

BIOLOGY (BIO)

BIO 100 Orientation to the Biology Major 1

Introduction to the Biology major at UNCG. What it means to be a Biology major at UNCG, in our community, and as a career.

BIO 105 Major Concepts of Biology 3

Introduction to major concepts in biology. Topic sections emphasize specific areas including conservation biology, biotechnology, and current issues. Survey sections emphasize basic aspects of biology, including genetics, physiology and ecology. For students not planning to take additional biology courses.

MAC: MAC CritThink Nat Sci

Corequisites: BIO 105L.

Notes: Students who have prior credit for BIO 111, BIO 112 may not take BIO 105 for credit.

BIO 105L Major Concepts of Biology Laboratory 1

Designed to acquaint non-science majors with the process of scientific inquiry and major ideas in biology, including function of cells, the human body, mechanisms of heredity, ecology, and evolution. Online sections must have previously passed or be concurrently enrolled in online lecture.

Corequisites: BIO 105.

BIO 110 Introduction to Biology 3

An introduction to the principles of biology, including the molecular and cellular basis of life, genetics, and biotechnology.

Prerequisites: Pre-Nursing or Nursing major or permission of instructor.

Notes: Students may not receive credit for both BIO 110 and BIO 111.

BIO 111 Principles of Biology I 3

Prerequisite for most other biology courses. Lecture covers the fundamental principles of biology including the molecular and cellular basis of life, genetics, and biotechnology.

MAC: MAC CritThink Nat Sci

Corequisites: BIO 111L or permission of instructor.

Notes: May not be taken more than twice.

BIO 111L Principles of Biology I Laboratory 1

Laboratory supporting BIO 111. Prerequisite or

Corequisites: BIO 111.

BIO 112 Principles of Biology II 3

Prerequisite for 300-level courses and above. Fundamental principles of biology including botany, zoology, evolution, and ecology. A passing grade in lecture and laboratory must be achieved for successful completion of this course.

MAC: MAC Nat Sci Data Analysis

Corequisites: BIO 112L.

Notes: May not be taken more than twice.

BIO 112L Principles of Biology II Laboratory 1

Laboratory supporting BIO 112. Prerequisite or

Corequisites: BIO 112.

BIO 271 Human Anatomy 3

Human anatomy with study of skeletons, models, and anatomical preparations. Includes dissection of cat.

Prerequisites: A grade of C- or better in BIO 110 or BIO 111 and in BIO 111L.

Corequisites: BIO 271L.

Notes: May not be taken more than twice.

BIO 271L Human Anatomy Laboratory 1

Laboratory supporting BIO 271.

Corequisites: BIO 271.

BIO 277 Human Physiology 3

Human physiology with emphasis on homeostatic mechanisms.

Prerequisites: A grade of C- or better in BIO 110 or BIO 111 and in BIO 111L. and high school chemistry with grade of C or better;

Corequisites: BIO 277L.

Notes: May not be taken more than twice.

BIO 277L Human Physiology Laboratory 1

Laboratory supporting BIO 277.

Corequisites: BIO 277.

BIO 280 Fundamentals of Microbiology 3

General survey of microscopic life and its impact on medicine, public health, and the environment. Includes laboratory work with bacteria, emphasizing aseptic technique.

Prerequisites: A grade of C- or better in BIO 110 or BIO 111 and in BIO 111L, and successful completion of BIO 271, or BIO 277, or KIN 291, or KIN 292.

Corequisites: BIO 280L.

Notes: Students cannot receive credit for both this course and BIO 481. May not be taken more than twice.

BIO 280L Fundamentals of Microbiology Laboratory 1

Laboratory supporting BIO 280.

Corequisites: BIO 280.

BIO 301 Principles of Ecology 3

Introduction to fundamentals of ecology. Principles relating to populations, communities and ecosystems. Particular emphasis placed on the many dimensions of interdependence within ecosystems.

Prerequisites: Minimum grade of C- in BIO 111, BIO 111L, BIO 112, and BIO 112L, and completion of MAT 183, or MAT 184, or MAT 151, or MAT 190, or MAT 191, or MAT 196.

BIO 315 Ecology and Evolution Laboratory 2

This course is designed to help students understand, via hands-on activities, how species and populations evolve and how species and individuals interact with one another and with their environment.

CIC: CIC College Writing

Prerequisites: Either BIO 301 or BIO 330.

Corequisites: If not completed as a prerequisite, either BIO 301 or BIO 330.

BIO 330 Evolution 3

Fundamental principles of evolutionary biology, including processes and patterns of biological evolution and an overview of the historical and contemporary biodiversity resulting from evolution.

Prerequisites: Minimum grade of C- in BIO 111, BIO 111L, BIO 112, and BIO 112L, and completion of MAT 183, or MAT 184, or MAT 151, or MAT 190, or MAT 191, or MAT 196.

BIO 355 Cell Biology 3

Study of cellular organization and function. Fundamental biochemical properties, including cellular components, enzyme function, energetics, and metabolism studied in relation to cellular structure, membrane function, cell movement, and cytoplasmic compartments.

Prerequisites: Minimum grade of C- in BIO 111, BIO 111L, BIO 112, and BIO 112L. CHE 114 (or equivalent);

Notes: May not be taken more than twice.

