

# BIOLOGY (BIOL)

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# Course numbers with the # symbol included (e.g. #400) have not been taught in the last 3 years.

## BIOL 801 - Plant Physiology

**Credits:** 4

Knowledge about principles of plant physiology is critical to understand how plants work and what happens between planting a seed and picking up a flower or a fruit. This course focuses on fundamentals of plant physiology and metabolism using lecture and laboratory investigations. Lecture topics include: plant-water relations, mineral nutrition, photosynthesis and respiration, plant metabolism, signaling and hormones, growth and development, and plant-environment interactions. Labs will be project-based and students will conduct experiments to explore basic plant processes. Prereq: Knowledge of plant biology and chemistry (introductory plant biol/botany and college level general or organic chemistry); or permission.

**Equivalent(s):** PBIO 801

**Grade Mode:** Letter Grading

## BIOL #802 - Lab Techniques in Plant Physiology and Biochemistry

**Credits:** 4

The course provides a hands-on experience with instrumentation and experimental procedures for analysis of plant growth and metabolism. Experiments demonstrate the regulation of plant growth and development in response to environmental and chemical factors, analysis of cellular contents and processes, and use of modern instrumentation and analytical tools for physiological and biochemical studies. Experiments deal with plant water relations, photosynthesis, plant hormones, enzyme kinetics, use of spectrophotometry and fluorometry, aseptic procedures, and liquid and thin-layer chromatography. Special lab fee. Prereq: BIOL 411, BIOL 412, BIOL 701/801 or permission of instructor.

**Equivalent(s):** GEN 802

**Grade Mode:** Letter Grading

## BIOL 804 - Plant-Microbe Interactions

**Credits:** 3

Microbes and plants have developed intriguing strategies to encourage, resist or profit from their coexistence. The primary objective of the course is to provide students with a comprehensive overview of the various ways in which microbes interact with plants, the outcomes of that interplay, and applications of these interactions and explore how these interactions impact ecosystem function. Prereq: BIOL 411 and BIOL 412, BMS 503 and BMS 504 or GEN 604.

**Grade Mode:** Letter Grading

## BIOL 805 - Molecular and Cellular Neurobiology

**Credits:** 4

The overarching goal of this course is to examine the molecular and cellular mechanisms underlying neuronal function. This course builds on fundamental knowledge in neuroscience. Students will be exposed to primary literature regarding the most advanced techniques in neuroscience, with emphasis in cellular and molecular processes. Students will learn how different model organisms have been used to understand neurons. Graduate students should have a strong background in chemistry, biochemistry and cell biology, and must obtain permission to register.

**Grade Mode:** Letter Grading

## BIOL 806 - Data Science with R for the Life Sciences

**Credits:** 4

Introduces students to the basic data analysis and programming tools commonly used throughout the life sciences. Students will become proficient in R programming, data wrangling and cleaning, the principles of open and reproducible science, SQL database management, version control via Git/Github, building maps, and Bash command lines. Data sets and case studies from across the life sciences will be used throughout the course. The class culminates with a small group project.

**Grade Mode:** Letter Grading

## BIOL 809 - Plant Stress Physiology

**Credits:** 3

Plants cannot move in order to avoid challenging environmental conditions. Hence, plants developed other mechanisms that allow them to cope with stress. This course focuses on the mechanisms deployed by plants to respond to stressful conditions, some responses being nothing short of chemical and biological warfare. Biotic and abiotic stresses covered include pathogens, herbivores, drought, salinity, temperature, UV radiation, and heavy metals. Agricultural and ecological implications are discussed.

**Equivalent(s):** PBIO 809

**Grade Mode:** Letter Grading

## BIOL 811 - Experimental Design & Analysis

**Credits:** 4

Design and analysis of biological and ecological research experiments. "Real world" studies used to discuss the identification of hypotheses, appropriate experimental design, and the application of statistical analyses including ANOVA, ANCOVA, correlation and regression, cluster analysis, classification and ordination techniques. Theoretical statistical concepts tailored to consider students' own thesis and dissertation research, allowing statistical problems to be addressed at various stages of the research process. Common computer packages used for analyses include Excel, JMP, Systat and R.

**Grade Mode:** Letter Grading

## BIOL 812 - Experimental Design Seminar

**Credits:** 2

Explore the experimental design of your own and your classmates' current or proposed graduate research projects. Learn to recognize the difference between good and bad experimental designs by analyzing recently published studies in your field of interest. Learn the secrets of statistical reviewers and how to avoid mistakes that will prevent your work from being published. Prereq: BIOL 811 or upper level stats course.

**Grade Mode:** Letter Grading

## BIOL 814 - Model Organisms in Biological and Medical Research

**Credits:** 2

Animals, plants, and microbes serve as powerful tools for both basic and biomedical research. This course integrates historical, philosophical, sociological, and biological perspectives to examine how models are chosen and used, and how to evaluate their strengths and weaknesses. Students will study particular model species in depth, and address general epistemological questions about the choice and use of model organisms. This course is designed for graduate students and advanced undergraduates interested in research.

**Grade Mode:** Letter Grading

**BIOL 820 - Plant-Animal Interactions****Credits:** 4

Animals and plants engage in a range of interactions, from plant-pollinator and plant-ant mutualisms to plant-herbivore and carnivorous plant antagonisms. This course will explore the consequences of a variety of interactions on the evolution of traits in both animals and plants, considering implications for both conservation and agriculture. Weekly recitation. Prereq: BIOL 412.

