... 2

KINE 305 Drug Education 2

KINE 405 Community Health Promotion..... 4

KINE 408 Exercise & Health Promotion Senior Adults..... 3

KINE 443 Comprehensive School Health Education 4

KINE 450 Worksite Health Promotion Programs.... 3

KINE 451 Nutrition for Fitness and Sport 5

ANT 401 Culture and Health..... 4

BIO 302 Human Genetics 3

MCRO 221 Survey of Microbiology 4

PSY 205 Human Sexuality 3

Adviser approved electives..... 8

45

Teaching Concentration

KINE 300 Planning Techniques in PE..... 5

KINE 309 Creative and Non-Traditional Games..... 3

KINE 315 Field Sports 3

KINE 356 Teaching Gymnastics 2

KINE 384 Water Safety Instructor 4

KINE 396 Outdoor Education 4

KINE 419 Physical Education Program Content in Elementary School 3

KINE 421 Strategies for Teaching PE 3

KINE 422 Teaching Elementary School PE 2

KINE 423 Teaching Middle School PE..... 3

KINE 425 Teaching High School PE 3

KINE 426 Senior Seminar for Teaching Concentration 2

KINE 443 Comprehensive School Health Education 4

DANC 381 Methods of Teaching Dance 4

45

Pre-Physical Therapy Concentration

KINE 218 Aquatics..... 2

PHYS 121 College Physics 4

PHYS 122 College Physics 4

PHYS 123 College Physics 4

BIO 153 Biology of Animals 5

CHEM 128 General Chemistry 4

CHEM 129 General Chemistry 4

Select from the following with adviser's approval.... 16

KINE 400, 408, 432,434, 437, 445, 522, 536

MCRO 221

CHEM 212, 313

PSY 317, 405

ZOO 422

43

Individualized Course of Study 36

Students have the option of choosing one of the above concentrations or they may take 36 adviser approved electives

MASTER OF SCIENCE DEGREE IN KINESIOLOGY

General Characteristics

The degree program is designed to offer advanced study in kinesiology which will qualify men and women to enter the field at occupational levels requiring a master's degree. The program offers the increased depth and quality needed for teaching physical education at the secondary and community college levels, and positions in corporate, private, and governmental agencies as well as those in clinical preventative and/or rehabilitative health settings.

Areas of Emphasis

Students may select one of the following areas of emphasis which is most compatible with career and personal objectives.

Exercise Science and Health Promotion

Exercise Science and Health Promotion is an extension of the Commercial/Corporate Fitness Concentration under the BS degree program in Kinesiology. This emphasis prepares students to work in the health promotion field in diversified settings, including corporate, club, private, and governmental agencies. It also qualifies graduates to pursue clinically oriented positions in preventative and rehabilitative health programs as well as providing students with an excellent background for advanced study.

Human Movement and Sport

This emphasis is offered for students who wish advanced preparation for elementary, secondary, or college positions in physical education and coaching. It is oriented toward a practical application and offers an opportunity for the in-depth study needed for (a) teaching physical education at all

levels; (b) coaching at the secondary and post-secondary levels, as well as with private and municipal agencies; and (c) continued graduate work at other institutions.

Conditionally Classified Standing

Applicants to the MS degree program in Kinesiology should have an undergraduate degree in Kinesiology or equivalent academic preparation. Those applicants with undergraduate deficiencies must remove these deficiencies through coursework or examination before Advancement to Candidacy.

Information pertaining to specific requirements for admission may be obtained from the Graduate Coordinator of the Physical Education and Kinesiology Program.

Classified Standing

For admission to classified standing, an applicant must have an undergraduate major in kinesiology or equivalent academic preparation as determined by the departmental coordinator of graduate studies and a minimum grade point average of 2.75 in the last 90 units of undergraduate work. Students below a 2.75 GPA may appeal to the Graduate Coordinator to be "conditionally" accepted. This latter procedure will involve a review process and a specified contract to be successfully completed before admission to classified standing.

