BIO - BIOLOGY

BIO 1001 Human Biology and Bioethics (FE) (3 Units)
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, cell biology/biochemistry, evolution 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.
Corequisite(s): BIO 1001L

BIO 1001L Human Biology and Bioethics Laboratory (FE) (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 1001.
Letter grade.
Corequisite(s): BIO 1001

BIO 1002 Environment and People (FE) (FE) (4 Units)
A systematic overview of major topics in global ecology as experienced by people in the developing world, both the problems they face and the successful actions of communities to solve those problems. Introduces creation care and sustainable development as key concepts needed to overcome the challenges and build hope for the future. Includes such topics as population growth, food and agriculture, land degradation, urbanization, sanitation, health care, biodiversity, climate change, consumerism, and the implications for wise resource management, green 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. Students engage in weekly readings, film discussions, and a term paper project.

BIO 1003 Introduction to Biology (FE) (3 Units)
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.
Corequisite(s): BIO 1003L

BIO 1003L Introduction to Biology Laboratory (FE) (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 1003.
Letter grade.
Corequisite(s): BIO 1003

BIO 1004 Biotechnology and Society (FE) (4 Units)
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.

BIO 1005 Ecology and Conservation (FE) (3 Units)
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 their impact on society, public policy, wise management of natural resources, consumerism and ethical choices encountered in everyday life. Focus topics include biodiversity, habitat destruction, exotic species introductions, human harvesting, protected areas, and climate change. Course approach emphasizes the process of science, critical thinking, active learning, social relevancy, and building connections between case studies and general concepts.
Corequisite(s): BIO 1005L

BIO 1005L Ecology and Conservation Laboratory (FE) (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 1005.
Letter grade.
Corequisite(s): BIO 1005

BIO 1006 Global Health and Pathogens (FE) (4 Units)
An examination of current topics in global health as they impact society, bioethics, and creation care. The course addresses the topics of the major pathogens that threaten global health, the basic immune response to a pathogen, how vaccines work, and challenges to fighting pathogens on a global level. The course approach emphasizes critical thinking, active learning, social relevancy, and building connections between case studies and general concepts of biology.
Online.

BIO 1030 Human Anatomy and Physiology I (FE) (3 Units)
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 in the Biology major.
Pre or Corequisite(s): CHE 1003 or CHE 1052
Corequisite(s): BIO 1030L

BIO 1030L Human Anatomy and Physiology I Laboratory (FE) (1 Unit)
An anatomy and physiology laboratory that is a co-requisite for BIO 1030.
Letter grade.
Corequisite(s): BIO 1030

BIO 1040 Human Anatomy and Physiology II (3 Units)
The second semester of a sequence which examines the human body from an integrated perspective emphasizing the interrelationship of structure and function. Topics include sensory and autonomic nervous system, endocrine system and reproduction, cardiovascular system, immune system, respiratory system, digestive system, and urinary system.
Does not count for credit toward the Biology major.
Prerequisite(s): BIO 1030 and CHE 1003 or CHE 1052
Corequisite(s): BIO 1040L

BIO 1040L Human Anatomy and Physiology II Laboratory (1 Unit)
An anatomy and physiology laboratory that is a co-requisite for BIO 1040.
Letter grade.
Corequisite(s): BIO 1040

BIO 2010 Cell Biology and Biochemistry (FE) (3 Units)
An introduction to the principles of cell biology, molecular biology, and biochemistry. Topics include the chemical basis of life, basic membrane functions and membrane transport, basic metabolic pathways including cellular respiration and photosynthesis, cell division, and expression of the genetic material.
Corequisite(s): BIO 2010L

BIO 2010L Cell Biology and Biochemistry Laboratory (FE) (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 2010.
Letter grade.
Corequisite(s): BIO 2010

BIO 2011 Ecological and Evolutionary Systems (FE) (3 Units)
An introduction to the principles of ecology, evolutionary biology and sustainability.
Corequisite(s): BIO 2011L

BIO 2011L Ecological and Evolutionary Systems Laboratory (FE) (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 2011.
Letter grade.
Corequisite(s): BIO 2011

BIO 2012 Organismal Biology (3 Units)
Principles of animal and plant structure, function, and diversity.
Prerequisite(s): BIO 2011
Corequisite(s): BIO 2012L

BIO 2012L Organismal Biology Laboratory (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 2012.
Letter grade.
Corequisite(s): BIO 2012

