

# BIOLOGY (BIOL)

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

## BIOL 400 - Professional Perspectives on Biology

**Credits:** 1

Where can a degree in biology take me? This course views the scope of biology and explores professional opportunities for biological science majors. Guest speakers from on- and off-campus present seminars and lead discussions on contemporary issues in biology. This course will help you learn the skills required to succeed in biology and develop strategies for college success. Today, the field is multidimensional, offering many career opportunities for the future. Required for all first semester biology majors.

**Grade Mode:** Credit/Fail Grading

## BIOL 402 - Biology in our Daily Lives

**Credits:** 4

Students will learn about the nature and practice of science as it relates to biology, and the ways in which our activities have a biological impact on the world around us. Throughout the course, the students will examine the biological messages with which we are constantly bombarded, and by linking background scientific principles to those messages, practice distinguishing science from pseudoscience.

**Attributes:** Biological Science(Discovery)

**Grade Mode:** Letter Grading

## BIOL 408 - Plants and Civilization

**Credits:** 4

Global experience of human interactions with plants, and the ways in which plants have contributed to the development and the flourishing of human societies. Includes role of plants in providing sustenance, clothing and shelter, quest for spices, 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.

**Attributes:** Biological Science(Discovery); Discovery Lab Course

**Equivalent(s):** PBIO 400

**Grade Mode:** Letter Grading

**Special Fee:** Yes

## BIOL 409 - Green Life: Introducing the Botanical Sciences

**Credits:** 0 or 4

All human and other animal life on earth depends upon green life: i.s., the plant world. In its diverse forms, green life is the ultimate source of our food, and of the atmospheric breath of life: oxygen. This course explores the structure, function, growth, reproduction, and remarkable evolutionary diversity of plants in their natural and human-influenced environments. Lab.

**Attributes:** Biological Science(Discovery); Discovery Lab Course

**Equivalent(s):** BOT 412, PBIO 412

**Grade Mode:** Letter Grading

**Special Fee:** Yes

## 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).

**Attributes:** Biological Science(Discovery)

**Grade Mode:** Letter Grading

## BIOL 411 - Introductory Biology: Molecular and Cellular

**Credits:** 0 or 4

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

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

**Equivalent(s):** BIOL #411H

**Mutual Exclusion:** No credit for students who have taken BIOL 413.

**Grade Mode:** Letter Grading

**Special Fee:** Yes

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

**Credits:** 0 or 4

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

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Honors course; Inquiry (Discovery)

**Equivalent(s):** BIOL 411

**Mutual Exclusion:** No credit for students who have taken BIOL 413.

**Grade Mode:** Letter Grading

**Special Fee:** Yes

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

**Credits:** 0 or 4

Evolution is the paradigm through which we understand Biology. This course will introduce students to evolutionary concepts that underlie the tremendous biodiversity present on Earth, and explore the ecological interactions that occur among individuals and species. Indoor and outdoor lab activities. Required for majors in the biological sciences. Students are not permitted to enroll in BIOL 411 and BIOL 412 in the same semester. Lab.

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

**Equivalent(s):** BIOL 412H

**Mutual Exclusion:** No credit for students who have taken BIOL 414.

**Grade Mode:** Letter Grading

**Special Fee:** Yes

**BIOL 412H - Honors/Introductory Biology: Evolution, Biodiversity, and Ecology Laboratory****Credits:** 0 or 4

Evolution is the paradigm through which we understand Biology. This course will introduce students to evolutionary concepts that underlie the tremendous biodiversity present on Earth, and explore the ecological interactions that occur among individuals and species. Indoor and outdoor lab activities. Required for majors in the biological sciences. Students are not permitted to enroll in BIOL 411 and BIOL 412 in the same semester. Lab.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Honors course; Inquiry (Discovery)**Equivalent(s):** BIOL 412**Mutual Exclusion:** No credit for students who have taken BIOL 414.**Grade Mode:** Letter Grading**Special Fee:** Yes**BIOL 413 - Principles of Biology I****Credits:** 0 or 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. Lab.

**Attributes:** Biological Science(Discovery); Discovery Lab Course; Inquiry (Discovery)**Mutual Exclusion:** No credit for students who have taken BIOL 411, BIOL #411H.**Grade Mode:** Letter Grading**Special Fee:** Yes**BIOL 414 - Principles of Biology II****Credits:** 0 or 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. Lab.

**Attributes:** Biological Science(Discovery); Discovery Lab Course**Mutual Exclusion:** No credit for students who have taken BIOL 412, BIOL 412H.**Grade Mode:** Letter Grading**Special Fee:** Yes**BIOL 420 - Introduction to Forensic Sciences****Credits:** 0 or 4

Explore the forensic sciences! How do you collect, preserve, and analyze evidence related to a crime scene investigation? Hear from the experts and apply scientific principles and techniques in laboratory exercises that follow a crime scene scenario. 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.

