

## 2007-2009 Cal Poly Catalog

### Updated Course Descriptions.

See catalog pages as printed for [original descriptions](#).

### [Biological Sciences Department](#)

## 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.

### BIO 112 Environmental Biology and Conservation (4) GE B5

A biologically centered exploration of our planet focusing on natural resource conservation and contemporary environmental issues. Interactions between components of the biosphere and impacts of human society on interrelationships within ecosystems. Trends in natural resource conservation and biodiversity preservation. 4 lectures.

### BIO 113 Animal Diversity and Ecology (4) GE B2 & B4

Animal diversity and ecology in aquatic and terrestrial communities including structural and functional adaptations of animals to their environment. Identification of common invertebrate and vertebrate animals. Field experience in local ecosystems. Saturday field trips. 2 lectures, 2 laboratories.

### BIO 114 Plant Diversity and Ecology (4) GE B2 & B4

Plant diversity and ecology in aquatic and terrestrial plant communities including adaptations of plants to their environment. Identification of common, local native plants and plant communities, uses of native plants by Native Americans, and human impacts on native plant communities. Saturday field trips. 2 lectures, 2 laboratories.

### BIO 115 Animal/Human Structure and Function (4) GE B2 & B4

Survey of the structure and function of animal cells, tissues, organs, and organ systems, with examples drawn from vertebrates and invertebrates; emphasis will be on vertebrates, especially the human. Not open to students who have completed BIO 153 or BIO 162. 3 lectures, 1 laboratory. Recommended prerequisite: a course in chemistry.

### BIO 160 Diversity and the History of Life (4)

Overview of the history, diversity and genetic relatedness of life on Earth; broad-scale evolutionary framework of the organization and expansion of life on Earth. 2 lectures, 2 laboratories.

### BIO 161 Introduction to Cell and Molecular Biology (4) GE B2 & B4

Fundamentals of cellular biology with an emphasis on the molecular perspective of life: metabolism, photosynthesis, cell structure and reproduction, meiosis, immunology, classical and molecular genetics, gene regulation. 3 lectures, 1 laboratory. Recommended prerequisite: BIO 160 and one college-level introductory chemistry course.

### BIO 162 Introduction to Organismal Form and Function (5)

Fundamentals of the structure and physiology of cells, tissues, and organs of plants and animals: energy acquisition and food distribution, gas exchange and fluid transport, and sensing and responding to the environment. 3 lectures, 2 laboratories. Prerequisite: BIO 161 or consent of instructor. Recommended: One college-level introductory chemistry course.

### BIO 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies or surveys of selected problems. Intended for lower division students in the Biological Sciences Department.

Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit does not apply to any concentration in the Biological Sciences Department. 1-2 laboratories. Prerequisite: Consent of department chair.

### BIO 213 Life Science for Engineers (2) GE B2

Fundamentals of life sciences: energetics, cell biology, molecular and classical genetics, microbiology, organismal biology, and ecology. For engineering students only. 2 lectures. Prerequisite: MATH 142 and CHEM 124. Co-requisite: ENGR/BRAE 213.

### BIO 227 Wildlife Conservation Biology (4) GE B2

Historical development of wildlife biology and philosophies. Basic principles of ecology and evolution. Practices applied to wildlife. Current problems involving people-wildlife interactions with special reference to world biodiversity. 4 lectures.

### BIO 232 Nanotechnology, Human Biology, Ethics and Society (4) (Also listed as MATE 232)

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: Instructor's consent and one course in college biology.

### BIO 263 Introductory Ecology and Evolution (4)

Basic concepts in ecology and evolution. Relationships among organisms in populations, communities and ecosystems, structures and dynamics of populations, communities and ecosystems, ecosystem inputs and energy flows, nutrient cycling, biogeography, population genetics, evolution, patterns of biodiversity and issues in conservation biology. 3 lectures, 1 laboratory. Prerequisite: BIO 161 or consent of instructor. Recommended: BIO 160 and BIO 162.

### BIO 301 Environmental Science and Human Ecology (4)

Introduction to natural processes regulating renewable and non-renewable physical, chemical, and biological resources. Human population ecology and the influence and interactions of human populations on/with physical, chemical, and non-human biological resources. Principles of management, environmental science, and conservation biology that lead to equilibrium or self-sustaining conditions. 4 lectures. Prerequisite: BIO 160, 162.

### BIO 302 Human Genetics (4) GE B5

Basic principles of human inheritance, including the transmission of genetic traits, chromosomal abnormalities and their effects, gene structure and function, mutations and mutagenic agents, cancer genetics, population genetics, and principles of genetic counseling. 4 lectures. Prerequisite: One course from GE Area B1 (Recommended: STAT 217 or STAT 218), and one course from GE Area B2.