BIO 361 Biology and Conservation of Sea Turtles 3

Students spend 2 weeks in July/August in Tortuguero, Costa Rica assisting with tagging and collecting data on nesting turtles. Seminar and N.C. field trip in spring.

Prerequisites: Minimum grade of C- in both BIO 111 and BIO 112 and permission of instructor.

Notes: May not be taken more than twice. Travel fees involved; see instructor for details.

BIO 375 Cell Biology and Genetics Laboratory 2

Laboratory and online course that integrates modern genetic, cellular, and molecular techniques and methods to understand the concept of the gene to phenotype in biology and human health.

CIC: CIC College Writing

Prerequisites: Either BIO 355 or BIO 392.

Corequisites: If not completed as a prerequisite, either BIO 355 or BIO 392.

BIO 392 Genetics 3

Concepts and principles of genetics, including Mendelian inheritance, linkage, the molecular basis of inheritance and gene expression, tools of genetic analysis, gene regulation, population genetics, and genetic diseases.

Prerequisites: Minimum grade of C- in BIO 111, BIO 111L, BIO 112, and BIO 112L, and completion of MAT 183, or MAT 184, or MAT 151, or MAT 190, or MAT 191, or MAT 196.

BIO 400X Experimental Course 1-6

This number reserved for experimental courses. Refer to the Course Schedule for current offerings.

BIO 401 Advanced Topics in Animal Ecology 3

Directed readings in the literature of physiological ecology, growth and regulation of populations, community structure, energy flow, mineral cycling, and other areas of current research interest.

Prerequisites: Permission of instructor.

BIO 402 Advanced Topics in Animal Physiology 3

Study of physiological mechanisms; selected problems from current literature.

Prerequisites: Permission of instructor.

BIO 406 Advanced Topics in Genetics 3

Basic mechanisms of gene action in microbes, animals, and plants.

Prerequisites: Permission of instructor.

BIO 407 Advanced Topics in Neurobiology 3

Directed readings on fundamental physiological principles of nervous system functioning. Topics may include motor pattern generation, sensory transduction, sensori-motor integration, neurohormonal modulation of behavior.

Prerequisites: Permission of instructor.

BIO 409 Advanced Topics in Microbiology 3

Critical review of current research covering a wide range of topics including infectious diseases, bacterial physiology, marine microbiology, and immunology. Focus on students' interests or needs.

Prerequisites: Permission of instructor.

BIO 410 Advanced Topics in Plant Ecology 3

Studies of special terrestrial communities or plant groups.

Prerequisites: Permission of instructor.

BIO 418 Computational Biology 3

The class will introduce concepts and methods to analyze biological data including DNA sequence data, genome assembly and annotation, DNA sequence comparison, phylogeny construction and protein structure analyses.

Prerequisites: BIO 330 and BIO 392.

BIO 419 Introduction to Nanotechnology 3

This course introduces students to the emerging field of nanotechnology and exposes them to current research and topics that are being influenced by nanomaterials including biology, healthcare, and the environment.

Prerequisites: BIO 392, BIO 355, CHE 342, CHE 351, or permission of instructor.

Notes: Same as NAN 419.

BIO 420 Marine Biology 3

An introduction to marine organisms and their habitats; special attention given to adaptations necessary for marine life, physical oceanography, and basic ecological principles; one weekend coastal field trip is required.

Prerequisites: One of BIO 301, BIO 330, BIO 355, or BIO 392.

BIO 421 Ecosystem Ecology and Biogeochemistry 3

Introduction to ecosystem function, structure, and dynamics; basic ecosystem theories; discussions of key processes governing energy flow and nutrient cycling; comparison of ecosystems; selected original literature.

Prerequisites: BIO 301 or permission of instructor.

BIO 422 Plant Diversity 4

Introduction to plant, fungi, and protista kingdoms. Emphasis is on structure, reproduction, and life cycles of the organisms.

Prerequisites: BIO 330 or BIO 301 or BIO 392.

Notes: Passing grade in lecture must be achieved for successful completion of this course. May not be taken more than twice.

BIO 422L Plant Diversity Lab 0

Introduction to plant, fungi, and protista kingdoms. Emphasis is on structure, reproduction, and life cycles of the organisms. Passing grade in lecture must be achieved for successful completion of course. NOTE: Students cannot receive credit for both BIO 322 and BIO 422. (LAB)

BIO 423 Landscape Ecology Laboratory 1

Field labs to observe different landscape structures and conduct course projects for comprehending principles of landscape ecology. Students will use computer labs for GIS basics, landscape analyses.

Prerequisites: BIO 301.

Corequisites: BIO 427.

BIO 424 Plant Physiology and Biotechnology 3

This course will cover: 1) the study of plant cells and functions, 2) transport processes in plants, 3) plant metabolism, 4) plant cellular signaling due to endogenous chemicals and environment, 5) plant development, and 6) plant adaptation to environment. Additionally, students will practice how to communicate science effectively through in-class discussions and oral presentations.

Prerequisites: BIO 355, BIO 375, and BIO 392.

Corequisites: BIO 424L.

