**BIOLOGICAL SCIENCES**

Explore the living world through hands-on experience in the lab and in the field

Discover the inner workings of living organisms from molecules to ecosystems in our Biological Sciences program. As our largest and most popular major, the Biological Sciences program is designed to give you the degree you want — through self-designed concentrations, independent study, research projects, internships, job shadows, study abroad, and more.

You’ll work with faculty mentors to customize your degree around your interests, allowing you to focus your learning in these diverse areas of study:

- Biology Teaching
- Ecology
- Genomics
- Microbiology
- Pre-Professional Health (Dental, Medical, Optometry, Pharmacy, Physician Assistant, Physical/Occupational Therapy, Veterinary, etc.)

All students, in consultation with their faculty advisor, develop a self-designed concentration where they select a group of upper-level courses that represent their interest.

Research is central to this program, empowering you to explore, question and invent. Side-by-side with your classmates and professors, you’ll conduct experiments in our state-of-the-art labs: general biology, advanced biology, microbiology, general chemistry and organic chemistry, as well as the cell culture research lab and microbiology research lab.

You’ll also have the opportunity to apply your skills in the real world through experiential learning, including:

- robust job shadows at the Elliot Hospital Laboratory and other local medical facilities
- internships at Manchester Water Works, ARMI (Advanced Regenerative Manufacturing Institute), and other biotechnology firms in the Millyard
- summer research courses at Shoals Marine Laboratory
- study away opportunities such as investigating biological diversity in Belize or microbial ecology in Iceland

Through diverse areas of study, faculty experts and hands-on experience, you’ll be prepared for success in graduate, medical or professional studies, and careers in industries from healthcare to agriculture to education.

[https://manchester.unh.edu/academics/degree-programs/biological-sciences](https://manchester.unh.edu/academics/degree-programs/biological-sciences)

### Programs

- Biological Sciences (A.S.)
- Biological Sciences Major (B.A.)
- Biological Sciences Minor

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### Courses

#### Biological Science (BSCI)

**BSCI 405 - Diversity of Life**

Credits: 4  
Survey of ecology, evolution, genetics, and the diversity of life. Emphasis on basic biological principles. For non-biological science majors. Lecture and lab. Cannot be taken for credit after completion of BIOL 411, BIOL 413, or equivalent. No credit for students who have completed BIOL 405. Special fee. Lab.  
Attributes: Biological Science(Discovery); Discovery Lab Course  
Equivalent(s): BIOL 405

**BSCI 406 - Human Organism**

Credits: 4  
Survey of biological chemistry, molecular and cell biology, and major plant and animal systems. Emphasis on basic biological principles. For non-biological science majors. Lecture and Lab. Cannot be taken for credit after completion of BIOL 412,BIOL 414, or equivalent. No credit for students who have completed BIOL 406. Special fee. Lab.  
Attributes: Biological Science(Discovery); Discovery Lab Course  
Equivalent(s): BIOL 406

**BSCI 410 - Contemporary Health Issues**  
Credits: 4  
This course exposes students to the three major dimensions of health - physical, emotional, and social. Nutrition, infectious diseases, substance abuse and addiction, mental health, sexual health, aging and stress management are among the issues that will be discussed. Students will learn to intelligently relate health knowledge to the social issues of the day.  
Attributes: Biological Science(Discovery)

**BSCI 415 - Millyard Scholar Academic Skills and Planning Seminar**  
Credits: 2  
Through in-class activities, workshops and guest speakers, students in the Millyard Scholars Program will explore career paths, and develop resources and skills for academic success. All student work, planning and experiences will be showcased in a digital portfolio.

**BSCI 418 - Phage Bioinformatics Lab**  
Credits: 2  
In the course, students undertake a hands-on undergraduate research experience to describe, document, and publish the discovery of new bacteriophages (bacterial viruses). In doing so, students will elucidate how the genome codes biological information. The aim of the course is for students to develop further research and computational analysis skills while preparing to publish their scientific discoveries. The course will focus on research data analysis and presentation of research data to scientists and the public. Permission required.