### BIO 303 Survey of Genetics (4)

Principles of heredity and variation, including transmission, population and quantitative genetics; introduction to molecular mechanisms of inheritance. 4 lectures. Prerequisite: One quarter of college biology. Recommended: STAT 218 or equivalent.

### BIO 305 Biology of Cancer (4) GE B5

Introduction to the causes, characteristics and treatment of human cancer. Topics include effects of carcinogens and radiation; the genetics of cancer; molecular, cellular and physiological changes in common cancers; conventional chemotherapy and new treatments. Not open for major credit in Biological Sciences, Microbiology or Biochemistry. 4 lectures. Prerequisite: One course for GE Area B2 in Biology.

### 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 course in biology (BIO, ZOO, BOT or MCRO prefix), completion of GE Area B, and junior standing. Not open for major credit in Biological Sciences (or Ecology and Systematic Biology majors on prior catalogs).

**BIO 317 The World of Spatial Data and Geographic Information Technology (4)** **GE Area F**  
(Also listed as FNR/GEORG/LA 317)

Basic foundation for understanding the world through geographic information and the tools available to utilize spatial data. Application of Geographic Information Systems (GIS) and related technologies, including their scientific basis of operation. 3 lectures, 1 activity. Prerequisite: Any CSC course, completion of GE Area B, and junior standing.

**BIO 318 Freshwater Ecology (4)** (formerly BIO 418)

Biological, physical, and chemical dynamics of aquatic systems surrounded by land including lakes, streams, wetlands, and estuaries. 3 lectures, 1 laboratory. Prerequisite: BIO 263 or consent of instructor. Recommended: College-level course in chemistry.

**BIO 325 General Ecology (4)**

Relationships between organisms and their physical, chemical, and biological environment in terrestrial and aquatic habitats. Laboratory emphasis on field studies. Occasional field experiences may require participation during non-scheduled times. 3 lectures, 1 laboratory. Prerequisite: BIO 160, BIO 162, and BIO 263, or consent of instructor.

**BIO 327 Wildlife Biology Methods (5)**

Methods for gathering information for management of wildlife. Use of the literature, inventory of plants and animal populations, use of maps, sexing and aging, trapping, handling, and marking techniques, physiological indices, and radio telemetry. 3 lectures, 2 laboratories. Prerequisite: BIO 325 or equivalent.

**BIO 328 Marine Biology (5)**

Introduction to the functional biology of marine plants and animals and the processes that underlie their distribution and abundance in open oceans, coastal regions, estuaries, and wetlands. 3 lectures, 2 laboratories. Several field trips. Prerequisite: BIO 160, BIO 162, BIO 263.

**BIO 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. [New course effective Winter 2009.](#)

**BIO 343 Principles of Systematic Biology** Course Change; see BIO 443

**BIO 351 Principles of Genetics (5)**

Principles of genetics and genetic analysis, including underlying molecular mechanisms. Subjects include gene structure and function, inheritance patterns, regulation of gene expression, mutation, recombination, recombinant DNA technology, and an introduction to population genetics. 5 lectures. Prerequisite: BIO 161 and CHEM 312 or CHEM 316. Recommended: BIO 263 and STAT 218. [Changed effective Winter 2009](#)

**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)** (Also listed as CHEM 375)

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 BIO 351 or CHEM 373. [Changed effective Fall 2008.](#)

**BIO 391 Field Quarter I – Field Ecology (4)**

Field studies of terrestrial and aquatic ecosystems of California. Investigation of habitat diversity, environmental factors, composition and functional biology, and seasonal progression of animal and plant communities. Several extended field trips. 2 lectures, 2 laboratories. Prerequisite: BIO 160, BIO 162, BIO 263 and BIO 325; corequisite: BIO 392, BIO 393, BIO 400 (2 units).

**BIO 392 Field Quarter II – Field Botany (4)**

Terrestrial and aquatic plant communities of California. Field identification of native and introduced plants in nature. Factors affecting plant distribution and relationships. Several extended field trips. 2 lectures, 2 laboratories. Prerequisite: BIO 160, BIO 162, BIO 263, and BIO 325; corequisite: BIO 391, BIO 393, BIO 400 (2 units); recommended: BOT 313. Students completing BIO 392 will not be able to receive degree credit for BOT 433 as well.

