

Track II Electives

COURSE #	TITLE	UNITS
BIO 390	Immunology	3
BIO 400	Developmental Biology	3
BIO 450	Advanced Biochemistry	4
BIO 470	Neuroscience	3
	Upper Division Elective Total	11-13
	Bachelor of Science Total	68-72

(Note: Courses with superscript "*" are required by the state for the Teacher Education concentration in Life Sciences)

Biology-Chemistry (B.S.) MAJOR

The interdepartmental major in Biology-Chemistry has been designed for those students whose academic needs and interests lie in both biology and chemistry. The major was instituted because a large segment of contemporary scientific interest lies at the intersection of these two fields. Areas well served by this preparation include medicine, dentistry, and several graduate disciplines, including biochemistry, physiology, and molecular biology. This major earns a Bachelor of Science degree.

LOWER-DIVISION REQUIREMENTS

COURSE #	TITLE	UNITS
BIO 110	Cell Biology and Biochemistry	4
BIO 120	Animal Biology	4
BIO 240	Genetics	4
CHE 152	General Chemistry I	4
CHE 153	General Chemistry II	4
CHE 211	Analytical Chemistry	2
CHE 295	Organic Chemistry I	5
PHY 141	General Physics I	4
PHY 142	General Physics II OR	
PHY 241	University Physics I	4
PHY 242	University Physics II	4
MTH 144	Calculus for the Life Sciences and Business	4
	TOTAL	44

UPPER-DIVISION REQUIREMENTS

COURSE #	TITLE	UNITS
BIO 380	Molecular Biology	3
BIO 497	Biology Seminar	1
CHE 300	Organic Chemistry II	2
CHE 325	Physical Chemistry I	5
CHE 351	Organic Qualitative Analysis	2
CHE 466	Advanced Inorganic Chemistry	2
CHE 326	Physical Chemistry II OR	
CHE 370	Instrumental Analysis OR	
CHE 453	Advanced Organic Chemistry	2
BIO 450	Advanced Biochemistry OR	
CHE 450	Advanced Biochemistry	4

Three courses from:

BIO 300	Biomathematics and Bioinformatics	3
BIO 350	Advanced Cell Biology	3
BIO 390	Immunology	3
BIO 400	Developmental Biology	3
BIO 420	Vertebrate Physiology	3
	TOTAL	39

Biology COURSES

BIO 101 (4) HUMAN BIOLOGY AND BIOETHICS -GE

An exploration of assorted topics in human biology as they intersect with bioethical and sustainability issues of current interest in society. Topics include human physiology, health, reproduction, genetics, and ecology. Course examines the underlying scientific basis of specific examples and how they relate to everyday life. Course approach emphasizes the process of science, critical thinking, active learning, social relevancy, and building connections between case studies and general concepts of biology. Lecture and inquiry-based lab. Offered every year.

BIO 102 (4) ENVIRONMENT AND PEOPLE-GE

A systematic overview of major topics in global ecology as they relate to environmental science and human use of natural resources. Includes such topics as sustainable development, population growth, food, agriculture, land degradation, urbanization, pollution, poverty, sanitation, health care, biodiversity, and war. The implications for wise resource management, bioethics, economics, and governmental policy. Course approach emphasizes the process of science, critical thinking, active learning, social relevancy, and building connections between case studies and general concepts. Lecture. Offered every year.

BIO 103 (4) INTRODUCTION TO BIOLOGY-GE

Designed to meet the requirements for the California Multiple Subject Teaching Credential for teaching grades K-8 (but open to all students). The subject areas include zoology, botany, physiology, cell structure, ecology, genetics, and evolution. Course explores major themes in these subject areas as they relate to everyday life, ethical concerns, conservation issues, and common misunderstandings. Course approach emphasizes the process of science, critical thinking, active learning, social relevancy, and building connections between case studies and general concepts of biology. Lecture and inquiry-based lab. Offered every year.

BIO 104 (4) BIOTECHNOLOGY AND SOCIETY-GE

An examination of current topics in biotechnology as they impact society, bioethics, and sustainable living. Course addresses the questions “What is biotechnology?”, “How does it work?”, and “How does it affect our lives?”. Topics may include genetic engineering, gene amplification, genome projects, gene therapy, DNA fingerprinting, cloning, assisted reproductive technology, genetic screening, recombinant DNA, knock-outs, AIDS research, and GM foods. Course approach emphasizes the process of science, critical thinking, active learning, social relevancy, and building connections between case studies and general concepts of biology. Lecture. Offered every year (tentatively starting 2005-2006).

BIO 105 (4) ECOLOGY AND CONSERVATION-GE

A wide-ranging exploration of major topics in ecological science relating to current issues in conservation biology. Drawing from academic and applied fields, the course examines major concepts in conservation biology and how they impact society, public policy, wise management of natural resources, and ethical choices encountered in everyday life. Focus topics include biodiversity, habitat destruction, exotic species introductions, human harvesting, protected areas, and future prospects. Course approach emphasizes the process of science, critical thinking, active learning, social relevancy, and building connections between case studies and general concepts. Lecture and inquiry-based lab. Offered every year (tentatively starting 2006-2007).

