

BIOLOGY MAJOR (B.S.)

<https://colsa.unh.edu/biological-sciences/program/bs/biology-major>

Description

Biology is one of the most popular science majors since it provides a broad background in the biological sciences while allowing flexibility and specialization within the major. It integrates theoretical and practical (hands-on laboratory and field work) courses in different aspects of the biology of multicellular life. It encompasses the study of structural and functional relationships of living organisms at the molecular, cellular, and organismal level, the interactions of living systems with the environment and with each other, and the evolutionary relationships of life. Our goal is to create an environment for those with a scholarly interest in the biological sciences, and to extend their understanding, awareness, and appreciation of the diversity inherent in the biological sciences. Our major is aimed at promoting an excellent education in biological sciences by involving undergraduate students in a strong interaction with faculty both in the classroom and in research laboratories.

The biology major prepares students for post graduate degrees in the biological and medical fields, and for job opportunities in industry (environmental, biomedical, pharmaceutical, and biotechnological) and governmental research, and secondary school teaching. Completion of the four-year undergraduate program plus a fifth-year internship will be necessary for biology teaching certification. Students who plan to enter medical, dental, or related professional schools are advised to confer with their faculty adviser to work the requirements for these programs into their academic majors.

Core courses in the biology major are from departments that contribute to the biological sciences community at UNH. The core curriculum consists of introductory and upper-level science courses plus seven additional courses in the biological sciences; three of these must be selected from course lists in three broad categories.

While students are advised to declare the biology major as incoming first-year students to assure adequate program planning, transfer into this major at a later stage is also possible. Several of the other biological science majors share the same biology core curriculum. For the first to two years, it is quite easy to change to or from these other majors.

Requirements

Biology Core Curriculum

The biology courses in the core curriculum constitute an integrated sequence that train students in the basic skills and concepts of knowledge inherent to the biological sciences. The biology core allows a student to obtain a broad background in biology, and in the related physical sciences and math that provide a foundation for success in understanding biological principals.

Code	Title	Credits
Core Curriculum Courses		
BIOL 400	Professional Perspectives on Biology ¹	1
BIOL 412	Introductory Biology: Evolution, Biodiversity and Ecology	4
BIOL 411	Introductory Biology: Molecular and Cellular	4
BIOL 541	Ecology	4
BMS 503 & BMS 504	General Microbiology and General Microbiology Laboratory	5

GEN 604	Principles of Genetics	4
CHEM 403 & CHEM 404	General Chemistry I and General Chemistry II	8
MATH 424B or MATH 425	Calculus for Life Sciences Calculus I	4
BIOL 528	Applied Biostatistics I	4
PHYS 401 & PHYS 402	Introduction to Physics I and Introduction to Physics II	8
CHEM 545 & CHEM 546	Organic Chemistry and Organic Chemistry Laboratory ²	5
BMCB 658 & BMCB 659	General Biochemistry and General Biochemistry Lab	5
BIOL 780	Capstone Companion Course	1
Total Credits		57

- 1 BIOL 400 Professional Perspectives on Biology is required only for first-year biology majors.
- 2 Students exploring pre-health professions should take a full year of Organic Chemistry (CHEM 651/CHEM 653 and CHEM 652/CHEM 654).

Biology Electives

In addition to the biology core curriculum, students must complete seven biology elective courses. One course must be taken from each of the three categories/disciplines; the other four electives can be chosen from the category lists or can be any other biological sciences course with approval of the student's adviser. At least two of these courses must have labs. All courses must be 500-level or above. There must be one animal-identified course (A) and one plant/fungal/algae course (FP). One capstone experience is required of all seniors; see subsequent section on capstones for detailed requirements. Corequisite lecture and lab courses count as one course.

