BIOLOGICAL SCIENCES

The curriculum in the biological sciences provides a comprehensive understanding of the principles underlying life's processes, from the molecular level through the biosphere. Many of the courses offered have lecture and laboratory components. This ensures that students become scientists capable of making significant contributions to the field. Majors have the opportunity to participate in cutting-edge research under the mentorship of a faculty member in the department. This affords students the opportunity to develop their organizational, technical, and analytical skills while using the most up-to-date techniques and instrumentation. Students conducting original research are expected to communicate their findings to the scientific community through, for example, their participation in Fordham College's annual Undergraduate Research Symposium. Students doing meritorious research are guided to publish their work in nationally recognized science journals.

The department offers two undergraduate degrees: the bachelor of science (B.S.) and the bachelor of arts (B.A.) in the biological sciences. Both degree tracks ensure the major's exposure to the broad scope of the discipline while providing the flexibility to choose upper-level courses that focus on one or more of the sub disciplines in greater depth. The curriculum gives students a strong foundation from which they can pursue studies leading to a career in medicine, dentistry, veterinary medicine, research and development, education, industry, forensics, or laboratory analysis.

Early Admission to the Master's Program

Please read the Early Admission to Graduate School of Arts and Sciences Master’s Programs (https://bulletin.fordham.edu/undergraduate/academic-programs-policies-procedures/special-academic-programs/early-masters-five-year-programs) section for more information. Interested students must apply by the time they register for the fall semester of their senior year but are encouraged to apply earlier. Students opting for early admission to the M.S. program must consult with their adviser and the associate chair for graduate studies before registering for graduate courses. Applications are made online through the Graduate School of Arts and Sciences website and do not need to include GRE scores unless the student is planning to apply for financial aid after completing the bachelor’s degree.

The minimum GPA required for eligibility is 3.5. This policy applies to students registered in FCRH, FCLC, and PCS. Candidates will begin their graduate studies in their senior year and will carry elective credit in the summer between their fourth and fifth years. Courses taken as part of the early admissions option must be approved by the department’s associate chair for graduate studies.

Program Activities

Biology Colloquium

Students are encouraged to attend the weekly Biology Colloquium which features presentations of outstanding research by visiting scientists as well as by the department’s own faculty and graduate students.

Research Opportunities

There are many varied research opportunities available to biology majors. A student interested in a faculty member's research should meet with that faculty member and discuss a program of independent laboratory or field research under that faculty member's mentorship. The student may elect to register for two semesters of research (for four credits each semester), including writing and defending a thesis, during the senior year in lieu of two elective biology courses (see BISC 4792 SENIOR THESIS RESEARCH in the course listings). Another alternative is enrollment in a research tutorial for a maximum of four credits in lieu of one biology elective (see BISC 4999 RESEARCH TUTORIAL in the course listings). If neither of the above options is desirable, a student may volunteer on an extracurricular basis to participate in a faculty member’s research. Details may be obtained in the department office. Fordham University has formal affiliations with the New York Botanical Garden, the Wildlife Conservation Society (Bronx Zoo), Albert Einstein College of Medicine, and Montefiore Hospital.

For more information

Visit the Biology department web page (https://www.fordham.edu/biology).

The Department of Biological Sciences offers courses numbered BISC 1000 LIFE ON THE PLANET EARTH-BISC 1010 FOUNDATIONS OF BIOLOGY, which satisfy the core life-science component of the natural science requirement in the Fordham College Core Curriculum. The two course sequence, BISC 1403 INTRODUCTORY BIOLOGY I-BISC 1404 INTRODUCTORY BIOLOGY II or BISC 1401 INTRODUCTION TO BIOLOGY I-BISC 1402 INTRODUCTION TO BIOLOGY II, when taken in sequence will fulfill both natural science requirements (physical science and life-science).

- Biological Sciences Major (https://bulletin.fordham.edu/undergraduate/biological-sciences/major)
- Biological Sciences Minor (https://bulletin.fordham.edu/undergraduate/biological-sciences/ minor)

BISC 1000. LIFE ON THE PLANET EARTH. (3 Credits)

A course designed for non-majors. A survey of animal and plant biology evolutionary history, ecology and conservation biology. Lectures complemented by experiments, demonstrations and slide presentations. Attributes: BIOE, LSCI.