Advancement to Candidacy

For Advancement to Candidacy, a student shall have:

Successfully completed all "conditionally classified requirements;

Successfully completed the Graduation Writing Requirement;

Maintained a minimum 3.0 GPA for all course work completed; and

Filed a Formal Study Plan.

At least 18 units must be completed after advancement to candidacy.

Requirements for the Degree

The formal program of study must include 45 units of approved graduate work; at least 33 of these units must be completed at the 500 level in Kinesiology.

All candidates must meet the current Graduation Writing Requirement.

Each candidate must successfully complete a comprehensive examination before the degree is granted. This examination may take one of two forms: (1) those students presenting a thesis or project must successfully defend the thesis or project in an oral examination, or (2) those students not presenting a thesis or project must pass an oral examination dealing with general current knowledge of the profession and coursework taken toward the degree requirements. *If the degree is not completed within 4 years, the graduate faculty will require that a thesis candidate also be tested on coursework.*

Up to 12 units may be taken in 400-level courses with adviser approval, provided these courses were not required as part of the undergraduate degree program. Graduate students taking 400-level courses will be required to complete assignments beyond those normally required of undergraduate students and will be graded against more rigorous standards than those applied to undergraduate students in the same course. A maximum of 12 adviser approved units may be taken outside of the Physical Education and Kinesiology Department.

CURRICULUM FOR MS KINESIOLOGY

Required courses	19
KINE 515 Behavior and Communication in a Health and Physical Education Setting (3)	
KINE 517 Research Methods in Kinesiology (3)	
KINE 519 Evaluation of Current Studies (3)	
KINE 522 Advanced Biomechanics (3)	
KINE 525 Human Performance & Learning (3)	
KINE 530 Adv Physiology of Exercise (4)	
Area of Emphasis	12/16
<i>Exercise and Health Promotion Emphasis (16)</i>	
KINE 503 Seminar in Adult Wellness (3)	
KINE 504 Cardiopulmonary Physiology, Pathology and Exercise (3)	
KINE 514 Health Education Planning (3)	
KINE 516 Management of Health Promotion in the Workplace (3)	
KINE 536 Advanced Electrocardiography (4)	
<i>Human Movement and Sport Emphasis (12)</i>	
KINE 502 Current Trends and Issues in Physical Education (3)	
KINE 511 Administration of Physical Education and Athletics (3)	
KINE 526 Sport in American Society (3)	
KINE 539 Observation, Development and Analysis of Teaching (3)	
Adviser approved electives	<u>14/10</u>
	45

For more detailed information or advisement, students should communicate with the Coordinator of Graduate Studies for Physical Education.

Physics

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 Science Bldg. (52), Room D-37
 (805) 756-2448
www.calpoly.edu/~phys; physics@calpoly.edu

Chair, Richard A. Saenz

Lawrence H. Balthaser	Leon Magur
Joseph C. Boone	Matthew J. Moelter
Ronald F. Brown	John Mottmann
Anthony J. Buffa	Kenneth S. Ozawa
David H. Chipping	Ralph A. Peters
Gayle Cook	John E. Poling
Robert H. Dickerson	David M. Roach
Neil L. Fleishon	Thomas G. Schumann
Theodore C. Foster	John P. Sharpe
Richard B. Frankel	Keith S. Stowe
David W. Hafemeister	Nilgun Sungar
Kenneth A. Hoffman	Willem L. van Wyngaarden
James S. Kalathil	Leonard W. Wall
Randall D. Knight	Ronald E. Zammit

ACADEMIC PROGRAMS

BS Physical Science BA Physics BS Physics

The Physics Department offers the Bachelor of Arts and the Bachelor of Science degrees in Physics, and the Bachelor of Science degree in Physical Science.

The department provides a comprehensive laboratory program. Facilities include specialized laboratories in electrical measurements, optics, solid state physics, nuclear and atomic physics. Student activities include a chapter of the national Society of Physics Students and a chapter of the national physics honor society, Sigma Pi Sigma.