**Grade Mode:** Letter Grading**BIOL 827 - Animal Communication****Credits:** 4

This course examines the principles underlying how animals communicate with each other and why they communicate the way they do by using perspectives drawn from a broad range of disciplines including physics, chemistry, ecology, psychology, economics, and behavioral ecology. Students will explore the primary literature, and work in teams to conduct independent research. The course is intended for advanced undergraduate or graduate students interested in neuroscience and behavior, evolution, wildlife and conservation biology, or zoology. Prereq: BIOL 412.

**Grade Mode:** Letter Grading**BIOL 828 - Marine Bioacoustics****Credits:** 3

Marine bioacoustics is a highly interdisciplinary field of science that requires knowledge of marine biology, oceanography, physics, and engineering. This course provides an introduction to the role of acoustics in aquatic biological systems and how acoustics is used to study biological processes and ecosystem dynamics. Topics include: marine animal hearing; sound production; behavior; echolocation; remote sensing; research methods; and the impacts of sounds on marine animals. It is suggested that students have a strong background in biology. College level physics and calculus is suggested.

**Grade Mode:** Letter Grading**BIOL #829 - Agricultural Waste Management****Credits:** 4

The management of agricultural wastes is crucial in the development of sustainable agricultural practices. This course covers principles of managing, handling, treating, and applying animal manures and organic byproducts from an agricultural system perspective. Topics include waste characterization, descriptions of systems and technology, utilization of wastes as resources (land application, composting electricity generation, fertilization, etc.), land application principles, preparations of waste management plans, and potential impacts to the environment. Prereq: SAFS 502 or permission of instructor.

**Grade Mode:** Letter Grading**BIOL 852 - New England Mushrooms: a Field and Lab Exploration****Credits:** 4

This is a hands-on field, lab and lecture course in the identification, classification, life histories, and ecology of mushrooms and other macrofungi. Lectures focus on macrofungal ecology and systematics. Laboratory instruction emphasizes morphological, microscopic, and molecular identification techniques, plus the use of smart-phone field note recording and on-line resources. Several field trips are required in addition to the weekly laboratory. Previous experience with fungi is not required. Grades are based on a collection, a project, and presentations. Prereq: Intro course in Biology or Plant Biology, or permission.

**Equivalent(s):** PBIO 852**Grade Mode:** Letter Grading**BIOL 855 - Biological Oceanography****Credits:** 4

Biological processes of the oceans, including primary and secondary production, trophodynamics, plankton diversity, zooplankton ecology, ecosystems and global ocean dynamics. Field trips on R/V Gulf Challenger and to the Jackson Estuarine Laboratory. Prereq: One year of biology or permission of the instructor. Special Fee.

**Equivalent(s):** ESCI #850, ZOO 850**Grade Mode:** Letter Grading**BIOL 873 - Physiology of Fishes****Credits:** 4

Investigates the physiological processes responsible for maintaining homeostasis in fishes. Focuses on the function and regulation of the major organ systems during stress and environmental adaptation. Topics include reproduction, osmoregulation, digestion, endocrinology, and sensory perception. Special Fee.

**Equivalent(s):** ZOO 873**Grade Mode:** Letter Grading**BIOL 895 - Advanced Studies****Credits:** 1-4

Advanced research or seminar, supervised by a faculty member.

**Grade Mode:** Letter Grading**BIOL 899 - Master's Thesis****Credits:** 1-10

Master's thesis research. Cr/F.

**Repeat Rule:** May be repeated for a maximum of 10 credits.**Grade Mode:** Graduate Credit/Fail grading**BIOL 901 - Introductory Graduate Seminar****Credits:** 2

This seminar provides an introduction to the Biological Sciences Graduate Program, offering students an overview of program structure and requirements, introducing faculty research and campus resources, and helping participants develop skills and strategies useful in graduate school. Requirements include preparation of a written research proposal and a brief oral presentation. Cr/F.

**Equivalent(s):** ZOO 901**Grade Mode:** Graduate Credit/Fail grading**BIOL 902 - Writing and Publishing Science****Credits:** 2

Participants in this seminar (1) make significant progress on one or more of their current academic writing projects; (2) increase their understanding of the genres, protocols, and mechanisms of scientific writing and publishing; and (3) develop strategies and skills for getting professional writing done efficiently and well, in graduate school and beyond. Cr/F.

**Repeat Rule:** May be repeated for a maximum of 6 credits.**Grade Mode:** Graduate Credit/Fail grading**BIOL #903 - Graduate Research Techniques****Credits:** 2

Introduction to a range of research approaches in biology and to research skills needed for success in graduate school and beyond. Topics include scientific methods and experimental design, research techniques, and instrumentation available for graduate research. Cr/F. Offered every spring.

**Grade Mode:** Graduate Credit/Fail grading

**BIOL 950 - Scientific Communication****Credits:** 2

Professional success in science depends on the ability to communicate, both by publishing in professional journals and by explaining the implications of research to a broad audience. This course covers a wide range of topics related to scientific communication. Students work on multiple forms of communication, practice communicating science to the public, strengthen peer reviewing skills, explore online scientific communities, and enhance awareness of relevant economic, legal, and ethical issues.

**Equivalent(s):** LSA 950**Grade Mode:** Graduate Credit/Fail grading**BIOL #997 - Graduate Seminar in Biology****Credits:** 1-2

Current topics in biological sciences; discussion of literature in the field, and student research. Topics span a wide range of biological disciplines (agricultural sciences, marine biology, integrative and organismal biology, etc.), and vary to reflect the faculty and student interests.

**Repeat Rule:** May be repeated for a maximum of 8 credits.**Grade Mode:** Graduate Credit/Fail grading**BIOL 999 - Doctoral Dissertation Research****Credits:** 0

Doctoral dissertation research. Cr/F.

**Grade Mode:** Graduate Credit/Fail grading