

# BIOLOGY (BIOL)

UNH's location and facilities provide unique opportunities for the study of biology due to its access to the seacoast, the Shoals Marine Laboratory (<http://marine.unh.edu/SML>), the lakes region of NH, and the White Mountains National Forest. The Biology faculty strongly believe in a hands-on approach to teaching and active involvement of undergraduates in research. We have a wide range of faculty expertise, including freshwater, estuarine and marine biology, aquaculture, agriculture, sustainability, physiology, neurobiology and behavior. A Biology degree provides the background for a variety of professional positions in the public and private sectors, and provides an excellent foundation for students seeking to apply for graduate, medical or veterinary school.

<http://colsa.unh.edu/dbs/biology>

## Programs

- Biology Major (B.S.) (<http://catalog.unh.edu/archives/2017-2018/undergraduate/life-sciences-agriculture/programs-study/biology/biology-major>)
- Biology Minor (<http://catalog.unh.edu/archives/2017-2018/undergraduate/life-sciences-agriculture/programs-study/biology/biology-minor>)

## Courses

### Biology (BIOL)

#### BIOL 400 - Professional Perspectives on Biology

**Credits:** 1

Views scope of biology and explores professional opportunities for biological sciences majors. Guest speakers from on and off campus present seminars and lead discussions on contemporary issues in biology. Departmental and interdepartmental major and option programs and strategies for achieving professional goals are discussed. Required for all first-semester biology majors. Cr/F.

#### BIOL 408 - Plants and Civilization

**Credits:** 4

Global experience of human interactions with plants and ways in which plants have contributed to the development and flourishing of human societies. Includes role of plants in providing sustenance, clothing and shelter, quest for spices, and the historical consequences of plant explorations and exploitations, the power to heal or kill, plants in mythology and spiritual endeavors, plants that alter consciousness, plant diseases and human history, plants as energy for society, and the Green Revolution in global change and feeding the world in the future. Special fee.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Biological Science GP 3B

#### BIOL 409 - Introductory Botany

**Credits:** 4

Plants in their natural environments: their structure, function, growth, reproduction, and evolutionary diversity. Special fee. Lab.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Biological Science GP 3B

#### BIOL 410 - Principles of Molecular and Cellular Biology

**Credits:** 3

Introduction to structure and function of cells; tissues and organs; physiological processes; genes and heredity. No Laboratory. All COLSA and pre-professional health students should take BIOL 411 (with lab). Prereq: permission required.

**Attributes:** Biological Science(Discovery)

#### BIOL 411 - Introductory Biology: Molecular and Cellular

**Credits:** 4

Introduction to structure and function of cells; tissues and organs; physiological processes; genes and heredity. Required for majors in the biological sciences. Special fee. Lab. Students not permitted to enroll in BIOL 411 and BIOL 412 in the same semester.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Biological Science GP 3B; Inquiry (Discovery)

#### BIOL 411H - Honors/Principles of Biology I

**Credits:** 4

Introduction to structure and function of cells; tissues and organs; physiological processes; genes and heredity. Required for majors in the biological sciences. Special fee. Lab.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Biological Science GP 3B; Inquiry (Discovery)

#### BIOL 412 - Introductory Biology: Evolution, Biodiversity and Ecology

**Credits:** 4

The biology of organisms, including survey of kingdoms, behavior, evolution, and ecology. Required for majors in the biological sciences. Students are not permitted to enroll in BIOL 411 and BIOL 412 in the same semester. Special fee. Lab.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Biological Science GP 3B; Inquiry (Discovery)

#### BIOL 412H - Honors/Principles of Biology II

**Credits:** 4

The biology of organisms, including survey of kingdoms, behavior, evolution, and ecology. Required for majors in the biological sciences. Special fee. Lab.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Biological Science GP 3B; Inquiry (Discovery)

#### BIOL 413 - Principles of Biology I

**Credits:** 4

Lecture and Laboratory introduction to biological principles; cell structure, function, replication, energetics and transport mechanisms; physiological processes; Mendelian, molecular genetics and gene technology. Required for students majoring in the life sciences. Cannot be taken for credit after BIOL 411 or equivalent. Special fee. Lab.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Biological Science GP 3B; Inquiry (Discovery)

#### BIOL 414 - Principles of Biology II

**Credits:** 4

Lecture and laboratory survey of the five kingdoms of life; physiology of cells, tissues, organs, and organ systems; evolution; human impact on the biosphere. Required for students majoring in the life sciences. Cannot be taken for credit after BIOL 412 or equivalent. Special fee. Lab.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Biological Science GP 3B