High school students planning to major in physics should include in their high school program as much as possible of the following: eight semesters of college preparatory mathematics, two of physics, and two of chemistry.

BS Physical Science

The BS in Physical Science is designed primarily to serve students who plan to enter another field in which a physical science background would be useful. The program provides students an interdisciplinary mix of courses in physics, chemistry, astronomy, and geology. Students intending to do graduate study in either chemistry or physics should elect a chemistry or physics major. The Physical Science degree program is administered jointly by the Chemistry and Biochemistry Department and the Physics Department.

BA Physics

The BA in Physics will provide the student with a solid foundation in physics. Its primary purpose is to serve students who plan to pursue a career in science teaching at the high school level, and those who plan a career in science related fields for whom a physics background would be an asset.

The curriculum has fewer required upper division courses than the BS, which allows the student to choose from an extensive list of electives in consultation with an academic adviser. In addition, the BA provides an attractive option for students in related disciplines who wish to pursue a double major.

BS Physics

The BS in Physics is the appropriate choice for those students planning a career in industry or government laboratories, and those seeking a strong foundation in physics for graduate study.

Students have the choice of selecting one of the specialized concentrations or following the general physics curriculum, which offers a variety of elective coursework. Students who are planning to pursue graduate studies in physics are advised to follow the general curriculum. The electronics concentration is designed for students wishing to acquire a working knowledge of electronics to use in experimental physics. The electro-optics concentration provides a background in optical devices and techniques used in this rapidly expanding field.

BA PHYSICS

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

* = Satisfies General Education requirement

MAJOR COURSES

PHYS 131 General Physics (B1a)*	4
PHYS 132 General Physics (Area B)*	4
PHYS 133 General Physics (Area B)*	4
PHYS 206 Instrumentation in Experimental Physics	3
PHYS 211 Modern Physics I	4
PHYS 212 Modern Physics II	3
PHYS 256 Electrical Measurements Laboratory	1
PHYS 301 Thermal Physics I (Area B)*	3
PHYS 302 Analytical Mechanics I	3
PHYS 323 Optics	5
PHYS 405 Quantum Mechanics I	4
PHYS 461 Senior Project	2
CHEM 127 General Chemistry (B1a) *	4
CHEM 128 General Chemistry (Area B) *	4
MATH 141 Calculus I (B2) *	4
MATH 142 Calculus II (B2)*	4
MATH 143 Calculus III (Area B)*	4
MATH 241 Calculus IV (Area B)*	4
MATH 242 Differential Equations (Area B)*	4
MATH/STAT elective (300-400 level; MATH 318 recommended)	4
CSC elective (must satisfy F1) *	4
PHYS/ASTR electives (200-400 level)	15

91**GENERAL EDUCATION (GE) 50**

72 units required; 22 of these units are in Major/Support.

→See page 79 for complete GE course listing.

→Minimum of 3 GE courses required at the 300-400 level.

Area A Communication (minimum 11 units)

Take one course from A1, A2, A3.

A1 Expository Writing

A2 Critical Thinking

A3 Speech

If less than 11 units, take one additional course in:

A4 Argumentative Writing

Area B Science and Mathematics (minimum 2 units)

18 units are in Major.

Take one course from B1b:

B1a Physical Sciences *see Major

B1b Life Sciences elective

B2 Mathematics and/or Statistics *see Major

Area B * see Major

Area C Arts and Humanities (minimum 15 units)

Take one course from each Area C category:

C1 Literature

C1 Philosophy

C2 Fine/Performing Arts

C3 Lit/Phil/Arts (300-400 level)

If less than 15 units, take one additional course from C1, C2, C3

Area D Social, Political, Economic Inst. (min 15 units)

No more than one course in any Area D category.

Take one course from D1a and one from D1b

D1a HIST 202 (USCP) or HIST 204 or LS 211

D1b POLS 110 or LS 212

Take three courses from D2, D3, D4a, D4b

D2 History (300-400 level)

D3 Economics

D4a Social Institutions

D4b Social Institutions (300-400 level)

Area E Life Understanding (minimum 3 units)

No more than one course in any Area E category.