**BIO 393 Field Quarter III – Field Zoology (4)**

Terrestrial and aquatic animal communities of California. Natural history, population and community ecology, and identification of vertebrates and invertebrates. Determinants of animal distribution. Major mechanisms determining diversity. Several extended field trips. 2 lectures, 2 laboratories. Prerequisite: BIO 160, BIO 162, BIO 263 and BIO 325; corequisite: BIO 391, BIO 392, BIO 400 (2 units).

**BIO 400 Special Problems for Advanced Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. 1-2 laboratories. Prerequisite: Consent of department chair.

**BIO 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 325 or equivalent.

**BIO 405 Developmental Biology (5)**

Events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation, and organogenesis, with emphasis on differential gene expression in model organisms. 3 lectures, 2 laboratories. Prerequisite: BIO 162, and BIO 303 or BIO 351.

**BIO 414 Evolution (4)**

Scientific evaluation of the theories, mechanisms, and patterns of biological evolution. 4 lectures. Prerequisite: BIO 263 or equivalent, and BIO 303 or BIO 351. Recommended: BIO 325 or equivalent.

**BIO 415 Biogeography (4)**


Plant and animal distribution patterns in relation to past and present physical and biotic factors; survey of major biomes with major emphasis on North and South America. 4 lectures. Prerequisite: BIO 263.

**BIO 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, BIO 325 or BOT 326, or consent of instructor.

**BIO 421 Wetlands (4)** (Also listed as FNR/SS 421)

The formation, characteristics, and functions of wetlands. Genesis of hydric soils. Plant adaptations to saturated soils. Wetlands as wildlife habitat. Policies and social issues associated with wetlands. The

procedures of wetland delineations. 3 lectures, 1 laboratory. Prerequisite: CHEM 128, BOT 313, SS 321. 

**BIO 424 Organizing and Teaching Life Sciences (4)**

Objectives, content, techniques, material, and recent trends of successful instruction in secondary school biology, including strategies for English language learners (ELL) and special needs students. 4 lectures. Prerequisite: Consent of instructor.

**BIO 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 consent of instructor. Recommended: Biochemistry course.

**BIO 427 Wildlife Management (4)**

Important habitats, such as riparian, wetlands, and habitat features important to wildlife, such as vegetation types and snags. Basic concepts of wildlife management. Emphasis on planning and designing habitats to meet the needs of wildlife. 3 lectures, 1 laboratory. Prerequisite: BIO 325 or equivalent.

**BIO 432 Vertebrate/Human Anatomy and Physiology I (5)**

Anatomy and physiology of the skeletal, muscular, nervous (central and peripheral) systems, and sense organs of vertebrates, with an emphasis on human systems. Not open to students with credit in ZOO 331. 3 lectures, 2 laboratories. Prerequisite: BIO 361 or consent of instructor.

**BIO 433 Vertebrate/Human Anatomy and Physiology II (5)**

Anatomy and physiology of the digestive, circulatory, urinary, endocrine, and reproductive systems, with an emphasis on human systems. Not open to students with credit in ZOO 332. 3 lectures, 2 laboratories. Prerequisite: BIO 361 or consent of instructor.

**BIO 434 Environmental Physiology (4)**

Comparative physiological mechanisms involved in the regulation of oxygen uptake, water and ion balance, and temperature regulation in animals. Emphasis is placed on physiological adaptations which maintain or restore homeostasis in animals which are subjected to environmental changes. 3 lectures, 1 laboratory. Prerequisite: BIO 162, CHEM 312 or CHEM 316. Recommended: BIO 325 and BIO 361.


**BIO 435 Plant Physiology (4)**

Consideration of the principal physiological and biochemical processes of plants with emphasis on water relations, mineral nutrition, photosynthesis, and the physiology of plant development. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or BIO 162; recommended: CHEM 312 or CHEM 316.

**BIO 437 Marine Resources (4)**

Biology of historical, current, and potential marine resources including both technical means used to harvest and biological factors important in achieving a sustainable yield. Identification, life histories, ecology, culture, and economics of pertinent organisms. 3 lectures, 1 laboratory. Prerequisite: BIO 160, BIO 162, and BIO 263 or consent of instructor.

**BIO 438 Aquaculture (4)**

Propagation and rearing of fishes, invertebrates and algae from marine, freshwater, and estuarine habitats. Current methodologies and general life histories. Global perspective including aquacultural development in developed and developing countries. 3 lectures, 1 laboratory. Prerequisite: BIO 160, BIO 162, and BIO 263 or consent of instructor. 