BIO 2020 Microbiology of Infectious Diseases (3 Units)
A study of microbial physiology, the diseases associated with infections by certain pathogenic microbes and the vertebrate response to microbial infections.
Prerequisite(s): CHE 1003 or CHE 1052; BIO 1040 (may be taken concurrently).
Corequisite(s): BIO 2020L

BIO 2020L Microbiology of Infectious Diseases Laboratory (1 Unit)
A laboratory that is a co-requisite for BIO 2020.
Letter grade.
Corequisite(s): BIO 2020

BIO 3012 Applied Plant Biology (2 Units)
A study of plant structure, function and phytochemistry through an examination of economically and culturally important plants, including plants for medicine, food, energy, fiber and building materials. Topics include environmental plant physiology, biotechnology, plant propagation, medicinal botany, and sustainable land use.
Prerequisite(s): BIO 2012
Recommended: MTH 2003 or MTH 3063

BIO 3015 Microbiology (3 Units)
An in-depth exploration of the world of microscopic organisms, including their diversity, physiology, biochemistry and ecology. Emphasis is on prokaryotes, but also some discussion of microscopic eukaryotes and viruses.
Prerequisite(s): BIO 3045
Corequisite(s): BIO 3015L

BIO 3015L Microbiology Laboratory (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 3015.
Letter grade.
Corequisite(s): BIO 3015

BIO 3023 Introduction to Oceanography (3 Units)
An introduction to the interdisciplinary study of the oceans, including survey of geological, chemical, physical and biological oceanography. Includes consideration of current research methods and exploration of marine systems.
Prerequisite(s): BIO 2011
Corequisite(s): BIO 3023L

BIO 3023L Introduction to Oceanography Laboratory (1 Unit)
A field work-based laboratory that is a co-requisite for BIO 3023.
Letter grade.
Corequisite(s): BIO 3023

BIO 3033 Marine Biology (3 Units)
The study of life in the oceans, including the ecology, structure, function and adaptations of marine organisms to their environment.
Prerequisite(s): BIO 2011
Corequisite(s): BIO 3033L

BIO 3033L Marine Biology Laboratory (1 Unit)
A field work-based laboratory that is a co-requisite for BIO 3033.
Letter grade.
Corequisite(s): BIO 3033

BIO 3040 Field Biology: Neotropical Ecology (2 Units)
A field-oriented course that introduces students to the ecology and conservation biology of the New World Tropics. The course begins during Quad II of the spring semester, and continues with a 10-day field immersion trip to Costa Rica in early May. We visit some of the most intense biodiversity hotspots in Central America. Through readings, lectures, student presentations, and field trips, we explore the plants and animals of the tropics and investigate the ecological and cultural complexities of conserving them. Relevant issues of culture, language, public policy, and stewardship are also covered. Students complete a project paper or presentation based on their independent research.
Prerequisite(s): BIO 2011

BIO 3045 Genetics (3 Units)
The study of the inheritance, organization, expression and variability of genes.
Prerequisite(s): BIO 2010 with a grade of "C" or better or consent of instructor.
Corequisite(s): BIO 3045L

BIO 3045L Genetics Laboratory (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 3045.
Letter grade.
Corequisite(s): BIO 3045

BIO 3050 Advanced Cell Biology (3 Units)
An in-depth study of the structure and function of eukaryotic cells. Topics include various aspects of subcellular structure, cytoskeleton dynamics and regulation, the mechanism of cell motility and intracellular transport cell adhesion, cellular signal transduction mechanisms, regulation of cell division and cancer. The laboratory provides exposure to important current methodologies.
Prerequisite(s): BIO 3045
Corequisite(s): BIO 3050L

BIO 3050L Advanced Cell Biology Laboratory (1 Unit)
A laboratory that is a co-requisite for BIO 3050.
Letter grade.
Corequisite(s): BIO 3050

BIO 3052 Research Methodology (3 Units)
This course builds upon the basis of the scientific method that students are exposed to as freshmen. It focuses on teaching students how to develop biological questions, search databases to obtain background information, design scientific experiments, and analyze data. The course will focus more specifically on how research data is obtained, how experimental knowledge and data are dispersed amongst the scientific community, and how these data are used as a base for correlating new data and upon which new experimentation is based.
Prerequisite(s): BIO 3045