Take one course from E1 or E2

E1 PSY 201/PSY 202

E2 Self Development

Area F Technology (no additional units required)

4 units in Major.

F1 Computer Literacy *see Major

Additional GE Courses (minimum 4 units)

To complete 72-unit requirement, select additional courses from Areas A, C, D, E. No more than one additional course per area.

ELECTIVES 45**186**

BS PHYSICS

- 60 units upper division GWR
- 2.0 GPA USCP

* = Satisfies General Education requirement

MAJOR COURSES

PHYS 131 General Physics (B1a)*	4
PHYS 132 General Physics (Area B)*	4
PHYS 133 General Physics (Area B)*	4
PHYS 202 Physics on the Computer	4
PHYS 206 Instrumentation in Experimental Physics	3
PHYS 211 Modern Physics I.....	4
PHYS 212 Modern Physics II.....	3
PHYS 256 Electrical Measurements Laboratory	1
PHYS 301 Thermal Physics I	3
PHYS 302 Analytical Mechanics I	3
PHYS 303 Analytical Mechanics II	3
PHYS 323 Optics.....	5
PHYS 340 Quantum Physics Laboratory I	1
PHYS 341 Quantum Physics Laboratory II.....	1
PHYS 342 Quantum Physics Laboratory III	2
PHYS 363 Undergraduate Seminar	2
PHYS 405 Quantum Mechanics I	4
PHYS 408 Electromagnetic Fields and Waves I	4
PHYS 461 Senior Project	2
PHYS 462 Senior Project	2
CHEM 127 General Chemistry (B1a) *.....	4
CHEM 128 General Chemistry (Area B) *.....	4
CSC 101 or CSC 234 (F1) * (CSC 101 recommended).....	4
MATH 141 Calculus I (B2) *	4
MATH 142 Calculus II (Area B)*	4
MATH 143 Calculus III (Area B)*.....	4
MATH 241 Calculus IV (Area B)*.....	4
MATH 242 Differential Equations (Area B)*	4
MATH 304 Vector Analysis (B2) *.....	4
MATH 318 Advanced Engineering Mathematics....	4
Advanced Physics electives or Concentration courses (see below)	20-21

119-120

GENERAL EDUCATION (GE) 50

72 units required; 22 of these units are in Major/Support.
→See page 79 for complete GE course listing.
→Minimum of 3 GE courses required at the 300-400 level.

Area A Communication (minimum 11 units)

Take one course from A1, A2, A3.

- A1 Expository Writing
- A2 Critical Thinking
- A3 Speech

If less than 11 units, take one additional course in:

- A4 Argumentative Writing

Area B Science and Mathematics (minimum 2 units)

18 units are in Major.

Take one course from B1b:

- B1a Physical Sciences *see Major
- B1b Life Sciences elective
- B2 Mathematics and/or Statistics *see Major
- Area B * see Major

Area C Arts and Humanities (minimum 15 units)

Take one course from each Area C category:

- C1 Literature
- C1 Philosophy
- C2 Fine/Performing Arts
- C3 Lit/Phil/Arts (300-400 level)

If less than 15 units, take one additional course from C1, C2, C3

Area D Social, Political, Economic Inst. (min 15 units)

No more than one course in any Area D category.

Take one course from D1a and one from D1b

- D1a HIST 202 (USCP) or HIST 204 or LS 211
- D1b POLS 110 or LS 212

Take three courses from D2, D3, D4a, D4b

- D2 History (300-400 level)
- D3 Economics
- D4a Social Institutions
- D4b Social Institutions (300-400 level)

Area E Life Understanding (minimum 3 units)

No more than one course in any Area E category.

Take one course from E1 or E2

- E1 PSY 201/PSY 202
- E2 Self Development

Area F Technology (no additional units required)

4 units in Major.

- F1 Computer Literacy *see Major

Additional GE Courses (minimum 4 units)

To complete 72-unit requirement, select additional courses from Areas A, C, D, E. No more than one additional course per area.