Code	Title	Credits
Category 1: Form and Function (Morphology, Anatomy and Physiology)		
ANSC 511	Anatomy and Physiology (A)	4
ANSC 512	Anatomy and Physiology (A)	4
ANSC 701	Physiology of Reproduction (A)	4
BIOL 701	Plant Physiology (FP)	4
BIOL #702	Lab Techniques in Plant Physiology and Biochemistry (FP)	4
BIOL 709	Plant Stress Physiology (FP)	3
BMS 507	Human Anatomy and Physiology I (A)	4
BMS 508	Human Anatomy and Physiology II (A)	4
BMS 702	Endocrinology (A)	4
BMS 718	Mammalian Physiology (A)	4
MEFB 628	Marine Invertebrate Evolution and Ecology (A)	5
NR 625	Physiological Ecology	4
ZOOL 518	Comparative Morphology and Biology of Vertebrates (A)	4
ZOOL 625	Principles of Animal Physiology (A, ZOOL 626 Lab optional)	3
MEFB 773	Physiology of Fishes (A)	4
ZOOL 777	Neuroethology (A, C)	4
MEFB 754	Anatomy and Function of Marine Vertebrates (SML, A)	4
Category 2: Genetics/Development (including molecular biology and bioinformatics)		
ANSC 612	Genetics of Domestic Animals (A)	4
BMCB 605	Principles of Cell Biology	4
GEN 704	Genetics of Prokaryotic Microbes	5
GEN 705	Population Genetics (GEN 725 lab optional)	3
GEN 706	Human Genetics (A)	4
GEN 711	Genomics and Bioinformatics	4
GEN 721	Comparative Genomics	4
GEN 771	Molecular Genetics	4
GEN 772	Evolutionary Genetics of Plants (FP)	4
GEN 774	Techniques in Plant Genetic Engineering and Biotechnology (FP)	4
NSB 705	Molecular and Cellular Neurobiology (A, C)	4
ZOOL 529	Developmental Biology (A)	4
ZOOL 736	Genes and Behavior (A, C)	4

Category 3: Evolution, Ecology and Biodiversity (including population biology)

BIOL 510	Mushrooms, Molds, and Mildews: Introduction to the Fungal Kingdom (FP)	4
BIOL 550	Mushroom Madness (FP)	3
BIOL 566	Systematic Botany (FP)	4
BIOL 601	Biology and Ecology of Plants (FP)	4
BIOL 704	Plant-Microbe Interactions (FP)	3
BIOL 720	Plant-Animal Interactions (FP, C)	4
BIOL 752	New England Mushrooms: a Field and Lab Exploration (FP)	4
GEN 715	Molecular Evolution	4
MEFB 510	Field Ornithology (SML, A)	4
MEFB 530	Evolution and Marine Diversity (SML)	4
MEFB 625	Introduction to Marine Botany (FP)	5
MEFB 630	Biodiversity and Biology of Marine Invertebrates (SML, A)	4
MEFB 674	Ecology and Marine Environment (SML)	4
MEFB 714	Field Animal Behavior (SML, A)	4
MEFB 717	Lake Ecology	4
MEFB 725	Marine Ecology	4
MEFB 747	Aquatic Plants in Restoration/Management (FP, C)	4
NR 506	Forest Entomology (A)	4
NR 642	Introduction to Biogeography	4
NR 660	Ecology and Biogeography of New Zealand	5
NR 663	Applied Directed Research in New Zealand	4
NR 712	Mammalogy (A)	4
NR 713	Quantitative Ecology	4
NR 765	Community Ecology	4
SAFS 651	Plant Pathology (FP)	4
ZOOL 542	Ornithology (A)	4
ZOOL 555	Introduction to Entomology (A)	4
ZOOL 613	Animal Behavior (A)	5
ZOOL 690	Evolution	4
ZOOL 708	Stream Ecology	4
ZOOL 710	Sharks and Bony Fishes (A)	4
ZOOL 726	Conservation Behavior (A)	4
ZOOL 733	Behavioral Ecology (A, C)	4
Other Elective Options		
BIOL 633	Data Analysis for Life Science	4
BIOL 675	Medical Botany (FP)	4
BIOL 700	Current and Controversial Issues in Biology (C)	4
BIOL 711	Experimental Design & Analysis	4
BIOL 770	Senior Capstone in Biology (C)	2
BMCB 753	Cell Culture	5
BMCB 760	Pharmacology	4
BMS 602	Pathogenic Microbiology	5
& BMS 603	and Pathogenic Microbiology Laboratory	
BMS 655	Human and Animal Parasites (A)	3
BMS 703	Infectious Disease and Health	4
BMS 706	Virology	5
& BMS 708	and Virology Laboratory	
BMS 711	Toxicology	4
HMP 501	Epidemiology and Community Medicine	4
MEFB 631	Ecotoxicology and Quantitative Reasoning	4
MEFB 741	Sharks: Biology and Conservation (A)	4
MEFB 755	Biological Oceanography (C)	4
NSB 727	Animal Communication (A, C)	4
NSB 728	Research Methods in Animal Behavior (A)	4
PSYC 531	Psychobiology	4
PSYC 716	Cognitive Neuroscience	4
PSYC 731	Brain and Behavior	4
PSYC 733	Drugs and Behavior	4
PSYC 737	Behavioral Medicine	4
SAFS 651	Plant Pathology (P)	4
TECH 797	Undergraduate Ocean Research Project (A, C)	2
ZOOL 610	Principles of Aquaculture	4

