

BIOLOGY (BIOL)

BIOL 501 Evolutionary Genetics (4 Credits)

Fall or Spring; Murphy. The course is designed to consider evolution as a process: Basic population genetic theory; sources of variation; natural selection; isolating mechanisms and speciation. Three lecture hours, one recitation hour.

BIOL 504 Topics in Biology (1-4 Credits)

Fall and Spring; Staff. Areas of special current research interest presented by resident and visiting faculty members as opportunity and demand arise. Hours to be arranged. This course may be repeated for credit.

BIOL 509 Virology (3 Credits)

Fall; Williamson. This course gives an overview of fundamental concepts in virology. Topics include the discovery of viruses, principles of virus structure, viral morphogenesis, virus detection methods, viral vaccines, and ecological significance of viruses. A strong emphasis is placed on molecular mechanisms of viral replication.

BIOL 510 Animal Behavior (3 Credits)

Fall; Staff. The study of vertebrate and invertebrate behaviors as adapted traits under the influence of both genes and the environment. Animal behavior, including that of humans and endangered species, will be placed in an ecological and evolutionary context.

BIOL 512 Vascular Plant Systematics (4 Credits)

Fall; Case. A study of the principles and research methods of vascular plant systematics, emphasizing classification, evolution, and comparative morphology of the major families of vascular plants. Three class hours. four laboratory hours.

BIOL 513 Plant Diversity/Identification (1 Credit)

Case. An introduction to vascular plant diversity at the species level with focus on plants of Virginia's Coastal Plain. Students will acquire essential background in research techniques and resources, life-history variation, structural evolution, and conservation principles that underpin professional field botanical skills. One class hour. Approval of instructor required.

Corequisite(s): BIOL 513L

BIOL 513L Plant Diversity/Identity Lab (2 Credits)

Case. This course is designed to build skills in plant identification through an immersive hands-on experience with local plants to facilitate professional competence for the conservation biology workplace, enhance research skills, and foster personal enrichment. Digital exercises as well as regular field trips to the College Woods and campus plants will comprise the learning environment. Students will acquire additional skills in data analysis, project design, and/or mentorship of undergraduate research teams. Three laboratory hours, one hour arranged. Approval of instructor required.

Corequisite(s): BIOL 513

BIOL 516 Intro to Ornithology (4 Credits)

Spring; Cristol. Offered in alternate years. Lectures, laboratory exercises, field experiments and birding trips will provide a comprehensive introduction to the ecology and evolution of birds. Phylogenetic relationships, behavior, conservation and identification of Virginia's avian fauna will be stressed. Three class hours, three laboratory hours, and several early morning field trips.

BIOL 516L Intro to Ornithology-Lab (0 Credits)

BIOL 517 Population/Community Ecology (4 Credits)

Spring; Dalgleish. Discussion of the structure and dynamics of ecological populations and biotic communities. Emphasis will be on environmental constraints and species interactions that control population growth and determine both diversity and similarities in community structure and function. Three class hours, three laboratory hours.

Corequisite(s): BIOL 517L

BIOL 517L Population/Community Lab (0 Credits)

Corequisite(s): BIOL 517

BIOL 518 Functional Ecology (3 Credits)

Spring; Concepts and approaches in physiological ecology, biomechanics, and ecological morphology. The course emphasizes critical thinking, discussion, and student presentations on journal articles from the primary literature. Hypothesis formulation and methods of data collection and analysis will be studied.

BIOL 520 Genetic Analysis (3 Credits)

Spring; Kerscher. Discussion of classical and modern genetics. Topics will be drawn from the following: Mendelian inheritance, recombination and linkage, cytogenetics, model genetic systems, mutation analysis, mitochondrial and chloroplast genetics.

BIOL 521 Genetic Analysis Lab (1 Credit)

Spring; Kerscher. Designed to illustrate genetic principles through experimental work with living organisms, including *Drosophila*, flowering plants and fungi. Three laboratory hours.

BIOL 522 Introduction to Bioinformatics (3 Credits)

Provides a broad overview of bioinformatic concepts and techniques across broad biology disciplines, including ecology, evolution, molecular, and developmental biology.

BIOL 522L Introduction to Bioinformatics Lab (1 Credit)

Designed to complement lecture topics and provide hands-on bioinformatic training for common techniques using publicly available datasets. Three laboratory hours.

Corequisite(s): BIOL 522

BIOL 532 Animal Physiology (4 Credits)

Spring; Treidel. The function of the animal as a whole as indicated by the physiology and interrelationships of different organs and organ systems. The emphasis is on vertebrates, with comparative examples from selected invertebrates. Three class hours, four laboratory hours.

BIOL 536 Advanced Cell Biology (3 Credits)

Fall; Shakes. An in-depth study of a specific topic in cell biology based on readings from the current primary literature. Topics will vary but may include the cytoskeleton or cell signaling. Three class hours.

BIOL 542 Molecular Genetics (3 Credits)

Fall; Allison. This course gives a comprehensive introduction to molecular genetics emphasizing genome organization, DNA replication and repair, synthesis of RNA and proteins, regulation of prokaryotic and eukaryotic gene expression, epigenetics, RNA processing, molecular genetics of cancer, DNA biotechnology and human gene therapy. Three class hours.