BIO 424L Plant Physiology and Biotechnology Lab 1

This course will cover 1) Plant membranes and transport processes, 2) water potentials and transpiration, 3) plant nutrition and mineral deficiency, 4) plant composition analysis (macro and micronutrients and proteins), 5) the pigments of chloroplast, 6) measurement of photosynthesis and respiration, 7) the effect of chemicals and hormones on seed germination and plant growth and development, 8) Agrobacterium-mediated transformation of model plants, 9) Validation of transgenic plants using molecular techniques. Students will gain hands-on experience in plant physiology research. They will also develop data interpretation and report writing skills.

Prerequisites: BIO 355, BIO 375, and BIO 392.

Corequisites: BIO 424.

BIO 425 Biological Clocks 3

Descriptive survey of behavioral and physiological rhythms in humans and other animals, including circadian, tidal, lunar, seasonal and circannual cycles, with ecological considerations and implications for human health.

Prerequisites: One of BIO 301, BIO 330, BIO 355, BIO 392.

BIO 426 Conservation Biology 3

Introduction to habitat and species conservation; topics include genetic diversity, demographic patterns of rare species, habitat fragmentation, design and management of nature reserves, ecological restoration.

Prerequisites: BIO 301 and BIO 392. STA 271 recommended.

BIO 427 Landscape Ecology 3

Introduction to patch-corridor-matrix structure of landscapes and their impact on ecological processes. Discussion of landscape indices, spatial heterogeneity, current issues, and general approaches in landscape ecology.

Prerequisites: BIO 301. STA 271; recommended

Corequisites: BIO 423.

BIO 428 Microbial Ecology 3

Emphasis on current areas of active research with reference to applied problems.

Prerequisites: BIO 280 or BIO 481, or permission of instructor.

BIO 429 Aquatic Ecology 3

The study of the geology, physics, chemistry, and ecology of lakes, including reservoirs and streams with comparisons to the ocean.

Prerequisites: BIO 301 and CHE 114, or permission of instructor.

BIO 431 The Biosphere 3

A study of environmental issues in biology, specifically ecosystems, population dynamics, biodiversity and extinction.

Prerequisites: BIO 301.

BIO 432 Aquatic Ecology Laboratory 1

Practical study of water chemistry methods, lake and stream morphometry, identification of freshwater zooplankton, benthic invertebrates and fish, and field trips to area reservoirs and streams.

Prerequisites: BIO 301.

Corequisites: BIO 429.

BIO 435 Biochemistry: Metabolic Regulation in Health and Disease 3

Chemical properties of major cellular compounds; biosynthesis, degradation, and function of carbohydrates, lipids, proteins, nucleic acids, vitamins, and hormones; energy metabolism; enzymatic catalysis.

Prerequisites: BIO 355 and BIO 392. or permission of instructor.

BIO 436 Biology of Aging 3

An integrative look at biological theory and mechanisms to explain the diversity of the aging process, including human implications.

Prerequisites: BIO 301, BIO 355, BIO 392, or permission of instructor.

BIO 437 Human Evolutionary Genetics 3

Study of primary literature testing hypotheses about human ancestry and evolution using molecular genetic methods.

Prerequisites: BIO 330 and BIO 392. or permission of instructor.

BIO 438 Animal Behavior 3

Application of theory of evolution to the explanation of animal behavior. Surveys a variety of species, addressing several behavioral categories as well as issues in sociobiology and human evolution.

Prerequisites: Grade of at least C- in PSY 230. concurrent enrollment in PSY 311 OR previous credit for PSY 311;

Notes: Students cannot receive credit for both this course and PSY 438L or PSY 438 or BIO 439. Same as PSY 438.

BIO 441 Invertebrate Zoology 3

Major invertebrate groups with emphasis on their phylogenetic relationships, ecology, physiology, evolution, and structural adaptations of representative types. Weekend coastal field trip may be required.

Prerequisites: BIO 330.

Notes: Includes a laboratory component. May not be taken more than twice; Students cannot receive credit for both BIO 341 and BIO 441.

BIO 441L Invertebrate Zoology Laboratory 1

Major invertebrate groups with emphasis on their phylogenetic relationships, ecology, physiology, evolution, and structural adaptations of representative types. Weekend coastal field trip may be required.

Prerequisite or

Corequisites: BIO 441.

Notes: Students cannot receive credit for both BIO 341 and BIO 441.

BIO 442 Genes and Signals 3

Investigates the regulation of gene expression in bacteria, yeast, and higher eukaryotes, and explores how such regulatory systems have evolved.

Prerequisites: BIO 355 and BIO 392.

BIO 443 Biophysics 3

Introduction to cellular biophysics, with emphasis on the physical properties of membranes, including membrane transport mechanisms and electrical properties of membranes.

Prerequisites: BIO 355, CHE 114, MAT 191, and either PHY 211 with PHY 212 or PHY 291 with PHY 292. or permission of instructor;

Notes: Same as PHY 443.

BIO 444 Entomology 3

A theoretical and practical overview of the insect orders, selected topics of insect behavior, ecology, and evolution, and an introduction to human-insect interactions. BIO 392 and BIO 441 recommended.

BIO 445 Disease Ecology 4

Understanding and managing emerging infectious diseases, primarily zoonotic, using an ecologically-based approach. Students learn theory and skills in the epidemiology and ecology of infectious diseases.

Prerequisites: BIO 301 or written permission of instructor.

