

# BIOLOGICAL SCIENCES

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The graduate program in the department of biological sciences at Fordham offers courses and research opportunities leading to the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees in biological sciences. The goal of the program is to ensure a broad education in biology and specialized training for those pursuing careers in research or teaching. There are two areas of concentration: (1) Cell and Molecular biology and (2) Ecology and Systematics.

For more information about graduate-level Biological Sciences, please visit our page on the Fordham website.

## Admissions Masters and Ph.D.

Applicants must:

- hold a bachelor's degree in the biological sciences or related major
- have a minimum undergraduate GPA of 3.0 (out of 4.0)
- have an acceptable combined GRE score
- Include each of the following items

### Resume

Up to two pages in length (submit via the online application).

### Statement of Intent

The "Statement of Intent" requires students to answer the following questions and also imposes a 300 word maximum for each question

- Why do you want to join Fordham's Graduate Biology Program?
- How will a Graduate degree in Biology help you in your career goals?
- Describe your research experiences to date.
- Describe your research interest.

### Official Transcripts

Official degree transcripts confirming prior degree conferral should be ordered at least one month prior to the application deadline. Please ensure that they are sent directly to the Office of Admissions via secure electronic delivery. If electronic delivery is not available, please request that your transcripts be submitted directly via post, in a sealed envelope, to: Graduate School of Arts and Sciences, Office of Admissions, Fordham University, 441 E. Fordham Rd., Bronx, NY 10458.

Please note: you may upload unofficial copies of your transcripts to your application while the Office of Admissions awaits receipt of your official transcripts.

### Official GRE Scores

These should be sent directly by the testing service to the Office of Graduate Admissions, Fordham University, Graduate School of Arts and Sciences – Code #2259.

### Recommendations

Three letters of recommendation submitted directly by referees via the online application.

### English Proficiency

International applicants whose native language is not English are required to complete and submit to GSAS prior to matriculation their official scores from the Test of English as a Foreign Language (TOEFL). GSAS will also consider a student's International English Language Testing System (IELTS)—Cambridge English Proficiency Level language testing results.

Official TOEFL or IELTS scores should be sent directly by the testing service to the Office of Graduate Admissions, Fordham University, Graduate School of Arts and Sciences – Code # 2259.

### Certificates

Applicants should have completed a B.A./B.S. in biological science or other natural/environmental science, or equivalent coursework. An undergraduate GPA of 3.0 or higher is required. GRE scores are not required. Applicants without the required background will be advised to take necessary prerequisite courses. Applications are accepted on a rolling basis, and students may begin their studies in any term, including summer.

For more information about admissions to the Graduate School of Arts and Sciences, please visit their page on the Fordham website.

### Programs

- Biological Sciences (M.S.)
- Biological Sciences (Ph.D.)
- Conservation Biology (Adv Cert)

### Courses

#### **BISC 5510. Conservation Biology. (3 Credits)**

Theory and practice of conservation biology. Topics will include maintenance of species diversity, design of reserves, captive management, genetic considerations, and factors affecting extinction rates.

**Attributes:** ABGS, CEED, CENS.

#### **BISC 5511. Conservation Law and Policy. (3 Credits)**

This course provides an introduction to the practice of both law and policy analysis, with a focus on issues associated with the conservation of biodiversity. Part I focuses on the law, and students will learn the basics of legal research, legal reasoning, and legal analysis. Part II focuses on policy analysis, and students will learn the basics of the policy process and basis policy analysis. This course will examine a wide range of laws, policies, regulations, treaties, and institutions designed to address local, national, and global conservation problems. Topics to be covered include protection of biodiversity, regulatory approaches to conservation, and international conservation law.

**Attributes:** CEED, CENS, HECS, URSG.

#### **BISC 5512. Freshwater Algae Identification. (0 Credits)**

This course will embark on a study of the largest, most diverse, and arguably the most important group of plants on earth: the algae. Algae form the base of aquatic food webs, and are both the cause of water quality issues and tool in ecological assessments used to protect inland waters.

**BISC 5642. Animal Behavior. (3 Credits)**

Introduction to animal behavior, including evolution, genetics, physiology, and ecology of behavior; sexual, mating, and reproductive behavior; habitat selection and anti-predator defenses; and feeding, social, and human behavior.

**BISC 6525. Biostatistics. (3 Credits)**

This course covers principles and applications of statistical methods for biologists, with an emphasis on the creation of sampling design and hypothesis testing.

**BISC 6535. Ecological Methods. (4 Credits)**

Methods and principles of ecological research, combining field and laboratory approaches, statistical and graphical data analysis, as well as modeling. Exercises emphasize techniques used to estimate the abundance and dispersion of organisms, describe habitat variables, estimate biomass, and production, characterize stoichiometric properties, and quantify energy fluxes. Assignments include research reports, data analysis and peer-review of research papers. All assignments emphasize benefits and limitations of specific techniques as well as interpretation of results in a theoretical context.