BIO 110 (4) CELL BIOLOGY AND BIOCHEMISTRY-GE

An introduction to the principles of cell biology and biochemistry. Topics to be discussed include the chemical basis of life, the structure and function of cellular organelles, basic metabolic pathways, the expression of the genetic material, recombinant DNA technology and models for the origin of cells. Lecture and lab. Offered every year.

Prerequisite: Must have a previous course in high school or university-level chemistry.

BIO 120 (4) ANIMAL BIOLOGY

Principles of animal structure, function, and diversity. Lecture and lab. Offered every year.

Prerequisite: Biology 110.

BIO 130 (4) HUMAN ANATOMY AND PHYSIOLOGY I-GE

The first course of a two-semester sequence which examines the human body from an integrated perspective. Topics include an introduction to chemistry and cell function, tissue types, skeletal system, muscular system, and nervous system. Does not count for credit toward a Biology major. Lecture and lab. Offered every year.

Prerequisite or Corequisite: Chemistry 103 or Chemistry 152.

BIO 140 (4) HUMAN ANATOMY AND PHYSIOLOGY II

The second semester of a sequence which examines the human body from an integrated perspective emphasizing the interrelationship of structure and function. Topics include endocrine system and reproduction, cardiovascular system, immune system, respiratory system, digestive system, and urinary system. Does not count for credit toward a Biology major. Lecture and lab. Offered every year.

Prerequisite: Biology 130.

BIO 220 (5) MICROBIOLOGY OF INFECTIOUS DISEASES

A study of microbial physiology, the diseases associated with infections by certain pathogenic microbes and the vertebrate response to microbial infections. Does not apply toward the Biology major. Lecture and lab. Offered every year.

Prerequisites: Biology 140 and Chemistry 103.

BIO 240 (4) GENETICS

The study of the inheritance, organization, expression and variability of genes. Lecture and lab. Offered every year.

Prerequisite: Biology 120.

BIO 300 (3) BIOMATHEMATICS AND BIOINFORMATICS

An examination of the importance of mathematical concepts, techniques and computer applications to contemporary biology. Lecture and lab topics include statistics, mathematical modeling, computer analysis of biological molecules, and the use of the Internet. Offered every year.

Prerequisites: Biology 110 and Mathematics 131 and 144.

BIO 302 (4) SCIENTIFIC ISSUES AND SOCIETY

Historical and current analysis of the progress of the biological and physical sciences and the impact of that progress on society. Offered 2005-2006.

Prerequisites: Biology 240; and one of the following - Physics 103, 141, or 241.

BIO 310 (4) GENERAL BOTANY

Principles of plant structure, function and diversity. Lecture and lab. Offered every year.

Prerequisite: Biology 110.

BIO 320 (3) MARINE ZOOLOGY

A study of marine animals and their habitats, with an emphasis on marine vertebrates. Lecture, lab, and field work. Offered every year.

Prerequisite: Biology 120.

BIO 330 (2) MARINE INVERTEBRATE ZOOLOGY

A study of invertebrate adaptive biology, including anatomy, locomotion, nutrition, respiration, excretion, reproduction, and behavior. An emphasis on marine invertebrates and other invertebrate representatives of importance to the Southern California ecosystems. Includes lecture and lab. Offered 2005-06.

Prerequisite: Biology 120.

BIO 340 (2) FIELD BIOLOGY

A field oriented course that explains a particular topic relevant to the field sciences in Southern California. Topics rotate from year to year based on current trends and opportunities. Examples could include topics such as ornithology, herpetology, conservation biology, endangered species management, and experimental ecology. Offered 2005-06.

Prerequisite: Biology 120 and pre- or concurrent enrollment in Biology 360.

BIO 350 (3) ADVANCED CELL BIOLOGY

A study of the structure and function of eukaryotic cells. Topics include various aspects of subcellular structure, the extracellular matrix, cellular signal transduction mechanisms, regulation of cell division and cancer. The laboratory provides exposure to important current methodologies. Offered every year.

Prerequisites: Biology 120 and 240.

BIO 360 (3) ECOLOGY

A study of current ecological theory with environmental applications. Lecture, lab, and field work. Offered every year.

Prerequisite: Biology 120.

BIO 370 (2) MARINE PLANT AND MICROBIAL LIFE

An analysis of shoreline, tidal and floating marine plants, and associated microbial life of the Southern California coastline. Ecological and habitat characteristics are studied. Lecture, lab, and field work. Offered 2004-05.

Prerequisites: Biology 102 or 110 and consent of instructor.

BIO 380 (3) MOLECULAR BIOLOGY

A study of the regulatory mechanisms that govern gene expression in eukaryotic and prokaryotic cells and their viruses. Alterations of normal eukaryotic genetic regulatory mechanisms resulting from the transformed (cancerous) state also are discussed. Laboratory includes practical experience with the methodologies of modern genetic engineering. Lecture and lab. Offered every year.