BIO 3063 Conservation Ecology (3 Units)
An examination of the key concepts and issues at the intersection of conservation biology and ecology, starting with environmental ethics and the valuation of nature and moving to sustainable development and creation care. Students read journal articles and discuss the medical value of biodiversity, zoonotic disease and public health, trophic cascades, toxicology, endocrine disruption, conservation genetics and extinction vortices, de-extinction and species resurrection, shifting baselines, physiological ecology, road ecology, conservation behavior, and community-based conservation. We also explore innovative technology driving advances in conservation such as biologgers, camera traps, and fecal genetic and hormonal analysis. Students complete a team field research project on (or near) the Point Loma campus to apply the concepts of conservation ecology to the local environment.
Prerequisite(s): BIO 2011
Corequisite(s): BIO 3063L
Recommended: BIO 2012

BIO 3063L Conservation Ecology Laboratory (1 Unit)
A field work-based laboratory that is a co-requisite for BIO 3063.
Letter grade.
Corequisite(s): BIO 3063

BIO 3080 Molecular Biology (3 Units)
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.
Prerequisite(s): BIO 3045 and CHE 1052
Corequisite(s): BIO 3080L

BIO 3080L Molecular Biology Laboratory (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 3080.
Letter grade.
Corequisite(s): BIO 3080

BIO 3090 Immunology (3 Units)
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 repertories, and innate and adaptive immune responses. Also included are discussions of the immune system's responses to cancer cells, tissue transplants, and allergenic substances.
Prerequisite(s): BIO 3045
Corequisite(s): BIO 3090L

BIO 3090L Immunology Laboratory (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 3090.
Letter grade.
Corequisite(s): BIO 3090

BIO 4000 Developmental Biology (3 Units)
An analysis of mechanisms of early development of invertebrates and vertebrates. Includes a study of the cellular, molecular, and genetic factors that influence cell differentiation and the determination of the body plan, as well as a study of the morphogenesis of selected organ systems. The implications of development on our understanding of the mechanisms of evolution (evo-devo) are discussed.
Prerequisite(s): BIO 3045
Corequisite(s): BIO 4000L

BIO 4000L Developmental Biology Laboratory (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 4000 and uses a variety of model organisms to study normal and abnormal development.
Letter grade.
Corequisite(s): BIO 4000

BIO 4010 Vertebrate Biology (3 Units)
An exploration of the evolution of morphology, physiology, and behavior of the vertebrate lineage from hagfish to humans. Appropriate emphasis is given to the major evolutionary approaches of form and function, phylogenetic systematics, taxonomy, natural selection, evo-devo, and the study of fossils and molecular genetics. The course works its way from fish to tetrapods, surveying the distinguishing morphology, physiology, ecology, and lifestyle adaptations of each group. Conservation status and current threats from human impacts are covered. Students learn through readings, group activities and discussions, films, and a research project tracing the evolution of a currently threatened vertebrate species or group.
Prerequisite(s): BIO 2011
Corequisite(s): BIO 4010L

BIO 4010L Vertebrate Biology Laboratory (1 Unit)
A laboratory that is a co-requisite for BIO 4010. Lab activities provide hands-on learning through exploration and dissection of specimen vertebrates and field trips to the zoo and aquarium.
Letter grade.
Corequisite(s): BIO 4010

BIO 4023 Advanced Human Physiology (3 Units)
This course examines how different organ systems work and interact with each other to maintain homeostasis in the human body. The course specifically examines metabolism, the digestion, the nervous system, endocrinology, the muscular system, respiration, the cardiovascular system, and the urinary system.
Prerequisite(s): BIO 2012 and CHE 2094 or consent of instructor (Cell and Molecular Biology or Organismal minors).
Recommended: MTH 2003 or MTH 3063

BIO 4023L Advanced Human Physiology Laboratory (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 4023.
Letter grade.
Corequisite(s): BIO 4023

BIO 4030 Animal Behavior (3 Units)
An exploration of the behavioral biology of animals, building on the foundation of Tinbergen's Four Problems and incorporating the insights of ethology, psychology, behavioral ecology, and cognitive ethology. Topics include proximate and ultimate mechanisms, behavioral genetics, developmental ethology, neurophysiology, learning, communication, reproduction, sexual selection, parasite and predator defense, mating systems, parental behavior, and sociality. The evolutionary basis of behavior is emphasized, including natural selection, developmental genetics, and domestication. Guest lectures and films expand on the reading and lecture content, and conservation issues are explored.
Prerequisite(s): BIO 2011
Corequisite(s): BIO 4030L