**BIOL 416 - Watershed Watch - Research Experience****Credits:** 2

This course builds upon the experiences gained while conducting the field and laboratory research from BIOL 415 (Watershed Watch Summer Institute). Students will be expected to integrate the conceptual and hands-on components learned in BIOL 415 into their own independent scientific research projects conducted under the mentoring of a faculty advisor from their college or university campus. Using a seminar format, students will receive additional lecture and reading materials (via distance-learning tools), compare their research progress (e.g., problems and accomplishments) with the progress of other students on other campuses, and will integrate their findings into the larger studies of the Merrimack and Pasquotank River watersheds. Ultimately, students will present their results at the UNH Undergraduate Research Conference at the end of April. (IA grading). Prereq: BIOL 415 and instructor approval. May be repeated.

**Attributes:** Biological Science GP 3B**BIOL 420 - Introduction to Forensic Sciences****Credits:** 4

This course is an introductory survey course in Forensic Sciences. The focus will be on the recognition, collection, preservation, and analysis of physical evidence related to crime scene investigations. Students will be presented with various state-of-the-art techniques utilized in the analysis of physical evidence, with the presumption that students do not necessarily have in-depth scientific or technical backgrounds (e.g., chemistry, biology and/or physics). The goal of this class will be to provide students with an understanding of what criminalistics entails and to prepare them for additional, more in-depth classes in criminalistics or forensic science. Special fee.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Biological Science GP 3B**BIOL 430 - Biology of the City****Credits:** 4

This course explores biological systems, functions, and interaction of organisms in an urban environment. Using the campus as our laboratory, the course will progress from exploring the effects of urbanization on biodiversity, biological responses to urbanization, urban forestry, urban agriculture, and conclude with topics in sustainable urban development and conservation. Students in the course will develop an understanding of ecological concepts, problems, and solutions to improving ecological systems of urban areas.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Biological Science GP 3B**BIOL 444A - Biotechnology and Society****Credits:** 4

The history and science of biotechnology and genetic engineering of bacteria, plants, and animals including humans. Applications of DNA technology, cloning and genetic engineering to agriculture, biomedicine, industrial products, and environmental problems. Discussion of economic, social, environmental, legal, and ethical issues related to the applications of biotechnology and genetic engineering. No credit for students who have completed BSCI 422 (UNHM).

**Attributes:** Environment,TechSociety(Disc); Technology GP 3T; Inquiry (Discovery)**BIOL 444B - Current Controversial Issues in Biology****Credits:** 4

An inquiry into current controversial issues in biology and their scientific and technical bases, but with an emphasis on exploring the various perspectives or beliefs related to each topic and their social and environmental implications.

**Attributes:** Biological Science(Discovery); Inquiry (Discovery)**BIOL 495 - Research Experience in Biological Sciences****Credits:** 1-2

Hands-on research experience for high school students and UNH freshmen under the supervision of a Biological Sciences faculty member. This independent-study course introduces students to the research process and requires them to undertake a research project that involves laboratory and/or field work. Before a student can register for the course, he/she must meet with a Biological Sciences faculty member who will serve as mentor and supervisor, and the two of them must have a formal agreement on the specific research activities that the student must carry out. Prereq: permission. May be repeated up to a maximum of 4 credits.

**BIOL 510 - Mushrooms, Molds, and Mildews: Introduction to the Fungal Kingdom****Credits:** 4

Fungi represent a diversity of both form and function and occupy nearly every habitat and niche on the planet. The fungi have been crucial in early and current scientific discovery as many species are used as model systems in biological sciences for the study of ecology, epidemiology, evolution, genetics, genomics, and physiology. Fungi occupy a number of important niches in natural and man made environments including: human, animal, insect, and plant pathogens, plant symbionts, organic matter decomposers, food source, antibiotic production, and are a crucial component of global nutrient cycling. The most recent use of fungi has been the identification of specific enzymes produced by fungi to degrade lignin substrates for the production of biofuels. This course will introduce students to the wonderful world of fungi in all their diversity and complexity.

**BIOL 520 - Our Changing Planet****Credits:** 4

Ecosystem interrelations and factors critical to maintain sustainability will be addressed in this course. Environmental issues such as water usage, pollution, and treatment; air and soil quality; fossil fuels and alternative energy sources will be presented. Not for credit if credit earned for ENE 520.