**BSCI 421 - Diseases of the 21st Century**  
Credits: 4  
Provides a basic understanding of several different diseases that may be prevalent over the next century. Treatment and prevention of the disease are also discussed. Students will acquire a basic understanding of the research methodologies underlying several fields within the biological sciences, such as microbiology, immunology, and molecular biology. Agents of biological warfare are also discussed. Prereq: ENGL 401.  
Attributes: Biological Science(Discovery)  
Equivalent(s): UMST 599G
BSCI 422 - Biotechnology and Society
Credits: 4
Provides a basic understanding of genetic engineering. Techniques discussed include cloning, gene transfer, the Polymerase chain reaction (PCR), in vitro fertilization, organ transplants, and paternity testing. Ethical issues involved with each technological advance are examined. Attributes: Biological Science(Discovery)
Equivalent(s): BIOL 404, BIOL 444A

BSCI 432 - Medical Terminology
Credits: 2
This course is an introduction to medical terminology. The origin, roots, prefixes and suffixes of common scientific and medical terms are examined. Course is totally online and includes assigned online interactive material. Appropriate for biology majors, prePA, premed, and other interested majors.

BSCI 450 - The Small Microbial World
Credits: 4
An introduction to the invisible world of microbes and microorganisms and their impact on human life and ecosystems. Laboratory will be an opportunity for science and non-science students to learn the scientific method while they participate in citizen or crowdsourced science and contribute to scientific knowledge. Vaccines, antibiotics, and other topics will be presented. Special fee.
Attributes: Biological Science(Discovery); Discovery Lab Course

BSCI 501 - Ethical Issues in Biology
Credits: 4
This course is an introduction to the ethical issues associated with current and future use of biotechnology. Students will think critically about different ethical problems that emerge from scientific research and its applications to medical technology. The focus will be on personal and public policy decision making. Prereq: BIOL 413 and 414 or BIOL 411 and BIOL 412. Writing intensive.
Attributes: Writing Intensive Course
Equivalent(s): BIOL 404

BSCI 502 - Intro to Biotech Manufacturing
Credits: 4
Introduction to the terminology and practices of the biotechnology industry, with an emphasis on the business, regulatory, legal, and basic scientific underpinnings of modern biotechnology in the commercial and government sectors.

BSCI 510 - Introduction to Biofabrication
Credits: 4
This project-based course introduces students to the techniques and challenges of biofabrication. Students learn how additive manufacturing is used to combine cells with a variety of biolinks to create living tissues such as skin, cartilage, vascularized bone, and blood vessels. During this process students learn how to design for and operate 3D printing and bioprinting equipment. An emphasis will be placed on the ways in which this emerging technology impacts our society.
Attributes: Environment,Tech,Society(Disc)

BSCI 599 - Special Topics in Biology
Credits: 1-4
This course explores and investigates topics in biology that would not normally be covered in other courses in the curriculum.
Repeat Rule: May be repeated for a maximum of 12 credits.

BSCI 620 - Global Science Exploration
Credits: 4
This course includes a spring break trip abroad investigating living organisms in their natural habitat. Students will participate in pre-trip seminars on the country, local flora, fauna and habitats they will visit. Students will design a project to integrate their personal interests and objections with in-country investigation. Post-trip seminar will focus on preparation of project and its presentation. Prereq: BIOL 413 and 414, or BIOL 411 and 412. Permission required. May be repeated if the spring break trip is to a different country.
Attributes: Writing Intensive Course
Repeat Rule: May be repeated for a maximum of 8 credits.