ELECTIVES 16-17

ADVANCED PHYSICS ELECTIVES OR CONCENTRATION

Select *either* the advanced physics electives *or* one of the concentrations.

Advanced Physics Electives

Select one of the following: PHYS 424 or MATH 418.

In addition, select courses at the 300 or 400 level with the prefixes PHYS, MATH, STAT or CSC.

At least 9 of these elective units must have the PHYS prefix. All courses must be taken for a letter grade.

For students anticipating an industrial career
PHYS 357, 412, 413, 423, and 452 are suggested electives.

For students anticipating graduate work in physics
PHYS 401, 406, 424, and MATH 408 are suggested electives. In addition, PHYS 357 is suggested for students who anticipate becoming experimental physicists.

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Electro-optics Concentration

Students will not be allowed to enroll in EE 301 until they have a) completed PHYS 357 and MATH 318, and b) received approval of advisers in both Physics and Electrical Engineering. Students will then be allowed to enroll in EE courses with physics courses substituting for EE prerequisites.

PHYS 357 Advanced Instrumentation in Experimental Physics.....	3
PHYS 423 Advanced Optics	4
EE 301 Linear Systems Analysis	3
EE 341 Linear Analysis Laboratory	1
EE 403 Fiber Optics Communication	3
EE 418 Photonic Engineering.....	3
EE 458 Photonic Engineering Laboratory	1
Electives to be selected from the following list:	3
EE 302, 307, 328.	
EE 342, 414, 443 are recommended additional courses.	

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Electronics Concentration

Students will not be allowed to enroll in EE 301 until they have a) completed PHYS 357 and MATH 318, and b) received the approval of advisers in both Physics and Electrical Engineering. Students will then be allowed to enroll in EE courses with physics courses substituting for EE prerequisites.

PHYS 357 Advanced Instrumentation in Experimental Physics.....	3
EE 301 Linear Systems Analysis.....	3
EE 302 Linear Control Systems	3
EE 307 Digital Integrated Electronics.....	3
EE 341 Linear Analysis Laboratory	1
EE 342 Control Systems Laboratory	1
EE 347 Digital Integrated Electronics Laboratory	1
EE electives to be selected from the following list:.....	6
EE 308, 309, 313, 328, 348, 349, 353	

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BS PHYSICAL SCIENCE

- 60 units upper division GWR
- 2.0 GPA USCP

* = Satisfies General Education requirement

MAJOR COURSES

ASTR 301 The Solar System <i>or</i>	
ASTR 302 Stars and Galaxies (Area B)*	3
Astronomy and/or earth science adviser approved	
elective	4
CHEM 127, 128, 129 General Chemistry (B1a)*....	4,4,4
CHEM 351 Biophysical Chemistry <i>or</i>	
CHEM 305 Physical Chemistry (Area B)*	3
¹ CHEM 216 Organic Chemistry <i>or</i>	
CHEM 212 Organic Chemistry (Area B)*	4/5
¹ CHEM 313 Survey of Biochemistry <i>or</i>	
CHEM 371 Biochemical Principles (Area B)*	5
Chemistry adviser approved elective (300-400	
level)	4
GEOL 201 Physical Geology (Area B)*	3
Physical sciences adviser approved electives	
(300– 400 level)	9
¹ PHYS 131, 132, 133 General Physics <i>or</i>	
PHYS 121, 122, 123 College Physics (Area B)*... 4,4,4	
PHYS 211 Modern Physics I.....	4
Physics adviser approved elective.....	3
Physics adviser approved elective (300–400 level) .	3
PSC 461, CHEM 461, or PHYS 461 Senior Project	2
	71-72

SUPPORT COURSES

CSC 110 <i>or</i> CSC 113 (F1) *	3
MATH 141, 142, 143 Calculus I, II, III (B2)*	4,4,4
MATH/CSC/STAT 200-level electives	8
	23

¹ A choice of the PHYS 121, 122, 123 sequence or CHEM 212 or CHEM 313 restricts the Physics and Chemistry electives available to the student later in this program.