Notes: Includes a laboratory component.

BIO 446 Evolutionary Medicine and Paleopathology 6

Evolutionary Medicine is a framework for understanding human health that employs evolutionary theory and paleopathological methods and data. Paleopathology is an interdisciplinary, epidemiological analysis of historical human health contextualized within particular social and cultural environments. This field course introduces students to theory, methods, and practical research in these fields.

Prerequisites: C grade or higher in BIO 271 or BIO 277, and/or permission of instructor.

BIO 449 Current Topics in Biology 1-3

Advanced topics courses in the biological sciences. Topics vary with instructor.

Prerequisites: Minimum grade of C- in both BIO 111 and BIO 112 and permission of instructor.

BIO 449C Current Topics in Biology: Neuron / Behavior 1-3

Advanced topics courses in the biological sciences. Topics vary with instructor.

BIO 451 Vascular Plant Systematics 4

Principles, methods, and the history of systematic biology are covered in the context of vascular plant classification and evolution.

Prerequisites: BIO 330 or BIO 301 or BIO 392.

Corequisites: BIO 451L.

Notes: Passing grade in lecture must be achieved for successful completion of this course. May not be taken more than twice.

BIO 451L Vascular Plant Systematics Lab 0

Principles, methods and the history of systematic biology are covered in the context of vascular plant classification and evolution. Passing grade in lecture must be achieved for successful completion of course. (LAB)

BIO 452 Metamorphosis 3

Readings, discussions, and oral presentations of current literature on metamorphosis in animals, mechanisms controlling metamorphosis, evolution of complex life cycles, and adaptations to differing habitats.

Prerequisites: Three courses selected from BIO 301, BIO 322, BIO 341, BIO 355, BIO 370, BIO 392. or permission of instructor.

BIO 453 Vertebrate Morphogenesis 3

Vertebrate development focused on cellular and molecular mechanisms of induction, differentiation, and morphogenetic processes that give rise to the adult body plan. Laboratory includes study of vertebrate embryos and adult specimens.

BIO 453L Vertebrate Morphogenesis Laboratory 1

Laboratory supporting BIO 453. Prerequisite or

Corequisites: BIO 453.

BIO 455 Vertebrate Reproduction 3

An advanced treatment of the diversity of vertebrate reproductive biology, with emphasis on structural, regulatory, behavioral, and evolutionary aspects.

Prerequisites: One of BIO 277, BIO 425, BIO 453, BIO 464, BIO 470, or BIO 477.

BIO 456 Global Change 3

This class will cover (1) the causes of anthropogenic global change, (2) the consequences for biological and ecological processes, and (3) ecology and biotechnology-based solutions for mitigating and adapting to this new world. Students will read and discuss the primary literature on global change as well as explore policy makers' perspectives. Additionally, students will practice how to communicate science effectively through in-class discussions and debates, written assignments, and multiple in-class oral presentations.

Prerequisites: BIO 301 or permission of instructor.

BIO 460 Symbiosis 3

Symbioses are intimate associations involving two or more species. Symbiotic associations are widespread in nature and we can expect to find them in every type of ecological niche. This course will cover the diversity of symbiotic interactions that exist between both microbes and fungi and various eukaryotic hosts, including plants, animals, and protists, as well as other microorganisms. This course will also include writing, presenting, and reviewing published work on various symbioses.

Prerequisites: BIO 330 and BIO 392.

BIO 464 Developmental Biology 3

A survey of developmental processes in plants and animals. Topics will include fertilization, achievement of multicellularity, cell determination and differentiation, pattern development, and the genetic regulation of such processes.

Prerequisites: C (2.0) or better in BIO 355 and BIO 392.

BIO 464L Developmental Biology Laboratory 1

Laboratory supporting BIO 464. Prerequisite or

Corequisites: BIO 464.

BIO 470 Vertebrate Zoology 3

Evolution of major vertebrate groups with emphasis on morphology, ecology, and behavior. Comparisons of vertebrates in the laboratory through dissections and field work.

Prerequisites: BIO 330.

Notes: May not be taken more than twice. Students cannot receive credit for both BIO 370 and BIO 470.

BIO 470L Vertebrate Zoology Laboratory 1

Laboratory supporting BIO 470. Prerequisite or

Corequisites: BIO 470.

BIO 472 Histology 3

Microscopic anatomy of vertebrate tissues. Emphasis on correlation of cell and tissue functions with structures visible under the light and electron microscopes.

Prerequisites: BIO 355. Prerequisite or

Corequisites: BIO 472L.

BIO 472L Histology Laboratory 1

Laboratory supporting BIO 472. Prerequisite or

Corequisites: BIO 472.

BIO 473 Drugs and the Brain 3

Pharmacology of major neurotransmitter systems in the brain and nervous system. Actions of clinically relevant drugs on these systems will be analyzed along with major drugs of abuse.

Prerequisites: BIO 355, and one of the following: BIO 277, BIO 477, BIO 479, PSY 230. or permission of instructor;

Notes: CHE 351 recommended.

BIO 474 Workshops in Biotechnology 1

Individual, intensive four-week workshops focused on specific techniques in biotechnology. Provides hands-on experience designing and implementing a focused project utilizing current methods and bioinformatics.

Prerequisites: BIO 494 or permission of instructor.