BISC 1001. HUMAN BIOLOGY. (3 Credits)

A course designed for non-majors. The biology of humans, emphasizing cells and molecules, reproduction and development, structure and function of the body, inheritance and evolution. Lectures are complemented by scheduled laboratory work. Attributes: BIOE, LSCI, ZLB3.

BISC 1002. ECOLOGY: A HUMAN APPROACH. (3 Credits)

A course designed for non-majors. Ecological concepts and how they relate to critical contemporary issues: air and water pollution, radiation, energy, world hunger. Includes experiments, demonstrations and field trips. Attributes: BIOE, ENST, LSCI, URST, ZLB3.

BISC 1005. AIDS: A CONSPIRACY OF CELLS. (3 Credits)

A course designed for non-majors. Emphasizes the biological roots of acquired immunodeficiency syndrome (AIDS). The disease is discussed in the context of genetics, cell biology, and evolution. Consideration is given to fundamental aspects of infection, immunology and virology. Laboratory exercises center on agents of opportunistic infection and the body's response to them. Attribute: C009.
BISC 1008. THE FINCH, THE SEED, AND THE STORM: ADVENTURES IN CONTEMPORARY EVOLUTION. (3 Credits)
Students will learn about the theory of evolution, with a focus on evolutionary ecology, selection, adaptation, and contemporary evolution, and will use this theory as a way of understanding the process of science and biological principles. Students will learn to think, write and speak scientifically and about science.
Attributes: EP1, LSCI, MANR.

BISC 1010. FOUNDATIONS OF BIOLOGY. (3 Credits)
In this introductory course for non-science majors, a general survey of the characteristics of life is presented, including such topics as cellular biology, metabolism, organ systems, genetics, development, evolution, behavior, and ecology. All forms of life will be studied, with emphasis on the human body and human evolutionary history.
Attributes: BIOE, LSCI.

BISC 1401. INTRODUCTION TO BIOLOGY I. (4 Credits)
A combined introductory lecture and laboratory course for the summer session concentrating on the chemistry of biological molecules; cell organization, metabolism and reproduction; and the principles of genetics, molecular biology and evolution. Also includes a survey of viruses, eubacteria, archaebacteria, protists, fungi, and plants. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

BISC 1402. INTRODUCTION TO BIOLOGY II. (4 Credits)
A combined introductory lecture and laboratory course for the summer session continuing the presentation begun in Introduction Biology I. Includes higher plant and animal structure and function; a survey of the major animal phyla including aspects their structure, function, behavior, and life cycle. Also includes concepts of ecology. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.

BISC 1403. INTRODUCTORY BIOLOGY I. (3 Credits)
An introduction to the chemistry of life; the structure, function and metabolism of the cell; heredity and molecular aspects of genetics; principles of evolution; biology of bacteria; protists and fungi; and plant evolution.
Attribute: ENVS.
Corequisite: BISC 1413.
Mutually Exclusive: NSCI 1403.

BISC 1404. INTRODUCTORY BIOLOGY II. (3 Credits)
An introduction to the biology of flowering plants and a systematic study of the major animal phyla involving aspects of their biology which suit them to their environment. Emphasizes the life support systems of mammals and humans, and addresses interactions among organisms; as well as between them and their environment.
Attribute: ENVS.
Corequisite: BISC 1414.
Mutually Exclusive: NSCI 1404.

BISC 1413. INTRODUCTORY BIOLOGY LAB I. (2 Credits)
A laboratory course designed to illustrate topics discussed in BISC 1403. Lab fee.
Attributes: ENVS, ZLB3.
Corequisite: BISC 1403.
Mutually Exclusive: NSCI 1413.

BISC 1414. INTRODUCTORY BIOLOGY LAB II. (2 Credits)
A laboratory course designed to illustrate topics discussed in BISC 1404. Lab fee.
Attributes: ENVS, ZLB3.
Corequisite: BISC 1404.
Mutually Exclusive: NSCI 1414.