**Attributes:** Environment,TechSociety(Disc); Technology GP 3T**BIOL 528 - Applied Biostatistics I****Credits:** 4

Development of elementary statistical techniques through the analysis of prepared biological data. Continuous and discrete probability distributions, distributions of sample statistics, small-sample theory, regression, correlation, and analysis of variance. No credit for students who have completed ADM 430; ADMN 420; BIOL 555; EREC 525; HHS #540; MATH 439; MATH 539; MATH 644; PSYC 402; SOC 502.

**Attributes:** Quantitative Reasoning(Disc); Quantitative Reasoning GP 2**BIOL 541 - General Ecology****Credits:** 4

Physical and biological factors affecting distribution, abundance, and adaptations of organisms. Population, community, and ecosystem structure and function. Prereq: BIOL 411 and BIOL 412 or equivalent. Special fee. Lab. Writing intensive.

**Attributes:** Writing Intensive Course

**BIOL 544 - Your Genes, Your Life****Credits: 4**

This course explores societal, ethical, and legal issues surrounding the human genomics revolution, with a particular focus on biomedical questions. What will it mean to know your complete DNA sequence? If everyone's genome were included in a public database, how should that information be controlled and used? What, ultimately, do our genes encode? We will examine the basis of genetic inheritance, the interaction between genes and environment, and the types of genetic variation that occur between individuals and populations. In the medical realm, we will look at genetic and evolutionary processes underlying diseases such as cancer, and at the role of genomic technology in the drive toward personalized medicine. No credit for students who have completed Biology 404 or BIOL 444A. Writing intensive.

**Attributes:** Environment, TechSociety(Disc); Technology GP 3T; Inquiry (Discovery); Writing Intensive Course

**BIOL 555 - Experimental Design and Analysis Laboratory (EDAL)****Credits: 4**

Using hands-on laboratory based inquiry, the course explores the concepts that form the basis of statistical analysis and experimental design. Working in small teams, students examine variability in different types of measurement data and empirically derive probability distributions including Poisson, Chi-square, Normal, Student's t, and F distributions. An intuitive approach to data analysis and hypothesis testing provides students with a conceptual understanding of the basic and advanced statistical analyses including ANOVA, Linear, and Non-Linear Regression, Correlation, Goodness-of-fit, ANCOVA, and MANOVA. Students have an opportunity to become familiar with how these tests are implemented in several popular statistical software packages. The approach used in the course emphasizes development of analytical thinking skills and the application of conceptual understanding to solve new problems. Grading is based on participation in team projects, presentations, mastery of concepts and skills, and written reports. No credit for students who have completed ADM 430; ADMN 420; BIOL 528; EREC 525; HHS #540; MATH 439; MATH 539; MATH 644; PSYC 402; SOC 502.

**Attributes:** Quantitative Reasoning(Disc)

**BIOL 566 - Systematic Botany****Credits: 4**

Scientific basis of plant taxonomy and the identification and classification of major plant families, native trees, shrubs, and wild flowers. Field trips, plant collection. Prereq: BIOL 412 or BIOL 409. Lab. Special fee.

**BIOL 600 - Field Experience****Credits: 1-4**

A supervised experience providing the opportunity to apply academic experience in settings associated with future professional employment and/or related graduate opportunities. Must be approved by a faculty adviser selected by the student. May be repeated to a maximum of 8 credit hours. Prereq: permission. Cr/F.

**BIOL #601 - Biology of Plants****Credits: 4**

Structural and functional biology of the plant organism, with emphasis on land plants. Evolution of vegetative processes and sexual reproduction/ breeding systems. Plant adaptations to environmental challenges. Prereq: BIOL 411 and BIOL 412 or ZOOL 412.

**BIOL 695 - Biology Teaching Practices****Credits: 1-4**

Students assist in teaching labs in undergraduate biology courses supervised by the lab coordinator/instructor. Responsibilities include facilitating lab endeavors, giving a presentation, and writing a report. Prereq: permission. May be repeated to 4 credits maximum.

**BIOL 700 - Current and Controversial Issues in Biology****Credits: 4**

This course explores current issues in the biological sciences that are controversial and have a significant impact on individuals and society. Issues related to human population growth, evolution, cloning, synthetic biology, genetically modified organisms, free will, etc. Biology capstone. Only open to Animal Science, Plant Biology, Zoology, Neuroscience, Biology, Marine & Freshwater Biology, and Sust Agriculture & Food Systems majors.