Notes: May be repeated for credit as long as letter suffix of course differs: workshops of a given letter may be taken only once.

BIO 476 Population Genetics and Molecular Evolution 3

Application of population genetic and molecular evolutionary theory to the study of natural history, natural selection, genome variation and organization, human evolution, conservation biology, and forensics.

Prerequisites: BIO 330 and BIO 392. or permission of instructor.

BIO 478 Hormones in Action 3

Hormonal signaling in humans and other animals is examined using developmental, physiological, behavioral, cellular, and molecular perspectives, with special emphasis on the adrenal glands and the gonads.

Prerequisites: BIO 355 and BIO 392.

BIO 479 Neurobiology 3

Survey of major integrative mechanisms used by nervous systems from invertebrates to humans. Synaptic transmission, sensory processing and activity of neural circuitry controlling behavior will be analyzed.

Prerequisites: BIO 355.

Notes: PHY 212 or PHY 292 recommended.

BIO 479L Neurobiology Laboratory 1

Computer-based laboratory exercises to complement BIO 479 lecture material, including intracellular and extracellular recording simulations.

Prerequisites: Pr. or Coreq.: BIO 479.

Notes: PHY 212 or PHY 292 recommended.

BIO 480 Environmental Physiology 3

Lectures, discussions, and student presentations on the physiology of animals as it is influenced by and is adapted to environmental conditions.

Prerequisites: BIO 355 and either BIO 277 or BIO 477.

BIO 481 General Microbiology 3

Introductory survey of microbiology, emphasizing the role of microorganisms in everyday life.

Prerequisites: BIO 301, BIO 355, and BIO 392, or permission of instructor.

Prerequisite or

Corequisites: BIO 481L.

BIO 481L General Microbiology Laboratory 1

Laboratory supporting BIO 481. Prerequisite or

Corequisites: BIO 481.

BIO 482 Molecular Biological Approaches in Research 1

Use of novel molecular approaches to address current questions in the life sciences will be explored by analyzing recent research reports and learning the principles underlying these approaches.

Prerequisites: BIO 392.

Notes: May be repeated for a total of 3 s.h. credit.

BIO 485 Virology 3

Selected topics in virology. Emphasis upon new trends in the study of animal, plant, and bacterial viruses at both molecular and cellular levels.

Prerequisites: BIO 355 and BIO 392. or permission of instructor.

BIO 486 Cell Cycle and Cancer 3

Molecular basis of cell division and cancer examined through lectures and discussions of primary literature. Topics include cell cycle control, genomic stability, carcinogenesis, and cancer genetics.

Prerequisites: BIO 355 and BIO 392, or permission of instructor.

BIO 487 Epigenetics 3

Study of epigenetic mechanisms involved in chromatin structure, DNA and histone modifications, gene expression, dosage compensation, imprinting, heterochromatin structure, stem cell differentiation, development, human disease, and environmental-gene interactions.

Prerequisites: BIO 355 and BIO 392.

BIO 488 Essentials of Toxicology 3

This course is designed to introduce undergraduate students to the fundamentals of toxicology and serve as the key introductory course for students who require a background in toxicology.

Prerequisites: Grade of C- or better in BIO 111, BIO 112, BIO 301 and BIO 355, or permission of instructor.

BIO 490 Introduction to Mathematical Models in Biology 3

Exploration of research and methodology at the interface of mathematics and biology, with an overview of relevant fields and in-depth case studies. Focus will be on mathematical models in biology.

Prerequisites: Minimum grade of C- in BIO 111 and minimum grade of B- in BIO 112 and either MAT 191 or STA 271. or permission of instructor;

Notes: Same as MAT 460.

BIO 492 Genetics of Complex Traits 3

Theory, experimental methods, and analysis related to the genetic basis for variation in complex traits, including quantitative and threshold traits in animals and plants, and complex human diseases.

Prerequisites: BIO 392 or permission of the instructor.

BIO 493 Honors Work 1-6

Honors Work.

Prerequisites: Permission of instructor required.

Notes: A maximum of 6 s.h. total of any combination of BIO 493, BIO 496, BIO 497, or BIO 499 may be counted toward requirements for the Biology B.A. or B.S. degree.

BIO 494 Introduction to Biotechnology 4

Introduction to the principles and techniques of biotechnology. Includes molecular cloning, DNA sequencing, and gene expression. Explores topics such as gene amplification, gene therapy, and DNA fingerprinting.

Prerequisites: BIO 392 and BIO 375.

BIO 495 Advanced Genetics 3

Selected topics in genetics at an advanced level. Emphasis placed on comparative view of molecular mechanisms underlying animal and plant development.

Prerequisites: BIO 392.

BIO 496 Science Pedagogy for Learning Assistants 1

Students learn about current research in science pedagogy in a weekly seminar and apply their knowledge to support active learning and inquiry as in-class learning assistants in a biology course.

Prerequisites: Permission of instructor.

Notes: May be repeated once for a total of 2 s.h.. A maximum of 6 s.h. total of any combination of BIO 493, BIO 496, BIO 497, or BIO 499 may be counted toward the BIOL major.

BIO 497 Internship in Biology 1-3

Students work at site outside University for a minimum of 45–135 hours under direction of faculty and on-site supervisor. Times vary.