BISC 2539. GENERAL GENETICS. (3 Credits)
A study of the gene in all its aspects; its structure, it's informational nature; how this information is inherited unchanged; how this information is expressed in terms of an organism's structure and function; how this information can be altered; and how expression of this information is regulated so that environmentally appropriate responses are made. The unifying position of genetics in the study of biology is emphasized.
Attribute: ENVS.
Corequisite: BISC 2549.
Prerequisites: CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).

BISC 2549. GENERAL GENETICS LAB. (2 Credits)
A laboratory course designed for a hands-on experience in the usage of various scientific methodologies and experiments in the field of basic genetics. Lab fee.
Attribute: ENVS.
Corequisite: BISC 2539.
Prerequisites: (BISC 1404 and CHEM 1322) or (BIRU 1404 and CHRU 1322) or (BISC 1404 and CHRU 1322) or (BIRU 1404 and CHEM 1322) or (BISC 1402 and CHEM 1322).
Mutually Exclusive: NSCI 3833.

BISC 2561. ECOLOGY. (3 Credits)
An introduction to the theories and applications of ecology including evolution, resources, population dynamics, life histories, competition, community structure, ecosystem processes, island biogeography, human impacts on ecosystems and conservation. An introduction to the theories and applications of ecology including evolution, resources, population dynamics, life histories, competition, community structure, ecosystem processes, island biogeography, human impacts on ecosystems and conservation. Corequisite: BISC 2571. Prerequisite: BISC 1404.
Attributes: ENST, ENVS.
Corequisite: BISC 2571.
Prerequisites: CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).

BISC 2571. ECOLOGY LAB. (2 Credits)
Laboratory and field studies designed to provide hands-on experience with habitats and organisms, ecological experiments, and data analysis. (4 hour field trips).
Attribute: ENVS.
Corequisite: BISC 2561.
Prerequisites: (BISC 1404 and CHEM 1322) or (BIRU 1404 and CHRU 1322) or (BISC 1404 and CHRU 1322) or (BIRU 1404 and CHEM 1322) or (BISCU 1402 and CHEM 1322).

BISC 3221. HUMAN ANATOMY. (3 Credits)
A lecture course which examines cell, tissue, and gross anatomy of the major organ systems of the human body as they relate to life processes in health and disease.
Corequisite: BISC 3231.
Prerequisites: CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).
BISC 3231. HUMAN ANATOMY LAB. (2 Credits)
A laboratory course employing slides, models and gross dissection to study the structure of the major organ systems of the human body.
**Attributes:** ZLB3.
**Corequisite:** BISC 3232.
**Prerequisites:** (BISC 1404 and CHEM 1322) or (BIRU 1404 and CHEM 1322) or (BISC 1404 and CHRU 1322) or (BIRU 1404 and CHEM 1322) or (BISC 1402 and CHEM 1322).

BISC 3232. HUMAN PHYSIOLOGY LAB. (2 Credits)
A laboratory course employing slides, models and gross dissection to study the structure of the major organ systems of the human body.
**Attributes:** ZLB3.
**Corequisite:** BISC 3232.
**Prerequisites:** (BISC 1404 and CHEM 1322) or (BIRU 1404 and CHEM 1322) or (BISC 1404 and CHRU 1322) or (BIRU 1404 and CHEM 1322) or (BISC 1402 and CHEM 1322).

BISC 3242. HUMAN PHYSIOLOGY LAB. (2 Credits)
A laboratory course employing slides, models and gross dissection to study the structure of the major organ systems of the human body.
**Attributes:** ZLB3.
**Corequisite:** BISC 3242.
**Prerequisites:** CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).

BISC 3244. EVOLUTIONARY BIOLOGY. (3 Credits)
The course covers both Micro- and Macro-Evolution ranging in focus from population, genetics and molecular evolution to the fossil record and major patterns of organismal diversity. Other topics include natural and sexual selection, the ecological context of adaptation, genomic and developmental mechanisms of evolutionary innovation, speciation, phylogeny reconstruction, and human evolution.
**Attributes:** ENVS.
**Prerequisites:** CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).

BISC 3521. BIOCHEMISTRY. (3 Credits)
A lecture course on the principles of biochemistry and molecular biology. Topics include the chemistry and function of carbohydrates, lipids, proteins, and nucleic acids; enzymology; metabolism; bioenergetics; and gene structure and expression.
**Prerequisites:** CHEM 1321 and CHEM 1322 and CHEM 2521 and CHEM 2522 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).