**Attributes:** Biological Science(Discovery); Discovery Lab Course**Grade Mode:** Letter Grading**Special Fee:** Yes**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**Grade Mode:** Letter Grading**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.

**Attributes:** Environment,TechSociety(Disc); Inquiry (Discovery)**Mutual Exclusion:** No credit for students who have taken BIOL 422, BSCI 422.**Grade Mode:** Letter Grading**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)**Grade Mode:** Letter Grading**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.

**Repeat Rule:** May be repeated for a maximum of 4 credits.**Grade Mode:** Letter Grading**BIOL 510 - Mushrooms, Molds, and Mildews: Introduction to the Fungal Kingdom****Credits:** 4

Fungi are a fascinating group of organisms that occupy nearly every habitat on the planet. We encounter fungi in everyday life from the dangerous to the delicious. This course is a fun, approachable introduction to the world of fungi. Students will learn about the role fungi play in human society, review basic concepts of fungal biology and discuss important issues of our time: how we use fungi to make medicines, how fungi feed us, how plant diseases and food spoilage affect food supply, and how fungi contribute to ecosystem functioning.

**Grade Mode:** Letter Grading

**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)**Equivalent(s):** CIE 520, ENCV 520, ENE 520**Grade Mode:** Letter Grading**BIOL 528 - Applied Biostatistics I****Credits:** 4

Knowledge of biostatistics is essential to understanding our observations of life on Earth and properly design and conduct scientific research. Students develop skills in organizing data and performing, presenting, and interpreting statistical analyses. Theoretical concepts are applied using statistical software(s) and prepared biological data. Topics include descriptive statistics, continuous and discrete probability distributions, inferential statistics, confidence intervals, hypothesis testing for a difference of means and proportions, linear regression, non-parametric hypothesis testing, and graphing.

**Attributes:** Quantitative Reasoning(Disc)

**Mutual Exclusion:** No credit for students who have taken ADM 430, ADMN 420, ADMN 510, EREC 525, HHS 540, MATH 439, MATH 539, MATH 644, PSYC 402, PSYC 402H, SOC 402, SOC #402H, SOC 502, SOC 502H.

**Grade Mode:** Letter Grading**BIOL 541W - Ecology****Credits:** 0 or 4

Physical and biological factors affecting distribution, abundance, and adaptations of organisms. Population, community, and ecosystem structure and function. Lab.

**Attributes:** Writing Intensive Course

**Prerequisite(s):** (BIOL 411 with a minimum grade of D- or BIOL #411H with a minimum grade of D- or BIOL 413 with a minimum grade of D- or NR 439 with a minimum grade of D-) and (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-).

**Equivalent(s):** BIOL 541**Grade Mode:** Letter Grading**Special Fee:** Yes**BIOL #550 - Mushroom Madness****Credits:** 3

An intensive 2-week summer field and lab course that emphasizes the identification of mushrooms and other macrofungi that occur in New England forests. The role of mycorrhizal fungi, decomposers, and pathogens in forest ecosystems will be examined. Recent changes in our understanding of the evolution and systematics of macrofungi will be explored. Collecting trips to the White Mountain National Forest, NH and Massachusetts state and town forests will be followed by lab identification sessions that utilize traditional methods (microscopy, spore prints, staining reactions) as well as modern molecular techniques (DNA barcoding, RFLP). Smart phone apps will be used for recording field notes and images, and for uploading observations to on-line repositories (iNaturalist and MushroomObserver). One overnight field trip will be scheduled.

**Grade Mode:** Letter Grading**Special Fee:** Yes**BIOL 566 - Systematic Botany****Credits:** 0 or 4

Scientific basis of plant taxonomy and the identification and classification of major plant families, native trees, shrubs, and wildflowers. Field trips, plant collection. Lab.

**Prerequisite(s):** (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D- or BIOL 409 with a minimum grade of D-).

**Equivalent(s):** PBIO 566**Grade Mode:** Letter Grading**Special Fee:** Yes**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.

**Repeat Rule:** May be repeated for a maximum of 8 credits.**Grade Mode:** Credit/Fail Grading**BIOL 601 - Biology and Ecology of Plants****Credits:** 4

Because plants can't move, they have evolved extraordinary adaptations that allow them to inhabit a wide variety of environments and respond to environmental changes. This course introduces students to these adaptations by focusing on how the relationship between plants and their environment has influenced their morphology, physiology, community structure, and distribution. Emphasis is on terrestrial plants. Labs will be field-based. Lab.

**Prerequisite(s):** (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-).

**Grade Mode:** Letter Grading**BIOL 633 - Data Analysis for Life Science****Credits:** 4

Expand your statistical knowledge and resume by learning R. Use project-based learning to explore topics such as inequalities of life expectancy, heart disease and risk behaviors, biomagnification of ecotoxins, and impacts of ticks on wildlife populations while learning statistical skills and R. In this course students will learn to become proficient in R (data manipulation, graphing, hypothesis testing, importing and cleaning data) and learn to effectively communicate statistical results.