BSCI 670 - Clinical Pathophysiology
Credits: 4
This course covers the principles and mechanisms of disease at the cellular, tissue, organ, and system levels, including responses to cell injury, death and adaptation, and inflammation. Acute and chronic disease processes as well as trauma are used to both understand the impact of these processes on body function as well as a means to gain a better understanding of integrative body systems. No credit if credit earned for BMS 794 or UMST 599 Clinical Pathophysiology. Prereq: BIOL 413 and BIOL 414 or BMS 507 and BMS 508.
Equivalent(s): BMS 704

BSCI 680 - Pharmacology
Credits: 4
This course is designed to cover the concepts of basic pharmacology and drug therapy. It includes examination of the body systems and the related drugs therapy within each system. It explores the basic drug groups, key similarities and differences among drugs in each group. Emphasis is placed on the mechanism of action for each group and how these medications act in relation to normative and pathophysiology. The therapeutic use and adverse effects of drugs as well as understanding recreational drug use will be included. No credit if credit received for UMST 599 Pharmacology. Prereq: BIOL 413 and BIOL 414 or BMS 507 and BMS 508.

BSCI 692 - Evolutionary Medicine
Credits: 4
This course introduces the theory of evolution by natural selection and the influence of evolutionary theory on our understanding of the cause and treatment of human disease. Topics covered include evolutionary theory, natural selection, human evolution, pathogen evolution, evolutionary mismatch, and the evolution of aging, cancer, and reproduction. Prereq: GEN 604 or permission of the instructor. Writing intensive.
Attributes: Writing Intensive Course

BSCI 695 - Exploring Biology Teaching
Credits: 1-4
Students assist in teaching labs in undergraduate courses supervised by the lab coordinator/instructor. Responsibilities include facilitating lab endeavors, giving a presentation, and writing a report. Prereq: permission. Repeat Rule: May be repeated for a maximum of 4 credits.
Equivalent(s): BIOL 695

BSCI 701 - Senior Seminar I
Credits: 1
To be taken during the last two semesters of the senior year as students complete their Capstone project. Course emphasizes written and oral communication, discussion of current topics in biology, and career guidance. Fall and spring semester. Cr/F.
BSCI 702 - Senior Seminar II
Credits: 1
To be taken during the last two semesters of the senior year as students complete their Capstone project. Course emphasizes written and oral communication, discussion of current topics in biology, and career guidance. Fall and spring semester. Cr/F.

BSCI 735 - Cell Biology
Credits: 4
This course is an upper level biology class that expands on the basic knowledge of cellular structure and function. The focus is on molecular biology and cell signaling. Experiments by preeminent scientists are explored and analyzed. Prereq: BIOL 413 and BIOL 414, CHEM 403 and CHEM 404, or equivalent.
Equivalent(s): BMCB 605

BSCI 737 - Microbial Genomics
Credits: 4
Microbial genomics (primarily bacteria and bacteriophages) and genome-scale approaches to addressing questions in microbial physiology and pathogenesis are the focus of the course. Large-scale sequencing projects, genome structure and evolution, metagenomics, and other challenges in comparative genomics are discussed. Hands-on wet laboratory and bioinformatics projects are included in this laboratory-lecture course. Prereq: GEN 604, BMS 503 and BMS 504. Special fee.

BSCI 740 - Aquatic Microbiology
Credits: 4
Lectures and labs focus on Lake Massabesic and its use as the source of supply as the drinking water for approximately 160,000 New Hampshire residents. The course covers a basic history of the Lake, the importance of watershed protection, EPA regulations, and standards and the various techniques and methods available to analyze water for basic quality. No credit for students who have earned credit for UMST 599 Aquatic Microbiology. Prereq: BMS 503 and BMS 504. Permission. Special fee. Writing intensive.
Attributes: Writing Intensive Course

BSCI 747 - Industrial Microbiology and Fermentation
Credits: 4
Production of biologics and food by the biotechnology and agribusiness industries is the major focus of this course. Development of procedures for fermentation and bioprocessing, from proof of concept through scale-up stages will be emphasized, utilizing both theory and quantitative understanding as well as hands-on wet lab experience with modern bioprocessing equipment. Troubleshooting, safety, and QC considerations will be addressed. Prereq: BMS 503, BMS 504. Special fee.
Equivalent(s): BSCI 606