BIO 4030L Animal Behavior Laboratory (1 Unit)
A laboratory that is a co-requisite for BIO 4030 in which students complete a semester-long team research project at the San Diego Zoo.
Letter grade.
Corequisite(s): BIO 4030

BIO 4050 Advanced Biochemistry (3 Units)
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.
Also offered as CHE 4050.
Prerequisite(s): BIO 2010 and CHE 2094
Corequisite(s): BIO 4050L

BIO 4050L Advanced Biochemistry Laboratory (1 Unit)
An inquiry-based laboratory that is a co-requisite for BIO 4050.
Letter grade.
Also offered as CHE 4050L.
Corequisite(s): BIO 4050

BIO 4063 Methods of Teaching Secondary Science (3 Units)
This methodology course is designed to prepare students to teach secondary-level (Grades 7-12) and college-level science. This course includes lesson planning, intentional practice of classroom management, micro-teaching, classroom observation, group and self-evaluation, active and equitable participation for culturally, ethnically, linguistically, and academically diverse learners, and formative assessment to differentiate instruction for all learners. Topics include the following: pedagogical content knowledge, curriculum selection and design, methods and modalities of science teaching, assessment, classroom application of various forms of technology, safe laboratory management and operation, integration of language arts and mathematics in the science curriculum, and professional organizations. Instruction is aligned to the state-adopted Science Common Core Standards (7-12) and the Next Generation English Language Development Standards, and relevance to college course teaching is incorporated. Modifications for diverse learners and learners with exceptionalities are researched. [AC1] Equivalent to EDU 4034 (undergraduate level) or EDU 6024 (graduate level). PLNU students who complete BIO 4063 are exempt from taking EDU 4034 or EDU 6024 for their preliminary single subject credential.
Prerequisite(s): BIO 2010 or FE-BIO and at least Sophomore standing.

BIO 4070 Neuroscience (3 Units)
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.
Prerequisite(s): BIO 1040 or BIO 2012 or BIO 4023, or PSY 3001, or consent of instructor.

BIO 4073 Experimental Marine Ecology (3 Units)
A field-oriented course that explores aspects of marine ecology within the context of coastal communities, including ecological relationships within the marine environment, factors influencing community structure, and biogeography. A central component of the course will be an independent project with experimental design.
Prerequisite(s): BIO 2011
Corequisite(s): BIO 4073L

BIO 4073L Experimental Marine Ecology Laboratory (1 Unit)
A field work-based laboratory that is a co-requisite for BIO 4073.
Letter grade.
Corequisite(s): BIO 4073

BIO 4083 Introduction to Geographic Information Systems (GIS) (3 Units)
Geographic Information Systems (GIS) involves the analysis and management of geographic information. This course is designed to introduce the basic principles and techniques of GIS (including spatial data sources, data structures, projections and coordinate systems), the essential skills of operating a functional GIS (including data creation, data editing and geospatial analysis), and the different applications of GIS technology.

BIO 4090 Internship in Biology (1-3 Units)
Authentic work experience in jobs that are oriented to the field of biology and that include responsibility for decision making, problem solving, and the use of techniques, skills, and knowledge acquired in the classroom.
May be repeated for a maximum of three (3) units. Credit/No Credit.
Prerequisite(s): Junior or Senior standing; consent of department chair and faculty advisor.
"C" Designation is for California Internships. "E" Designation is for Out of State Internships.

BIO 4095 Special Topics - Naturalist Interpretation (3 Units)
Instruction includes topics specific to how to conduct research for information of a particular location and unique characteristics of that environment and ecosystem.

BIO 4097 Biology Seminar (1 Unit)
Examination and discussion of selected biological issues with an emphasis on the relationship between Christian faith and scientific study. Course is to be taken by Biology, Biology-Chemistry and Environmental Science majors during their last semester prior to graduation.
Prerequisite(s): Senior standing as a Biology, Biology-Chemistry, or Environmental Science major.

BIO 4099 Research in Biology (1-3 Units)
Independent investigation, under the supervision of a member of the biology faculty.
May be repeated for a total of six (6) units, but no more than three (3) units may count toward upper-division requirements for graduation.
Prerequisite(s): Junior or Senior standing and consent of instructor.