**Grade Mode:** Letter Grading**BIOL #675 - Medical Botany****Credits:** 4

This course is an integrated study of the medical, psychoactive, and poisonous plants, their active constituents their physiological effects on people, their mode of action and their role in historical and current medical practice. Emphasis is placed on the impact that plants have on human health. Students will take an active role in class, and will develop their own knowledge of medicinal plants through guided discussions and in-class group activities.

**Prerequisite(s):** (BIOL 411 with a minimum grade of D- or BIOL #411H with a minimum grade of D- or BIOL 413 with a minimum grade of D-) and (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-).

**Grade Mode:** Letter Grading

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

Students assist instructor in biology course labs. Responsibilities may include assisting instructors with field trips, lab set-up and clean-up, helping students during lab and field exercises, presenting material, and creating a project that enhances the curriculum. You may be expected to present material or create a project that enhances the curriculum. This course is by invitation only.

**Repeat Rule:** May be repeated for a maximum of 4 credits.**Equivalent(s):** BSCI 695**Grade Mode:** Letter Grading**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, Zoology, Neuroscience and Behavior, Biology, Marine & Freshwater Biology, and Sust Agriculture & Food Systems majors.

**Grade Mode:** Letter Grading**BIOL 701 - 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.

**Prerequisite(s):** (SAFS 421 with a minimum grade of D- or BIOL 409 with a minimum grade of D- or BIOL 411 with a minimum grade of D- or BIOL #411H with a minimum grade of D- or BIOL 413 with a minimum grade of D-) and (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-) and (CHEM 411 with a minimum grade of D- or CHEM 403 with a minimum grade of D-).

**Grade Mode:** Letter Grading**BIOL 704 - 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.

**Prerequisite(s):** (BIOL 411 with a minimum grade of D- or BIOL #411H with a minimum grade of D- or BIOL 413 with a minimum grade of D-) and (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-) and (GEN 604 with a minimum grade of D- or (BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-)).

**Grade Mode:** Letter Grading**BIOL 706 - 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 709 - 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):** PBIOL 709**Grade Mode:** Letter Grading**BIOL 711 - 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 714W - 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. 58 hours of Undergrad Coursework, including advanced study in at least one specified area required.

**Attributes:** Writing Intensive Course**Equivalent(s):** BIOL 714**Grade Mode:** Letter Grading**BIOL 720 - 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.

**Prerequisite(s):** (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-).

**Grade Mode:** Letter Grading

**BIOL 752 - 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.

**Prerequisite(s):** ((BIOL 411 with a minimum grade of D- or BIOL #411H with a minimum grade of D- or BIOL 413 with a minimum grade of D-) or (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-)) or BIOL 409 with a minimum grade of D-.

**Equivalent(s):** BOT 752, PBIO 752

**Grade Mode:** Letter Grading

**Special Fee:** Yes

**BIOL 770 - Senior Seminar in Biology****Credits:** 2

Explore and synthesize your undergraduate biological knowledge and skills through an integrated outlook at a topic relating to your professional future. Each semester revolves around a different overarching topic on which students read assigned topical papers, prepare critical analyses, and give presentations to the class.

**Grade Mode:** Letter Grading

**BIOL 780 - Capstone Companion Course****Credits:** 1

This course is the required companion course to a student's individual capstone experience. It must be taken during the same semester as the individual experience, or in the fall immediately following a summer experience. This course will help connect a student's individual capstone experience to their broader academic program, and will be a forum for sharing individual experiences with peers. Thesis students should enroll in BIOL 780 during the second semester of the thesis. Should also be taken with a pre-approved individual capstone experience.

**Grade Mode:** Credit/Fail Grading

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

Independent study in a topic related to Biology, arranged by the student with a faculty sponsor. Enrollment by permission only.

**Repeat Rule:** May be repeated for a maximum of 8 credits. May be repeated up to 5 times.

**Equivalent(s):** BIOL 795W

**Grade Mode:** Letter Grading

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

Topics may include teaching or research practicum in a biological science, supervised by a faculty member.

**Attributes:** Writing Intensive Course

**Repeat Rule:** May be repeated for a maximum of 4 credits.

**Equivalent(s):** BIOL 795

**Grade Mode:** Letter Grading

**BIOL 799H - Honors Senior Thesis****Credits:** 2-8

Independent research requiring a written proposal, a thesis, and a final public presentation (e.g. the Undergraduate Research Conference). Intended for biology majors completing biology Honors-in-major requirements. Contact biology program coordinator prior to senior year to arrange supervision and obtain permission. Two consecutive semesters. (4 credit minimum total; 8 credits maximum).

**Attributes:** Honors course; Writing Intensive Course

**Repeat Rule:** May be repeated for a maximum of 8 credits.

**Equivalent(s):** BIOL 799

**Grade Mode:** Letter Grading