GENERAL EDUCATION (GE) 51

72 units required; 21 of these units are in Major/Support.
 →See page 79 for complete GE course listing.
 →Minimum of 3 GE courses required at the 300-400 level.

Area A Communication (minimum 11 units)

Take one course from A1, A2, A3:

- A1 Expository Writing
- A2 Critical Thinking
- A3 Speech

If less than 11 units, take one additional course in:

- A4 Argumentative Writing

Area B Science and Mathematics (minimum 2 units)

18 units are in Major.

Take one course from B1b:

- B1a Physical Sciences *see Major
- B1b Life Sciences elective
- B2 Mathematics and/or Statistics *see Major
- Area B * see Major

Area C Arts and Humanities (minimum 15 units)

Take one course from each Area C category:

- C1 Literature
- C1 Philosophy
- C2 Fine/Performing Arts
- C3 Lit/Phil/Arts (300-400 level)

If less than 15 units, take one additional course from C1, C2, C3

Area D Social, Political, Economic Inst. (min 15 units)

No more than one course in any Area D category.

Take one course from D1a and one from D1b

- D1a HIST 202 (USCP) *or* HIST 204 *or* LS 211
- D1b POLS 110 *or* LS 212

Take three courses from D2, D3, D4a, D4b

- D2 History (300-400 level)
- D3 Economics
- D4a Social Institutions
- D4b Social Institutions (300-400 level)

Area E Life Understanding (minimum 3 units)

No more than one course in any Area E category.

Take one course from E1 *or* E2

- E1 PSY 201/PSY 202
- E2 Self Development

Area F Technology (no additional units required)

3 units are in Support.

- F1 Computer Literacy *see Support

Additional GE Courses (minimum 5 units)

To complete 72-unit requirement, select additional courses from Areas A, C, D, E. No more than one additional course per area.

ELECTIVES 40-41

Statistics

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Department Chair, Jay L. Devore

Matthew Carlton	Steven Rein
Beth Chance	John M. Rogers
James C. Daly	Andrew A. Schaffner
John E. Groves	Robert K. Smidt
Roxy L. Peck	Kent D. Smith

ACADEMIC PROGRAMS

BS Statistics Statistics Minor

The Statistics Department has two primary purposes—to offer introductory statistics courses to students from many different majors at Cal Poly, and to offer a curriculum of diverse statistics courses for those students pursuing a Bachelor of Science degree in Statistics.

In this age of high technology it has become increasingly easy to record and store information resulting from experiments, surveys, and historical studies. It is the responsibility of the professional statistician to determine the best ways to collect, summarize and analyze these data. Because of the increasing number of quantitative studies that are conducted in fields ranging from medicine to agriculture to business, the professional statistician is in great demand.

The National Science Foundation estimates that statistics is one of the few areas that will have more openings in the next decade than there are individuals with degrees in that area. Recent graduates of the program at Cal Poly are working for companies in fields as diverse as insurance, aircraft manufacturing, banking, computer manufacturing, and pharmaceutical development.

The statistics degree program requires students to have a substantial amount of coursework in mathematics and computer science. With this basis the students take courses in the following statistics areas—analysis of variance, regression analysis, statistical use of computers, sampling methods, nonparametric analysis, multivariate analysis, and mathematical statistics. In the various courses the students make use of computer systems available at Cal Poly.

Throughout the program faculty encourage students to work on practical, realistic problems that require the understanding of all aspects of the data acquisition and analysis problem.