Prerequisites: Prior approval required.

Notes: A maximum of 6 s.h. total of any combination of BIO 493, BIO 496, BIO 497, or BIO 499 may be counted toward requirements for the Biology B.A. or B.S. degree.

BIO 499 Undergraduate Research 1-3

Biological research under the direction of a faculty member, culminating in a written report. Research will include laboratory and/or field work and/or directed readings of the literature. Times by arrangement.

Prerequisites: One of the following: BIO 301, BIO 330, BIO 355, or BIO 392. and permission of instructor;

Notes: A maximum of 6 s.h. total of any combination of BIO 493, BIO 496, BIO 497, or BIO 499 may be counted toward requirements for the Biology B.A. or B.S. degree.

BIO 519 Introduction to Nanotechnology 3

This course introduces students to the emerging field of nanotechnology and exposes them to current research and topics that are being influenced by nanomaterials including biology, healthcare, and the environment.

Notes: Same as NAN 519.

BIO 600 Introduction to Graduate Studies 1

Training in research ethics and oral-visual communication. Topics include plagiarism, experimental design, statistical interpretation, conflicts of interest, animal safety, authorship, peer review, and scientific presentations.

Prerequisites: Biology graduate student or permission of instructor.

BIO 600X Experimental Course 1-6

This number reserved for experimental courses. Refer to the Course Schedule for current offerings.

BIO 601 Seminar in Animal Ecology 3

Literature of animal ecology including both classical and recent papers. Using student presentations and class discussions, the ontogeny of some overarching ecological themes are explored.

Prerequisites: BIO 301.

BIO 605 Seminar in Ecology 3

Broad view of ecological literature and in-depth studies of selected aspects of population and community ecology.

Prerequisites: Previous course in ecology.

BIO 609 Seminar in Molecular Cell Biology 3

Topics in cell and molecular biology will be reviewed through discussion of research journal articles. Emphasis on modern experimental techniques and approaches.

Prerequisites: BIO 355.

BIO 610 Seminar in Molecular Genetics 3

Recent advances in molecular genetics, reinforcing basic concepts underlying these developments and understanding their impact on the life sciences.

Prerequisites: BIO 355 and BIO 392.

BIO 611 Advanced Topics in Animal Ecology 3

Directed readings in the literature of physiological ecology, growth and regulation of populations, community structure, energy flow, mineral cycling, and other areas of current research interest.

Prerequisites: Permission of instructor.

BIO 614 Prenatal Development: Embryology and Teratology 3

Human embryological development with emphasis on normal and abnormal development. Issues in teratology and birth defects, clinical problems associated with birth defects and their means of prevention.

Prerequisites: Enrollment in MS genetic counseling program or permission of instructor.

BIO 615 Advanced Topics in Animal Physiology 3

Study of physiological mechanisms; selected problems from current literature.

Prerequisites: Permission of instructor.

BIO 617 Advanced Topics in Genetics 3

Basic mechanisms of gene action in microbes, animals, and plants.

Prerequisites: Permission of instructor.

BIO 618 Computational Biology 3

The class will introduce concepts and methods to analyze biological data including DNA sequence data, genome assembly and annotation, DNA sequence comparison, phylogeny construction and protein structure analyses.

BIO 619 Plant Physiology 3

This course will cover the study of plant cells and functions, transport processes in plants, plant metabolism, plant cellular signaling due to endogenous chemicals and environment, plant development, and plant adaptation to environment.

Prerequisites: Approval of the instructor.

BIO 620 Ecosystem Ecology and Biogeochemistry 3

Introduction to ecosystem function, structure, and dynamics; basic ecosystem theories; discussions of key processes governing energy flow and nutrient cycling; comparison of ecosystems; selected original literature.

BIO 623 Landscape Ecology Laboratory 1

Field labs to observe different landscape structures and conduct course projects for comprehending principles of landscape ecology. Students will use computer labs for GIS basics, landscape analyses.

Corequisites: BIO 627.

BIO 624 Advanced Topics in Microbiology 3

Critical review of current research covering a wide range of topics including infectious diseases, bacterial physiology, marine microbiology, and immunology. Focus on students' interests or needs.

Prerequisites: Permission of instructor.

BIO 626 Conservation Biology 3

Introduction to habitat and species conservation; topics include genetic diversity, demographic patterns of rare species, habitat fragmentation, design and management of nature reserves, ecological restoration.

BIO 627 Landscape Ecology 3

Introduction to patch-corridor-matrix structure of landscapes and their impact on ecological processes. Discussion of landscape indices, spatial heterogeneity, current issues, and general approaches in landscape ecology.

Corequisites: BIO 623.

BIO 628 Microbial Ecology 3

Emphasis on current areas of active research with reference to applied problems.

BIO 629 Aquatic Ecology 3

The study of the geology, physics, chemistry, and ecology of lakes, including reservoirs and streams with comparisons to the ocean.

BIO 630 Advanced Topics in Plant Ecology 3

Studies of special terrestrial communities or plant groups.

Prerequisites: Permission of instructor.

BIO 635 Molecular Toxicology 3

Molecular mechanisms involved in the toxicant-induced adverse health effects and discussion of molecular pathways altered in cells in response to environmental xenobiotic exposure.

