# BIOINFORMATICS MINOR

Bioinformatics studies the sequence, structure, and function of genes and proteins in all living organisms, including the human species. The advent of high throughput next-generation sequencing (NGS) has accelerated the pace of genome-wide profiling of biological sequences from various assays (Chip-Seq, RNA-seq, DNA-seq, Hi-C, etc.), thereby enabling multiomics analysis to bring deeper insights into the genetics of millions of species on the planet. Therefore, we now have access to thousands of organisms' genome sequences, including their annotations on the respective protein-coding sequences. Scientists all over the world are constantly working to understand gene expression and chromatin patterns across many cell types covering the full human genome. Due to this, bioinformatics has seen exponential growth in academic research and linear growth in the biomedical and bioinformatics industry, adding more than 10% additional jobs each year.

A minor in bioinformatics is available on both the Rose Hill and Lincoln Center campuses. Bioinformatics is an interdisciplinary field comprising mainly computer sciences and biological sciences. At Fordham, bioinformatics students focus on learning the key biological concepts as well as relevant algorithms and software tools for analyzing large-scale biological datasets. Some examples of the topics are genomics, proteomics, phylogenetics, systems biology, DNA microarray gene expression, next-generation sequencing (NGS) data analysis, genomic medicine, biomarkers for cancer and disease, drug discovery and design for disease and disorders, database and data mining, network form and function, and ESL (ethical, societal, and legal) issues.

## For more information

Visit the Bioinformatics minor program webpage.

## Requirements

The following courses are required for the Bioinformatics minor.

| Course | Title | Credits |
|---|---|---|
| CHEM/NSCI 1321 | General Chemistry I (no lab) | 4 |
| CHEM/NSCI 1322 | General Chemistry II (no lab) | 4 |
| MATH 1205 | Applied Statistics (or equivalent) | 3 |
| BISC 2539/ NSCI 3133 | General Genetics | 3 |
| BISC 2549/ NSCI 3833 | General Genetics Lab | |
| BISC 3754/ NSCI 3154 | Cell Biology | 3 |
| CISC 4020 | Bioinformatics | 4 |

Intro Biology I and II with Lab must be taken to fulfill the Natural Science Core Requirement.

| Course | Title | Credits |
|---|---|---|
| BISC/NSCI 1403 | Introductory Biology I | 3 |
| BISC/NSCI 1413 | Introductory Biology Lab I | 2 |
| BISC/NSCI 1404 | Introductory Biology II | 3 |
| BISC/NSCI 1414 | Introductory Biology Lab II | 2 |

Certain majors are required to complete certain additional courses (often taken as electives in their major) to earn the Bioinformatics minor.

Computer Science majors must also take:

- CISC 2500 Information and Data Management
- CISC 4631 Data Mining.

Biological Sciences (RH) majors must also take:

- CISC 3500 Database Systems
- CISC 1400 Discrete Structures
- CISC 1600 Computer Science I /CISC 1610 Computer Science I Lab or CISC 1800 Introduction to Computer Programming (Students who take CISC 1600 during Fordham's Summer Session do not take CISC 1610, as the summer lecture and lab are offered in a combined format.)
- CISC 4631 Data Mining
- Either BISC 3754 Cell Biology or BISC 3752 Molecular Biology as an elective toward the major.

Natural Science (LC) majors must also take:

- CISC 3500 Database Systems
- CISC 1400 Discrete Structures
- CISC 1600 Computer Science I/CISC 1610 Computer Science I Lab orCISC 1800 Introduction to Computer Programming (Students who take CISC 1600 during Fordham's Summer Session do not take CISC 1610, as the summer lecture and lab are offered in a combined format.)
- CISC 4631 Data Mining
- NSCI 3133 Genetics Lecture taken toward the major.
- NSCI 4176 Molecular Biology Lecture or NSCI 3154 Cell and Development Biology Lecture taken toward the major.

General Science (RH) majors must also take:

- CISC 3500 Database Systems
- CISC 4597 Artificial Intelligence
- CISC 4631 Data Mining
- BISC 2539 General Genetics/BISC 2549 General Genetics Lab taken toward the major.
- Either BISC 3754 Cell Biology or BISC 3752 Molecular Biology as an elective toward the major.

Integrative Neuroscience majors must also take:

- CISC 3500 Database Systems
- CISC 1400 Discrete Structures
- CISC 1600 Computer Science I/CISC 1610 Computer Science I Lab or CISC 1800 Introduction to Computer Programming (Students who take CISC 1600 during Fordham's Summer Session do not take CISC 1610, as the summer lecture and lab are offered in a combined format.)
- CISC 4631 Data Mining
- NSCI 3133 Genetics Lecture or  BISC 2539 General Genetics taken toward the major.
- NSCI 4176 Molecular Biology Lecture or NSCI 3154 Cell and Development Biology Lecture or  BISC 3754 Cell Biology or BISC 3752 Molecular Biology as an elective toward the major.

# Availability

The minor in bioinformatics is available at Fordham College at Rose Hill and Fordham College at Lincoln Center. Students in Fordham's School of Professional and Continuing Studies may minor in bioinformatics only if they receive the approval of their advising dean and/or department, and their schedules are sufficiently flexible to permit them to take day courses at the Rose Hill or Lincoln Center campuses.

***Fordham College at Rose Hill students:*** *The requirements above are in addition to those of the* Core Curriculum.

***Fordham College at Lincoln Center students:*** *The requirements above are in addition to those of the* Core Curriculum.