**Prerequisites:** BISC 7501 and BISC 7503.

**BISC 6734. Cell Biology of Eukaryotes. (4 Credits)**

The focus will be on major principles of cell organization as related to cell function in multicellular organisms with emphasis on animal cells. Physiological and biomedical aspects of cell structure and function will be discussed. Experimental approaches employing diverse microscopic, biomedical, and biophysical techniques will also be examined. 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.

**Prerequisite:** BISC 7502.

**BISC 6999. Research for M.S. in Biological Sciences. (1 to 6 Credits)**

Faculty-mentored independent M.S. research.

**BISC 7501. Population and Community Biology. (4 Credits)**

The course focuses on the evolution and ecology of populations, including both intra- and interspecific interactions. Particular emphasis is placed on evolution, species, speciation, gene flow, adaptation, behavior ecology, life histories, population growth, community structure, species diversity, niche theory, and competition, predation, parasitism, and mutualisms within and among species. 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 7502. Eukaryotic Molecular Biology. (4 Credits)**

The course will explore principles of gene structure and expression in eukaryotes. It starts with the review of structure of biopolymers (DNA, RNA, proteins) and techniques employed in Molecular Biology. Further topics will include genome organization (nucleosomes, chromatin, and chromosomes), genome maintenance (replication, mutability, and repair), genome expression (transcription and translation), and genome regulation (regulatory proteins and RNAs). 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:** DATA.

**BISC 7503. Community and Ecosystem Ecology. (4 Credits)**

Focus on biotic and abiotic interactions in ecosystems. Emphasis is placed on food webs, habitat selection, succession, spatial variation in species diversity, species diversity and ecosystem functions, patterns and processes associated with ecosystem function and energy flow. Note: 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.

**Prerequisite:** BISC 7501.

**BISC 7529. Principles of Geographical Information Science. (4 Credits)**

This course covers basic concepts and theories of Geographical Information Science (GISc), and provides actual hands-on experience with a Geographical Information Systems (GIS) software package for computer mapping and data analysis. 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:** DATA.

**BISC 7530. Principles of Geographical Information Science II. (4 Credits)**

This course will explore in depth topics of GIS for the Natural Sciences and will give students the opportunity to design and conduct an independent GIS project. Through a series of discussions, demonstrations, hands-on exercises, and the development of a GIS project, students will learn more advanced spatial techniques and their applications to the Natural Sciences. The course is intended to provide the student with a solid grounding in GISc research design and methodology by designing and conducting an independent GIS project. Class session will be conducted as seminars, with discussion regarding the use of GISc in current research, and weekly group feedback on project design and implementation issues. Projects are to be substantive and original research efforts conforming to generally acceptable professional geographical practices and techniques. 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 7801. Methods in Cell and Molecular Biology. (1 Credit)**

Study of methodologies employed in the field of cell molecular biology.

**BISC 7804. Techniques in Molecular Biology. (4 Credits)**

The study and practice of methodologies employed in the analysis of proteins, RNA and DNA. 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.

**Prerequisite:** BISC 7801.

**BISC 7999. Research for Ph.D. in Biological Sciences. (1 to 6 Credits)**

Faculty-mentored independent Ph.D. dissertation research. Thirty credits required for Ph.D.

**BISC 8051. Project and Internship. (3 Credits)**

With supervision and approval of a participating ecology faculty member, a student will develop an independent project or work in some form of on-the-job internship in conjunction with a collaborating conservation agency, such as, The American Museum of Natural History, Wildlife Conservation Society, New York Botanical Garden, NYS Department of Environmental Conservation, Natural Resource Council, Bronx River Alliance, Riverkeeper, US Environmental Protection Agency, or NYC Department of Environmental Protection.

**BISC 8530. Seminar: Ecology/Evolution I. (1 Credit)**

Discussion of current topics in ecology and evolution.

**BISC 8710. Seminar in Genetics. (3 Credits)**

Lectures and discussion of current genetics research and research design.

**BISC 8750. Seminar in Cell Biology. (3 Credits)**

Lectures and discussion of current cell biology research and research design.

**BISC 8801. Biological Colloquium I. (0 Credits)**

This colloquium features lectures by outside speakers on current research topics.

**BISC 8999. Independent Study. (1 to 4 Credits)**

Faculty-mentored independent research tutorial.

**BISC 9999. Dissertation Direction. (1 Credit)**

Direction of PhD dissertation research after 30 credits of BISC 7999 have been completed.