**BIOL 701 - Plant Physiology****Credits: 5**

Structure-function relationship of plants, internal and external factors regulating plant growth and development, plant hormones, plant metabolism, water relations, and mineral nutrition. Prereq: BIOL 409 or SAFS 421 or BIOL 411 and BIOL 412; CHEM 403 and CHEM 404; PBIO 501 or equivalent.

**BIOL 702 - Techniques in Plant Physiology and Biochemistry****Credits: 4**

The course provides 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 for physiological and biochemical studies. The experiments deal with plant water relations, photosynthesis, plant hormones, enzyme kinetics, use of spectrophotometry, aseptic procedures, and liquid and thin-layer chromatography. Prereq: BIOL 411, BIOL 412 or permission of instructor. Special fee. Lab.

**BIOL 704 - Plant-Microbe Interactions****Credits: 3**

This course provides an overview of the molecular, cellular and biochemical factors underlying the interactions of plants with various microbes, including bacterial fungal, oomycete and viral pathogens, and mutualistic symbionts, such as mycorrhizal fungi and Rhizobium. Unifying themes underlying disease, resistance, and symbiosis are emphasized. Prereq: BIOL 411 and BIOL 412, BMS 503 and BMS 504 or GEN 604.

**BIOL 709 - Plant Stress Physiology****Credits: 3**

Physiological and biochemical mechanisms of plant responses to abiotic stresses, including drought, salt, high and low temperature, visible and ultra-violet radiation, heavy metals, and air pollutants. Current hypotheses, and agricultural and ecological implications are discussed. Prereq: plant physiology; biochemistry; or permission. (Offered alternate years.)

**BIOL 711 - Applied Biostatistics II****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 student's own thesis and dissertation research, allowing statistical problems to be addressed at various stages of the research process. Common computer packages used for analyses. Prereq: BIOL 528; permission.

**BIOL 713 - Biochemistry of Photosynthesis****Credits:** 4

Physiology and biochemistry of photosynthesis in higher plants and microorganisms: light reactions, electron transport, membrane structure and function, carbon assimilation pathways, energy conservation, and metabolic regulation. Agronomic and ecological aspects of photosynthesis are examined. Prereq: plant physiology or biochemistry (Not offered every year.) Special fee.

**BIOL 720 - Plant-Animal Interactions****Credits:** 4

This course will explore interactions between plants and animals and their evolutionary consequences on individual organisms as well as on ecological communities. Readings from the primary literature will serve as case studies to discuss hypotheses related to plant-animal interactions, the methods employed to test these hypotheses, and the conclusions drawn from these experiments. A weekly discussion session will be used as a grant-writing workshop, with activities designed to help students prepare an NSF-style grant as the culminating course project. Prereq: BIOL 411 and BIOL 412.

**BIOL 752 - Mycology****Credits:** 4

Classification, identification, culturing, life histories, and ecology of fungi, from slime molds to hallucinogenic mushrooms; the significance of fungi in human history, from their contributions to the art of bread making and alcoholic fermentation to their destructiveness as agents of deadly diseases of plants and animals. Prereq: BIOL 411 and BIOL 412 or BIOL 409 or equivalent. Special fee. Lab.

**BIOL 758 - Plant Anatomy****Credits:** 5

Anatomy of vascular plants, emphasizing structure and development of basic cell and tissue types, and of the major plant organs. Prereq: BIOL 412 or BIOL 409. Lab. Special fee. (Not offered every year.)

**BIOL 795 - Independent Investigations****Credits:** 1-4

Topics may include teaching practicum in a biological science supervised by a biology faculty member (permission required); research practicum in a biological science supervised by a biology faculty member (permission required); or special topics of current interest in biology. Lecture-discussion format. Prereq: 12 credits of biology or permission. May be repeated to 4 credits.

**BIOL 795W - Independent Investigations****Credits:** 1-4

Topics may include teaching practicum in a biological science supervised by a biology faculty member (permission required); research practicum in a biological science supervised by a biology faculty member (permission required); or special topics of current interest in biology. Lecture-discussion format. Prereq: 12 credits of biology or permission. May be repeated to 4 credits. Writing intensive.

**Attributes:** Writing Intensive Course**BIOL 799 - Honors Senior Thesis****Credits:** 2-8

Independent research requiring a written proposal, a thesis, and a presentation of research results to an audience of faculty and/or students. Intended for biology majors completing biology honors-in-major requirements. Contact biology program coordinator prior to senior year to arrange supervision and obtain permission. 2 consecutive semesters. (4 credit minimum total; 8 credits maximum.) Writing intensive.