**BIO 441 Bioinformatics Applications (4) (Also listed as CHEM 441) (formerly BIO 447)**

Introduction to new problems in molecular biology and current computer applications for genetic database analyses. Use of software for: nucleic acid, genome and protein sequence analysis; genetic databases, database tools; industrial applications in bioinformatics; ethical and societal concerns. 3 lectures, 1 laboratory. Prerequisite: One course in college biology (BIO 111 or BIO 161 recommended). Recommended: BIO 303, BIO 351 or CHEM 373.

**BIO 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. [Changed effective Winter 2009.](#)

**BIO 444 Population Ecology (3)**

Growth, fluctuations, balance, and natural mechanisms controlling terrestrial wildlife populations. 3 lectures. Prerequisite: BIO 325 or equivalent.

**BIO 450 Undergraduate Laboratory Assistantship (1-4) (CR/NC)**

Assisting the instructor in teaching and supervising undergraduate laboratories in the Biological Sciences Department. Total credit limited to 8 units, with a maximum of 4 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of instructor and department chair.

**BIO 452 Cell Biology (4)**

Introduction to cell structure and function, energy conversions, protein sorting, signaling, cytoskeleton, cell adhesion, and the cell cycle. 3 lectures, 1 laboratory. Prerequisite: BIO 351 or CHEM 373 and CHEM 312 or CHEM 317. Recommended: Course in biochemistry.

**BIO 461 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 or consent of instructor.

**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, consent of instructor, and department chair approval.

**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 topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

**BIO 471 Selected Advanced Laboratory (1-4)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list topics 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) (Also listed as CHEM 476)**

Heterologous gene expression of a recombinant protein in a microbial system: gene cloning, construction of expression plasmid, DNA sequence analysis, transformation of microbial host, selection and analysis of transformed host cells, expression and purification of recombinant protein. 2 laboratories. Prerequisite: BIO/CHEM 375; CHEM 313 or CHEM 371. [Changed effective Fall 2008.](#)

**BIO 485 Cooperative Education Experience (6) (CR/NC)**

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**BIO 495 Cooperative Education Experience (12) (CR/NC)**

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**BIO 500 Individual Study (1–3)**

Advanced study planned and completed with the approval of and under the direction of a member of the department faculty. A written scholarly presentation of the results of each BIO 500 project must be included in the graduate student's departmental file. Not open for credit to students in the thesis program. Total credit limited to 3 units. 1-3 laboratories. Prerequisite: Graduate standing in Biological Sciences and consent of instructor.

**BIO 501 Molecular and Cellular Biology (4)**

Principles of molecular and cellular biology including gene function and regulation, energetics, protein trafficking, cytoskeleton, signaling, adhesion, and the cell cycle. 3 lectures, 1 laboratory. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

**BIO 502 Biology of Organisms (4)**

Principles of and current topics in organismal biology, with an emphasis on physiology (including organ systems), behavior, and responses to the environment. 3 lectures, 1 laboratory. Prerequisite: BIO 501 and graduate standing in Biological Sciences, or consent of instructor.

**BIO 503 Population Biology (4)**

Considerations of theory and practice in population ecology, evolutionary biology, and biosystematics. 3 lectures, 1 laboratory. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

**BIO 511 Trends in Biology (1) (CR/NC)**

Recent trends in the field of biology for graduate students new to the Biological Sciences master's degree program. Overview of current faculty research to help students choose a thesis project and mentor. Credit/No Credit grading only. 1 activity. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

**BIO 515 History of Biology (3)**

Analysis of historical attempts to solve biological problems. 3 seminars. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

**BIO 524 Developmental Biology 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 542 Multivariate Biometry (4)**

Studies in continuous multivariate statistics, including the multivariate linear model, principal components and factor analysis, discriminant analysis, clustering, and canonical correlation. Use of MINTAB and SAS throughout. 4 lectures. Prerequisite: Two courses in statistics or consent of instructor.

**BIO 570 Selected Topics in Biology (1–4)**

Directed group study of selected topics for graduate students. The Schedule of Classes will list topics for selection. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

**BIO 575 College Teaching Practicum (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 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing in Biological Sciences and consent of instructor.

**BIO 590 Seminar in Biology (1)**

Problems and topics in advanced biology selected according to the interest and needs of the students enrolled. Total credit limited to 5 units. 1 activity. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

**BIO 595 Cooperative Education Experience (12) (CR/NC)**

Advanced study, analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing in Biological Sciences and consent of instructor.

**BIO 599 Thesis (3)**

Individual research under the general supervision of the faculty, leading to a graduate thesis of suitable quality. Total credit limited to 9 units. 3 laboratories. Prerequisite: Graduate standing in Biological Sciences; consent of instructor, and consent of thesis committee.