BSCI 750 - Cancer Biology: From Benchtop Research to Therapeutic Interventions
Credits: 4
The development and progression of cancer can be defined by several molecular and cellular biological characteristics. In this course, we will utilize primary literature to begin to understand (1) how specific cellular processes are altered during cancer initiation and progression; (2) how different cancers and the genetic landscape underlying them are being studied using models in the laboratory; and (3) how innovative therapeutics are being designed to target tumors based upon their individual molecular signatures. Prereq: GEN 604.
Attributes: Writing Intensive Course

BSCI 765 - Nucleic Acid Techniques
Credits: 4
Laboratory course focused on application of molecular biology techniques for the extraction, detection, and use of nucleic acids. Emphasis is on recombinant DNA cloning and bioengineering techniques in biotechnology. Special fee. Prereq: GEN 604, BMCB 658/659. No credit for students who have received credit for BMCB 754, BMCB 755, BMS 650, or BMS 714.
Equivalent(s): BMCB 754, BMCB 755, BMS 650, BMS 714

BSCI 766 - Protein and Immunologic Techniques
Credits: 4
Laboratory course focused on application of molecular biology techniques for the isolation, quantitation, detection, analysis, and use of proteins. Substantial emphasis on the use of immunoassays and antibodies in protein work. Modern proteomics techniques are also discussed. Emphasis on recombinant protein expression in the field of biotechnology. Prereq: GEN 604, BMCB 658. Credit cannot be received if credit received for BMS 650, BMS 714, BMS 715. Special fee.
Equivalent(s): BMS 650, BMS 714, BMS 715

BSCI 777 - Molecular Biology and Biotechnology
Credits: 5
The organization, expression, and control of RNA and protein-coding genes in prokaryotic and eukaryotic cells. The focus of the course is on mechanisms of genetics at the molecular level and the application of modern techniques to laboratory biotechnology projects. Prereq: GEN 604. Special fee.

BSCI 792 - Research
Credits: 1-4
Advanced independent research under the direction of a faculty mentor. Content area to be determined in consultation with faculty mentor. Prereq: permission. Up to 4 credits may be applied to self-designed concentration. Up to 4 credits may be applied to the Capstone requirement. Fall and spring semester. Prereq: Permission of Faculty mentor. Cr/F.
Repeat Rule: May be repeated for a maximum of 8 credits.

BSCI 793 - Internship
Credits: 1-4
Field-based learning opportunities in the biological sciences through placement in the appropriate outside agency, under the direction of a faculty mentor and representative of outside agency. Content area to be determined in consultation with faculty mentor. Prereq: Permission. Up to 4 credits may be applied to self-designed concentration. Up to 4 credits may be applied to the Capstone requirement. Fall and spring semester. Cr/F.
Repeat Rule: May be repeated for a maximum of 8 credits.

BSCI 794 - Clinical Microbiology Internship
Credits: 4
Advanced instruction in clinical bacteriology, mycology, parasitology, and/or virology at a local hospital or reference laboratory. Isolation, identification, determination of antibiotic sensitivities, and modern advanced testing for common pathogens are emphasized. Prereq: BMS 602 and permission of instructor.
Equivalent(s): BMS 751, BMS 761
BSCI 795 - Independent Study
Credits: 1-4
Advanced individual study under the direction of a faculty mentor. Content area to be determined in consultation with faculty mentor. Prereq: permission. Up to 4 credits may be applied to self-designed concentration. Up to 4 credits may be applied to the Capstone requirement. Fall and spring semester. Cr/F.
Repeat Rule: May be repeated for a maximum of 8 credits.

Faculty

Biological Sciences Faculty