BISC 3643. MICROBIOLOGY. (3 Credits)
Detailed study of microbial metabolism and physiology; microbial roles in maintaining earth's ecosystems and human health; global environmental change and effects on emerging infectious diseases, epidemiology, and public health.
**Attributes:** ENVS, ZLB3.
**Corequisite:** BISC 3653.
**Prerequisites:** CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).

BISC 3653. MICROBIOLOGY LAB. (2 Credits)
Laboratory exercises are designed to develop skills in: sterile culture techniques for isolating bacteria and fungi from natural substrates; microscopy and staining techniques for visualization, identification and quantification of microbes.
**Attributes:** ENVS, ZLB3.
**Corequisite:** BISC 3643.
**Prerequisites:** (BISC 1404 and CHEM 1322) or (BIRU 1404 and CHEM 1322) or (BIRU 1404 and CHEM 1322) or (BISC 1404 and CHEM 1322) or (BISC 1402 and CHEM 1322).

BISC 3752. MOLECULAR BIOLOGY. (3 Credits)
Principles and regulation of gene expression; nucleic acid structure/ function, replication, transcription, RNA processing, translation; experimental and recombinant DNA methodologies and approaches.
**Prerequisites:** CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).
**Mutually Exclusive:** NSCI 4176.

BISC 3754. CELL BIOLOGY. (3 Credits)
Presents fundamental principles of cell structure and function important to an understanding of cellular interactions in the development, maintenance, and reproduction of multicellular organisms. Cell-cell interactions and their role in human disease are discussed extensively.
**Prerequisites:** CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).
**Mutually Exclusive:** NSCI 3154.

BISC 3893. INTRODUCTION TO VIROLOGY. (3 Credits)
An introduction to the significance of viruses as agents of disease, and as tools to understand basic life processes. The course will cover the structural and biochemical properties of viruses, viral replication strategies, virus-cell interactions, viral pathogenesis and host immune reactions. Emphasis will be on animal viruses but the properties and replication strategies of prokaryotic and plant viruses will also be explored.
**Prerequisites:** CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).

BISC 4530. CANCER BIOLOGY AND SIGNALING. (3 Credits)
Course covers the basic biology of cancer at the cellular and molecular levels with special emphasis on aberrant signal transduction pathways in cancer cells.
**Prerequisites:** BISC 3754 and BISC 2539.

BISC 4532. NEUROSCIENCE. (3 Credits)
Study of the anatomy, biochemistry and physiology of neurons and neural pathways that comprise the peripheral and central nervous systems and their relationship to behavior.
**Prerequisites:** CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).
**Mutually Exclusive:** NSCI 2030.
BISC 4642. ANIMAL BEHAVIOR. (4 Credits)
Introduction to animal behavior; evolution, genetics, physiology and ecology of behavior; sexual/mating/reproductive behavior; habitat selection, feeding behavior, anti-predator defenses, social behavior, human behavior. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.
Attribute: ENVS.
Prerequisites: CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).

BISC 4693. DEVELOPMENTAL BIOLOGY. (3 Credits)
An introduction to animal development with emphasis on molecular aspects of gametogenesis, fertilization, and organogenesis. Current models of normal and abnormal cellular differentiation will also be considered.
Prerequisites: CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).

BISC 4792. SENIOR THESIS RESEARCH. (4 Credits)
Individually tailored laboratory or field research during senior year. Grade and credits are given only upon completion of thesis. Preliminary work in junior year is required. Details may be obtained in the department office. Four-credit courses that meet for 150 minutes per week require three additional hours of class preparation per week on the part of the student in lieu of an additional hour of formal instruction.
Prerequisites: CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).

BISC 4999. RESEARCH TUTORIAL. (4 Credits)
Provides one-semester, hands-on participation in a faculty member’s research program.
Prerequisites: CHEM 1321 and CHEM 1322 and (BISC 1403 and BISC 1404) or (BISC 1401 and BISC 1402) or (BISC 1401 and BISC 1404) or (BISC 1403 and BISC 1402).