BIO 636 Ecotoxicology 3

This course is designed to provide an in-depth understanding of the sources and transport of environmental pollutants, and their adverse ecological impacts.

Prerequisites: Introductory undergraduate-level course in Ecology or Environmental Sciences or equivalent or permission of the instructor.

BIO 637 Human Evolutionary Genetics 3

Study of primary literature testing hypotheses about human ancestry and evolution using molecular genetic methods.

BIO 638 Aquatic Ecology Laboratory 1

Practical study of water chemistry methods, lake and stream morphometry, identification of freshwater zooplankton, benthic invertebrates and fish, and field trips to area reservoirs and streams.

Corequisites: BIO 629.

BIO 639 Biochemistry: Metabolic Regulation in Health and Disease 3

Chemical properties of major cellular compounds; biosynthesis, degradation, and function of carbohydrates, lipids, proteins, nucleic acids, vitamins, and hormones; energy metabolism; enzymatic catalysis.

BIO 640 Biology of Aging 3

An integrative look at biological theory and mechanisms to explain the diversity of the aging process, including human implications.

BIO 641 Stream Ecology 3

Study of ecology and management of flowing water ecosystems. Topics such as community and ecosystem processes, major paradigms, management of point versus non-point pollutants, and restoration addressed.

Prerequisites: BIO 301 or equivalent.

BIO 642 Genes and Signals 3

Investigates the regulation of gene expression in bacteria, yeast, and higher eukaryotes, and explores how such regulatory systems have evolved.

BIO 643 Biophysics 3

Introduction to cellular biophysics, with emphasis on the physical properties of membranes, including membrane transport mechanisms and electrical properties of membranes.

BIO 644 Entomology 3

A theoretical and practical overview of the insect orders, selected topics of insect behavior, ecology, and evolution, and an introduction to human-insect interactions.

BIO 645 Disease Ecology 4

Understanding and managing emerging infectious diseases, primarily zoonotic, using an ecologically-based approach. Students learn theory and skills in the epidemiology and ecology of infectious diseases.

Prerequisites: Permission of instructor.

Notes: Includes a laboratory component.

BIO 646 Advanced Topics in Neurobiology 3

Directed readings on fundamental physiological principles of nervous system functioning. Topics may include motor pattern generation, sensory transduction, sensori-motor integration, neurohormonal modulation of behavior.

Prerequisites: Permission of instructor.

BIO 648 Current Topics in Biology 1-3

Advanced topics courses in the biological sciences. Topics vary with instructor.

Prerequisites: Permission of instructor.

BIO 649C Current Topics: Neurons / Behavior 1-3

Advanced topics courses in the Biological Sciences. Topics vary with instructor.

Prerequisites: Permission of Instructor.

BIO 651 Vascular Plant Systematics 4

Principles, methods, and the history of systematic biology are covered in the context of vascular plant classification and evolution.

Corequisites: BIO 651L.

Notes: Passing grade in lecture must be achieved for successful completion of this course. May not be taken more than twice.

BIO 651L Vascular Plant Systematics Laboratory 0

Principles, methods and the history of systematic biology are covered in the context of vascular plant classification and evolution.

Notes: Passing grade in lecture must be achieved for successful completion of course.

BIO 652 Metamorphosis 3

Readings, discussions, and oral presentations of current literature on metamorphosis in animals, mechanisms controlling metamorphosis, evolution of complex life cycles, and adaptations to differing habitats.

BIO 655 Vertebrate Reproduction 3

An advanced treatment of the diversity of vertebrate reproductive biology, with emphasis on structural, regulatory, behavioral, and evolutionary aspects.

BIO 656 Global Change 3

This course covers causes of anthropogenic global change, consequences for biological and ecological processes, and ecology- and biotechnology-based solutions for mitigating and adapting to this new world. Students will read and discuss the primary literature on global change, explore policy makers' perspectives, and practice how to communicate science effectively through in-class discussions and debates, written assignments, and multiple in-class oral presentations.

Prerequisites: Biology graduate student or permission of instructor.

BIO 660 Symbiosis 3

Symbiotic interactions of living organisms from an evolutionary perspective. Metabolic, genetic, behavioral, and ecological adaptations which allow symbioses to be formed and maintained will be discussed.

BIO 673 Drugs and the Brain 3

Pharmacology of major neurotransmitter systems in the brain and nervous system. Actions of clinically relevant drugs on these systems will be analyzed along with major drugs of abuse.

BIO 674 Workshops in Biotechnology 1

Individual, intensive four-week workshops focused on specific techniques in biotechnology. Provides hands-on experience designing and implementing a focused project utilizing current methods and bioinformatics.

Notes: May be repeated for credit as long as letter suffix of course differs. Workshops of a given letter may be taken only once.

BIO 676 Population Genetics and Molecular Evolution 3

Application of population genetic and molecular evolutionary theory to the study of natural history, natural selection, genome variation and organization, human evolution, conservation biology, and forensics.

BIO 678 Hormones in Action 3

Hormonal signaling in humans and other animals is examined using developmental, physiological, behavioral, cellular, and molecular perspectives, with special emphasis on the adrenal glands and the gonads.

BIO 680 Environmental Physiology 3

Lectures, discussions, and student presentations on the physiology of animals as it is influenced by and is adapted to environmental conditions.