**Attributes:** Writing Intensive Course**BIOL 801 - Plant Physiology****Credits:** 5

Structure-function relationship of plants, internal and external factors regulating plant growth and development, plant hormones, plant metabolism, water relations, and mineral nutrition. Prereq: introductory botany or concepts of plant growth; one year of college chemistry (e.g., general chemistry); organic chemistry or basic chemistry; or permission.

**BIOL 802 - Techniques in Plant Physiology and Biochemistry****Credits:** 4

The course provides 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 for physiological and biochemical studies. The experiments deal with plant water relations, photosynthesis, plant hormones, enzyme kinetics, using spectrophotometry, aseptic procedures, and liquid and thin-layer chromatography. Prereq: BIOL 411 and BIOL 412 or permission of instructor. Special fee.

**BIOL 804 - Plant-Microbe Interactions****Credits:** 3

This course provides an overview of the molecular, cellular and biochemical factors underlying the interactions of plants with various microbes, including bacterial fungal, oomycete and viral pathogens, and mutualistic symbionts, such as mycorrhizal fungi and rhizobium. Unifying themes underlying disease, resistance, and symbiosis are emphasized. Prereq: BIOL 411 and BIOL 412, BMS 503 and BMS 504 or GEN 604.

**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. Prereq: Cell biology, chemistry, biochemistry.

**BIOL 809 - Plant Stress Physiology****Credits:** 3

Examines the physiological and biochemical mechanisms of plant response to abiotic stresses including drought, salt, high and low temperature, visible and ultraviolet radiation, heavy metals, and air pollutants. Discusses current hypotheses, agricultural and ecological implications. Prereq: plant physiology; biochemistry; or permission.

**BIOL 811 - Applied Biostatistics II****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 student's own thesis and dissertation research, allowing statistical problems to be addressed at various stages of the research process. Common computer packages used for analyses. Prereq: BIOL 528; permission.

**BIOL 813 - Biochemistry of Photosynthesis****Credits:** 4

The physiology and biochemistry of photosynthesis in higher plants and microorganisms: light reactions, electron transport, membrane structure and function, carbon assimilation pathways, energy conservation, and metabolic regulation. Agronomic and ecological aspects of photosynthesis are examined. Prereq: plant physiology or biochemistry. (Not offered every year.)

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

This course will explore interactions between plants and animals and their evolutionary consequences on individual organisms as well as on ecological communities. Readings from the primary literature will serve as case studies to discuss hypotheses related to plant-animal interactions, the methods employed to test these hypotheses, and the conclusions drawn from these experiments. A weekly discussion session will be used as a grant-writing workshop, with activities designed to help students prepare an NSF-style grant as the culminating course project. Prereq: BIOL 411 and BIOL 412.

**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.

**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.

**BIOL 852 - Mycology****Credits:** 4

Classification, identification, culturing, life histories, and ecology of fungi, from slime molds to hallucinogenic mushrooms; the significance of fungi in human history, from their contribution to the art of bread making and alcoholic fermentation to their destructiveness as agents of deadly diseases of plants and animals. Prereq: principles of biology I, II or introduction to botany, or equivalent. Special fee. Lab.

**BIOL 858 - Plant Anatomy****Credits:** 5

Anatomy of vascular plants from a functional/developmental point of view with emphasis on Angiosperms. Basic cell and tissue structure of plant organs will be covered as well as the importance of chaos, fractals, scaling, mechanical stress and environmental factors in determining the role anatomy plays in the biology of plants. Prereq: principles of biology or introductory botany. Lab. Special fee. (Not offered every year.)

**BIOL 895 - Biology Special Investigations****Credits:** 1-4**BIOL 899 - Master's Thesis****Credits:** 1-10

Master's thesis research. May be repeated up to 10 credits. Cr/F.

**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.

**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.

**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.

**BIOL 933 - Design, Analysis, and Interpretation of Experiments****Credits:** 4

Through in-depth consideration of common general linear models used in the analysis of variance, this course introduces graduate students to the fundamental concepts and statistical methods necessary to plan, conduct, and interpret effective experiments. The course provides an opportunity for graduate students to receive critical input on the experimental design and analysis of their individual graduate research projects. All analysis is conducted using the open-source package R; no previous coding experience is required.

**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.

**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.

**BIOL 999 - Doctoral Dissertation Research**

**Credits:** 0

Doctoral dissertation research. Cr/F.

## Faculty

<http://colsa.unh.edu/faculty/all>