Prerequisite: Biology 240.

BIO 390 (3) IMMUNOLOGY

Introduction to the immune system with an emphasis on mammalian models. The course focuses on the cellular and molecular regulation of the immune system in health and disease. Topics include recognition of antigen, development of lymphocyte repertoires, and innate and adaptive immune responses. Also included are discussions of the immune system's responses to cancer cells, tissue transplants, and allergenic substances. Lecture and laboratory. Offered every year.

Prerequisites: Biology 240 and Chemistry 295;

Biology 450 is recommended.

BIO 400 (3) DEVELOPMENTAL BIOLOGY

An analysis of mechanisms of early development of invertebrates and vertebrates. Includes a study of the cellular, molecular, and genetic factors which influence the determination of the body plan as well as a study of the morphogenesis of selected organ systems. Lecture and lab. Offered every year.

Prerequisites: Biology 240 and 380.

BIO 410 (3) VERTEBRATE BIOLOGY

Taxonomy, behavior, distribution, and ecology of the vertebrates and a comparative study of their morphologies. Lecture and lab. Offered 2004-05.

Prerequisite: Biology 120.

BIO 420 (3) VERTEBRATE PHYSIOLOGY

A physiochemical analysis of life processes, as studied by a systemic approach. Lecture and lab. Offered every year.

Prerequisites: Biology 120 and Chemistry 295.

BIO 430 (3) ANIMAL BEHAVIOR

An exploration of the behavioral biology of animals, including behavior genetics, physiological mechanisms, development, learning, neuro-physiology, ecology, reproduction, and social behavior; insights from ethology, psychology, behavioral ecology, and sociobiology will be studied. Labs emphasize various aspects of behavioral research in field settings and students conduct their own research projects. Lecture and lab. Offered 2005-06.

Prerequisite: Biology 360 or consent of instructor.

BIO 450 (4) ADVANCED BIOCHEMISTRY

Detailed analysis of protein and membrane structure. Includes quantitative approaches to the study of enzymes, catalytic mechanisms of enzymes, and a survey of the major metabolic pathways of carbohydrates, lipids, amino acids and nucleic acids. One three-hour lab each week. Also listed as Chemistry 450. Offered every year.

Prerequisites: Biology 110 and Chemistry 295.

BIO 470 (3) NEUROSCIENCE

A study of the nervous system at the molecular, cellular and intercellular levels with the goal of understanding the generation and control of thoughts and behavior. Laboratory exercises examine sensory transduction, CNS function, synaptic physiology, behavior and neuroanatomy. The relationship of brain and mind are examined in discussions of nervous system development, intelligence, memory, patho-physiology, sexuality and gender identity, and religious faith and ethics. Lecture and lab. Offered 2004-05.

Prerequisites: Biology 140 or 420, or Psychology 301, or consent of instructor.

BIO 490 (1-3) INTERNSHIP IN BIOLOGY

Authentic work experience in jobs that are biologically oriented and which include some responsibility for decision making, problem solving, and the use of techniques, skills, and knowledge acquired in the classroom. May be repeated to a maximum of three units. Graded Credit/No Credit. Offered every year.

Prerequisites: Junior or Senior standing. Consent of department chair and faculty advisor is required.

BIO 495 (1-3) SPECIAL STUDIES IN BIOLOGY

Individual study in depth of a selected topic in biology under the direct supervision of a member of the faculty. Offered every year.

Prerequisites: Consent of instructor and department chair.

BIO 497 (1) BIOLOGY SEMINAR

Examination and discussion of selected biological issues with an emphasis on the relationship between Christian faith and scientific study. This course is to be taken by Biology and Biology-Chemistry majors during their last spring semester prior to graduation. Offered every year.

Prerequisite: Senior standing as a Biology or Biochemistry major.

BIO 499 (1-3) RESEARCH IN BIOLOGY

Independent investigation, under the supervision of a member of the biology faculty. May be repeated for a total of six units, but no more than three units may count toward upper-division requirements for graduation. Offered every year.

Prerequisites: Junior or Senior standing and consent of instructor is required.

Au Sable Environmental Field Studies Program

Summer field courses in environmental biology are offered by the Au Sable Institute of Environmental Studies, a Christian organization offering course work and field experiences in the context of Christian environmental stewardship. Courses are offered during two 5-week summer sessions at three North American campuses (Great Lakes, Pacific Rim, Florida) and two international venues (India, Kenya). Courses are at the 300/400 upper-division level, and provide students with academic content, field experience, and practical tools for stewardship of creation resources. Academic credit for all Au Sable courses is granted through PLNU. Courses are four units each, and a two-course load is typical. Course credit counts for graduation electives. Qualified students are awarded the Au Sable Fellowship of up to \$1500, and grants-in-aid of at least \$600 are also available. Interested students should contact PLNU's Au Sable Institute representative.