STATISTICS MINOR

Select one of the following introductory sequences 8-9

- STAT 217 Applied Statistics-Liberal Arts (4) *and* STAT 313 Applied Experimental Design and Regression Models (4)
- STAT 218 Applied Statistics-Life Sciences (4) *and* STAT 313 (4)
- STAT 221 Intro Probability and Statistics (5) *and* STAT 313 (4)
- STAT 251 Statistical Inference for Mgmt. I (4) *and* STAT 252 Statistical Inference for Mgmt. II (5)
- STAT 321 Probability and Statistics for Engineers and Scientists (4) *and* STAT 322 Statistical Analysis for Engineers and Scientists (4)

Required Courses

STAT 330 Statistical Uses of Computers.....	4
STAT 323 Design/Analysis of Experiments I <i>or</i> STAT 324 Applied Regression Analysis	4
STAT 400-level electives.....	4,4
Select one course from outside the Statistics Department, with the approval of the Statistics Minor Coordinator, that has substantial statistical applicability	3-4
	27-29

BS STATISTICS

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

MAJOR COURSES

STAT 100 Orientation to Statistics.....	1
MATH 141 Calculus I (B2)*	4
MATH 142 Calculus II (B2)*	4
MATH 143 Calculus III (Area B)*	4
MATH 206 Linear Algebra I (Area B)*	4
MATH 241 Calculus IV (Area B)*	4
STAT 321 Probability and Statistics for Engineers and Scientists (Area B)*	4
STAT 322 Statistical Analysis for Engineers and Scientists (Area B)*	4
STAT 323 Design and Analysis of Experiments I...	4
STAT 324 Applied Regression Analysis	4
STAT 330 Statistical Uses of Computers	4
STAT 425 Probability Theory	4
STAT 426 Estimation and Sampling Theory	4
STAT 427 Mathematical Statistics	4
STAT 461 Senior Project	2
STAT 462 Senior Project	2
STAT 463 Undergraduate Seminar	2
Statistics electives (400 level).....	12
CSC 342 Numerical Analysis I.....	3
	74

SUPPORT COURSES

CSC 101 Fundamentals of Computer Science <i>or</i> CSC 110 Computers and Computer Applications: Windows (F1)*	4
CSC 102 Fundamentals of Computer Science <i>or</i> CSC 234 C and UNIX.....	3/4
MATH 248 Methods of Proof in Mathematics	4
MATH electives to be selected with adviser's approval from: MATH 242, 306, 335, 336, 406, 412, 431, 437.	8
Adviser approved technical electives.....	12
	31-32

GENERAL EDUCATION (GE) 53

72 units required; 19 of these units are in Major/Support.
→See page 79 for complete GE course listing.
→Minimum of 3 GE courses required at the 300-400 level.

Area A Communication (minimum 11 units)

- Take one course from A1, A2, A3:
A1 Expository Writing
A2 Critical Thinking
A3 Speech
If less than 11 units, take one additional course in:
A4 Argumentative Writing

Area B Science and Mathematics (minimum 5 units)

- 15 units are in Major.
Take one course from B1a and one from B1b; one with lab
B1a Physical Sciences elective
B1b Life Sciences elective
B2 Mathematics and/or Statistics *see Major
Area B * see Major

Area C Arts and Humanities (minimum 15 units)

- Take one course from each Area C category:
C1 Literature
C1 Philosophy
C2 Fine/Performing Arts
C3 Lit/Phil/Arts (300-400 level)
If less than 15 units, take one additional course from C1, C2, C3

Area D Social, Political, Economic Inst. (minimum 15 units)

- No more than one course in any Area D category.
Take one course from D1a and one from D1b
D1a HIST 202 (USCP) *or* HIST 204 *or* LS 211
D1b POLS 110 *or* LS 212
Take three courses from D2, D3, D4a, D4b
D2 History (300-400 level)
D3 Economics
D4a Social Institutions
D4b Social Institutions (300-400 level)

Area E Life Understanding (minimum 3 units)

- No more than one course in any Area E category.
Take one course from E1 *or* E2
E1 PSY 201/PSY 202
E2 Self Development

Area F Technology (no additional units required)

- 4 units are in Support.
F1 Computer Literacy *see Support

Additional GE Courses (minimum 4 units)

To complete 72-unit requirement, select additional courses from Areas A, C, D, E. No more than one additional course per area.

ELECTIVES 27-28