BIO 682 Molecular Biological Approaches in Research 1

Use of novel molecular approaches to address current questions in the life sciences will be explored by analyzing recent research reports and learning the principles underlying these approaches.

Notes: May be repeated for a total of 3 credits.

BIO 685 Virology 3

Selected topics in virology. Emphasis upon new trends in the study of animal, plant, and bacterial viruses at both molecular and cellular levels.

BIO 686 Cell Cycle and Cancer 3

Molecular basis of cell division and cancer examined through lectures and discussions of primary literature. Topics include cell cycle control, genomic stability, carcinogenesis, and cancer genetics.

BIO 687 Epigenetics 3

Study of epigenetic mechanisms involved in chromatin structure, DNA and histone modifications, gene expression, dosage compensation, imprinting, heterochromatin structure, stem cell differentiation, development, human disease, and environmental-gene interactions.

BIO 691 Genetics of Complex Traits 3

Theory, experimental methods, and analysis related to the genetic basis for variation in complex traits, including quantitative and threshold traits in animals and plants, and complex human diseases.

BIO 694 Advanced Genetics 3

Selected topics in genetics at an advanced level. Emphasis placed on comparative view of molecular mechanisms underlying animal and plant development.

BIO 695 Biological Research 1-6

Student engages in advanced biological research under the supervision of a member of the Graduate Faculty.

Notes: Course may be repeated with a maximum of 9 hours credit counting toward the MS degree. Grade: Satisfactory/Unsatisfactory (S/U).

BIO 698 Non-Thesis 3

Capstone for completion of non-thesis option.

Prerequisites: Students must have at least 15 credits in 600-749 level courses and cannot enroll in BIO 695, BIO 801, or BIO 803.

BIO 699 Thesis 1-6

Individual research for the completion of a thesis.

Prerequisites: Successful presentation of thesis proposal to Biology Department.

BIO 707 Seminar in Environmental Health Science 2

Development of critical-thinking and writing skills through discussions and critiques of primary literature in environmental health science and through writing assignments.

Prerequisites: Biology graduate student or permission of instructor.

BIO 708 Biostatistics 1 3

Biological research requires competency in the concepts and methods used to statistically test hypotheses. Emphasis is on the representation, manipulation and hypothesis testing of biological data with R. Students will use statistical analyses to solve problems encountered in biological analyses, such as analyzing sequencing data, sampling bias and phylogenetic relatedness.

BIO 709 Biostatistics 2 3

The class will cover advanced concepts and methods to perform statistical tests on environmental and biological data, particularly those challenges that come with utilizing data that is collected from a non-laboratory (i.e. less controlled) setting.

Prerequisites: BIO 708 or permission of instructor.

BIO 731 Environmental Health Science I: Ecosystems to Individuals 3

Causes of environmental problems that society faces and the effects on ecosystem and community function and species survival. Implications for environmental and human health are explored.

Prerequisites: Biology graduate student or permission of instructor.

BIO 732 Environmental Health Science II: Individuals to Molecules 3

Introduction to fundamentals of toxicology with a focus on toxicological consequences of environmental perturbations on physiological and cellular processes, genome structure, and gene function.

Prerequisites: Biology graduate student or permission of instructor.

BIO 733 Workshops in Environmental Health Science 1

Individual six-week workshops focusing on analytical tools and experimental approaches used in freshwater/riparian ecosystem analysis, environmental genomics, environmental forensics, and cellular/physiological research.

Prerequisites: Biology graduate student or permission of instructor.

BIO 734 Current Research in Environmental Health Science 1

Weekly discussion of research journal articles in the area of environmental health science. Students will present and discuss research journal articles.

Notes: May be repeated for a total of 2 credit hours.

BIO 749 Research Lab Rotations 1

Course providing credit for participation in laboratory meetings and/or the initiation of preliminary research training in the labs of 1 to 3 potential dissertation or thesis advisors.

Notes: May be repeated for a total of 3 hours credit. Grading method is Satisfactory/Unsatisfactory (S/U).

BIO 790 Directed Study in Environmental Health Science 1-6

Advanced research in environmental health science under the direction of a graduate faculty advisor. Preparation of doctoral research proposal and planning for dissertation research.

Prerequisites: Admitted to PhD in environmental health science and approval of graduate faculty advisor.

Notes: May be repeated for a maximum of 12 hours credit counting towards the PhD degree. Grade: Satisfactory/Unsatisfactory (S/U).

BIO 791 Independent Doctoral Research 1-6

Independent research in environmental health science related to the student's primary area of research specialization leading to dissertation.

Prerequisites: Admitted to candidacy.

Notes: May be repeated for a maximum of 15 hours credit counting towards the PhD degree. Grade: Satisfactory/Unsatisfactory (S/U).

BIO 799 Dissertation 1-18

Individual research for the completion of the doctoral dissertation.

Prerequisites: Admitted to candidacy.

Notes: May be repeated for a maximum of 18 hours credit. Grade: Satisfactory/Unsatisfactory (S/U).

BIO 801 Thesis Extension 1-3

Thesis Extension.

BIO 802 Dissertation Extension 1-3

Dissertation Extension.

BIO 803 Research Extension 1-3

Research Extension.