BIOL 543 Molecular Genetics Lab (1 Credit)

Fall; Allison. Experiments illustrating current techniques in molecular genetics, including basic cloning, transformation of bacteria with recombinant DNA, plasmid and genomic DNA purification, gel electrophoresis, restriction digests, DNA labeling, Southern transfer, PCR and green fluorescent protein expression in transfected mammalian cells. Three laboratory hours.

Prerequisite(s): BIOL 542 (may be taken concurrently)

BIOL 545 GIS for Biologists (3 Credits)

Fall; Leu. This hands-on course will integrate Geographical Information Systems into biological research. Emphasis will be on developing spatial metrics, comparing cell or land cover patterns across spatial or temporal scales, classifying satellite or medical imagery, and modeling species distributions.

BIOL 546 Nuclear Struct & Gene Activity (3 Credits)

Spring; Allison. An in-depth advanced exploration of the structure of the nucleus and molecular mechanisms of eukaryotic gene regulation, based on readings from the current primary literature. Topics will include mechanisms regulating nuclear import and export of transcription factors and RNA, the role nuclear architecture plays in gene activity and RNA processing, and how failure to appropriately coordinate these processes leads to abnormal or diseased states.

BIOL 549 Sexual Selection (3 Credits)

Spring; Swaddle. Areas of special current research interest presented by resident and visiting faculty members as opportunity and demand arise. (Hours to be arranged.) This course may be repeated for credit.

BIOL 553 Protein Structure & Function (3 Credits)

Fall; Hinton. The functionality of a protein is an integral part of its structure. This course provides a comprehensive analysis of how to use sequence data to understand a protein's physical properties, and to predict its function and interaction. Three class hours.

BIOL 560 Stem Cell Research (3 Credits)

Spring; Wawersik. An in-depth exploration of the field of stem cell research ranging from basic stem cell behavior and regulation, to stem cell therapies and cancer, as well as ethics and government oversight. Topics are based around readings of primary literature, with emphases placed on evaluating the validity of data as well as scientific communication through written and oral presentation.

BIOL 566 Directed Studies (3-4 Credits)

Fall and Spring; Graded Pass/Fail. No credits earned in this course may be applied to the number of credits required to satisfy graduate degree requirements. This course may be repeated for credit.

BIOL 601 Introduction to Graduate Studies (1 Credit)

Fall; Puzey. BIOL 601 is a required, first-semester course designed to orient new graduate students to the MS program Biology. The course focuses on professional development and the core skills needed to succeed the Biology graduate program. Learning goals: (1) Understand the structure, expectations, and milestones of the Biology graduate program. (2) Engage with the Biology research community, including faculty, staff, and peers. (3) Develop effective professional communication skills in academic, research, and committee settings. (4) Build teaching skills through discussion and troubleshooting of TA experiences. (5) Understand necessary lab safety procedures, research ethics, and responsible conduct of research. (6) Navigate mentorship and other academic relationships.

BIOL 602 Research Design/Methods (3 Credits)

Fall; Puzey. BIOL 602 is a required first-semester course designed to help graduate students develop the skills necessary to design a compelling and technically sound research proposal. The course emphasizes statistical reasoning and experimental design. Topics included in this course are relevant to all sub-disciplines within Biology. Learning Goals: (1) Develop a compelling and feasible research proposal rooted in primary literature. (2) Formulate clear, testable research questions and hypotheses. (3) Use R at an introductory level to clean, manipulate, and visualize biological data. (4) Practice communicating scientific ideas effectively through persuasive writing.

BIOL 610 Biochemical Interactions through Bioinformatics (1 Credit)

Fall; Hinton. This course provides a hands-on introduction to computations approaches that are used to study the 3D structure and functions of proteins. Students will learn to utilize diverse computational approaches that are available to investigate biochemical interactions while addressing a research question related to their Master's thesis research. One class hour.

BIOL 680 Advanced Topics: Biology (1-4 Credits)

Fall and Spring; Staff. Areas of special current research interest presented by resident and visiting faculty members as an opportunity and demand rise. This course may be repeated for credit.

BIOL 680L Advanced Topics: Biology Lab (0 Credits)**BIOL 682 Research Seminar (1 Credit)**

Fall and Spring; Staff. Presentations on and discussions of selected biological topics by graduate students. One class hour. This course may be repeated for credit up to a maximum of 4 credits.

BIOL 685 Colloquium (0-2 Credits)

Fall and Spring; Graded Pass/Fail. No credits earned in this course may be applied to the number of credits required for a degree. This course may be repeated.

BIOL 690 Problems in Biology (1-3 Credits)

Fall and Spring; Graded Pass/Fail. Consent of Departmental Graduate Committee required.

BIOL 695 Dir Thesis Master's Research (1-12 Credits)

Fall and Spring; Staff. Graded Pass/Fail. Note: Students who are not submitting a master's thesis may not use this course to satisfy degree requirements. Students design and conduct research in support of their master's thesis under the direction of a faculty advisor. This course may be repeated, but no more than 9 semester credit hours may be used to satisfy degree requirements for submitting a master's thesis.

BIOL 700 Thesis (1-12 Credits)

Fall and Spring; Staff. Grade of either G or U converts to P upon successful completion of a defense and submission and acceptance of the thesis. Students finish the research for and the writing of their master's thesis under the direction of a faculty advisor. Students who are not submitting a master's thesis may not use this course to satisfy degree requirements. This course may be repeated, but no more than 6 semester credit hours may be used to satisfy degree requirements for submitting a master's thesis.