

BIOINFORMATICS (MS)

Bioinformatics is a highly interdisciplinary STEM field that integrates computational and statistical methods for analyzing large biological data sets. Bioinformaticians apply their biological and computational sciences backgrounds to develop, utilize, and optimize new computational tools for organizing, synthesizing, and analyzing the rapidly increasing amount of biological and biomedical data.

Prospective students choose between the **Thesis-based track** and the **Non-thesis track**.

Thesis-Based Track

Students will be trained and mentored in conducting independent hypothesis-driven research, including experimental design, data analysis, and interpretation of results. They will also learn scientific writing and presentation design and delivery. After graduation, students are primed for competitive Ph.D. programs and positions at research institutions, in government agencies and other public sectors, as well as in the private sector.

Non-Thesis Track

Students gain real-world experience in an internship environment and are exposed to a breadth of coursework in the field of bioinformatics.

At the conclusion of their studies, graduates are competitive for employment in the biotech industry, as well as in bioinformatics positions in academia, government agencies, hospitals, and related public and private institutions.

Related Programs

Master's

- Biology (MS) (<https://catalog.luc.edu/graduate-professional/graduate-school/arts-sciences/biology/biology-ms/>)
- Computer Science (MS) (<https://catalog.luc.edu/graduate-professional/graduate-school/arts-sciences/computer-science/computer-science-ms/>)
- Data Science (MS) (<https://catalog.luc.edu/graduate-professional/graduate-school/arts-sciences/data-science/data-science-ms/>)

CURRICULUM

Degree Requirements

Applicants pursuing the Master of Science in Bioinformatics select the **Thesis-based track** or the **Non-Thesis track**. Students must complete 30 credit hours. Six (6) courses, worth a total of 17 credit hours, comprise the **Core Curriculum**, and the remaining 13 credit hours will consist of track-specific courses.

Core Curriculum

Code	Title	Hours
BIOL 488	Bioinformatics	3
COMP 483	Computational Biology	4
STAT 437	Quantitative Bioinformatics	3
BIOI 500	Advanced Bioinformatics	3
BIOI 501	Bioinformatics Seminar	1
BIOI 565	Exploring Proteins (Fall only)	3
or CHEM 465	Special Topics in Biochemistry	

Track Specific Courses (p. 1)	13
Total Hours	30

Track Specific Courses

Thesis Track

Code	Title	Hours
UNIV 370	Responsible Conduct in Research and Scholarship	0
BIOI 494	Bioinformatics Research Design	1
BIOI 499	Bioinformatics Research	8
BIOI 595	Thesis Supervision	1
+ 1 Bioinformatics Elective *		3
Total Hours		13

* *Thesis track: No stipulation regarding the department of the Bioinformatics Elective (see list below).*

Non-Thesis Track

Code	Title	Hours
BIOI 498	Bioinformatics Internship	1
+ 4 MS Bioinformatics Electives *		12
Total Hours		13

* *Non-Thesis Track: Bioinformatics Elective Courses must be selected from at least three departments.*

Bioinformatics Electives

Code	Title	Hours
Biology		
BIOL 402	Microbiology	3
BIOI 495	Special Topics in Bioinformatics (Human Genetics)	3
BIOL 482	Advanced Molec Genetics	3
BIOL 495	Special Topics (Genomics - Spring only)	3
BIOL 495	Special Topics (Human Molecular Genetics)	3
BIOL 495	Special Topics (Metagenomics - Fall only)	3
Chemistry		
CHEM 425	Special Topics in Organic Chemistry (Medicinal Chemistry)	3
CHEM 435	Special Topics in Physical Chemistry (Computational Biochemistry)	3
CHEM 455	Special Topics in Analytical Chemistry (Introduction to Spectroscopy)	3
CHEM 465	Special Topics in Biochemistry (Enzymology)	3
CHEM 465	Special Topics in Biochemistry (Plant Biochemistry)	3
CHEM 465	Special Topics in Biochemistry (Protein Crystallography)	3
Computer Science		
COMP 406	Data Mining	3
COMP 413	Intermediate Object-Oriented Development	3
COMP 439	Distributed Systems	3
COMP 460	Algorithms & Complexity	3
COMP 453	Database Programming	3
COMP 471	Theory of Programming Languages	3
COMP 479	Machine Learning	3

COMP 486	Computational Neuroscience	3
Statistics		
STAT 406	Stochastic Processes	3
STAT 407	Statistical Design	3
STAT 408	Applied Regression Analysis	3
STAT 410	Categorical Data Analysis	3
STAT 436	Topics in Biostatistics	3

Responsible Conduct of Research

All PhD students and students in thesis-based Master's degree programs must successfully complete UNIV 370 Responsible Conduct in Research and Scholarship or other approved coursework in responsible conduct of research as part of the degree requirements. It is strongly recommended that students complete this two-day training before beginning the dissertation/thesis stage of the program.

Graduate & Professional Standards and Regulations

Students in graduate and professional programs can find their Academic Policies in Graduate and Professional Academic Standards and Regulations (<https://catalog.luc.edu/academic-standards-regulations/graduate-professional/>) under their school. Any additional University Policies supersede school policies.

LEARNING OUTCOMES

In Loyola's M.S. in Bioinformatics program you will gain fundamental skills that will help you be an inquisitive scientist, including:

- a solid foundation in biological, computational, chemical, and statistical concepts and theory;
- the facility to interpret primary scientific literature;
- the capacity to employ statistical and computational methods to investigate and solve problems within the life sciences;
- the ability to conduct bioinformatics study in industry and/or the research environment; and
- science-related oral and written communication skills.