Note: It is strongly recommended that students participate in an exchange semester at another university, or in a field-oriented program or internship. There are many exchange opportunities available in which a full semester of credits toward the major may be earned. It is

further recommended that students explore possibilities of one or more semesters of independent investigation (research projects). For details, students should contact their adviser. Financial support is available for most of these programs. In addition, students can explore the courses at the Shoals Marine Laboratory (SML), which provides an excellent setting for several "field-oriented" courses during the summer. Often there is financial support available for the SML programs. (See the SML website at <https://marine.unh.edu/SML> or the Cornell website at <http://www.shoalsmarinelaboratory.org> for details.)

A 600, 695, 795, or 799 experience may substitute for one elective in any category with academic advisor approval, but only if taken for at least four credits. These four credits may be spread over multiple semesters if they are consecutive and with the same faculty mentor.

Academic Requirements

To receive the B.S. degree in biology, students must complete 128 credit hours with at least a 2.0 cumulative grade-point average for completion of the degree. All UNH Discovery Program requirements, biology core curriculum requirements, plus seven additional courses from the biological sciences, and a capstone experience (see below). A minimum grade of C- is required in all biological science courses that are counted toward the requirements for a degree in biology. Students who expect to compete successfully for post-baccalaureate programs should attain a cumulative GPA of 3.0 or higher by the end of the sophomore year and maintain it at that level.

Capstone Experience

As part of the University of New Hampshire's Discovery Program requirements, all students must complete a capstone experience during their senior year (after earning at least 90 credits). **The capstone experience for students majoring in Biology consists of BOTH (1) an approved individual experience AND (2) the successful completion of the BIOL 780 Capstone Companion Course.** Students will not be approved for graduation until capstone certification has been granted.

1) The individual experience

The individual experience may be satisfied through various forms of experiential learning (e.g., Honors thesis, mentored research project, internship) or a course denoted with a "(C)" in the courses listed above. The individual experience must fulfill **at least one** of the University's capstone criteria:

- synthesizes and applies disciplinary knowledge and skills
- fosters reflection on undergraduate learning and experience
- demonstrates emerging professional competencies
- applies, analyzes, and/or interprets research, data, or artistic expression
- explores areas of interest based on the integration of the prior learning

Before beginning any capstone individual experience, students MUST SUBMIT A COMPLETED CAPSTONE APPROVAL FORM to their Program Coordinator.

Students can obtain this form on the Department's Capstone page or from their Program Coordinator. Here they will describe their proposed individual experience and how it fulfills at least one of the University's capstone criteria listed above. If the student is selecting a "C" course for their individual experience, they should obtain the course syllabus from

the instructor for information about the course's content and learning objectives.

2) Enrollment in BIOL 780

Students will also be required to enroll in BIOL 780 Capstone Companion Course (1 cr.) **during the semester of their individual experience**. BIOL 780 is offered every Fall and Spring semester.

- If the individual experience is a two-semester thesis, BIOL 780 should be taken during the second semester.
- If the individual experience occurs during the summer (e.g., internship), BIOL 780 should be taken during the Fall semester that immediately follows.
- Note: Because BIOL 780 is not offered during the summer, students cannot complete their individual experience during the summer *and graduate during that same August*. Summer experiences could only be used as individual capstone experiences if completed the summer before the student's senior year.

Student Learning Outcomes

- Students demonstrate that they understand basic principles of biology. Demonstrate a fundamental understanding of the relationships between structure, function, and process at the level of molecular, cellular, and organismal levels. Describe the principles and mechanisms of organismal evolution and genetics as the central unifying and explanatory concepts of biology. Explain the relationship between organisms and their physical, chemical, and biological environments. Explain what biodiversity is, its value in ecosystems, and the need for its conservation.
- Students demonstrate that they can undertake scientifically valid methods of inquiry. Demonstrate proficiency in searching, reading, and understanding scientific literature. Apply the scientific process, including the framework of initiation, designing, and conducting experiments, and the appropriate analysis and discussion based on the data gathered. Exhibit technical skills in the use of appropriate laboratory and field techniques commonly used in biology.
- Students demonstrate that they can think critically and analytically. Demonstrate an ability to critically and objectively evaluate data, develop hypotheses, interpret and or design biological experiments and studies.
- Students demonstrate that they can communicate effectively. Communicate scientific material effectively in written and oral formats.
- Students practice science responsibly and ethically, and acknowledge the influence of cultural and historical biases in the sciences.