BIOINFORMATICS AND COMPUTATIONAL BIOLOGY, MS

The Master of Science in Bioinformatics and Computational Biology addresses the growing need for professionals who can analyze and interpret complex biological data using computational methods. It provides students with a specialized course of study that emphasizes advanced topics in computational biology. **This combination of skills is needed both in the pharmaceutical and biotechnology industries, as well as in biomedical research**. The program focuses on practical applications and hands-on experience, teaching students to create and modify tools for understanding biological systems.

Students in the program receive:

- Rigorous training through a curriculum that combines computational and biological sciences.
- Hands-on experience in bioinformatics techniques for analyzing biological data.
- Access to research, internship, and career development opportunities in bioinformatics.
- Personalized advising and mentoring by experienced faculty.

Coursework for this program is offered during afternoon and evening hours, allowing working students to extend their professional training. Multiple research and independent study opportunities are available; a research thesis is optional for students.

Why Pursue a Master's in Bioinformatics and Computational Biology?

Students pursuing a degree in Bioinformatics are positioned at the forefront of 21st-century biological sciences. Revolutionary advancements are transforming how we analyze, interpret, and apply vast datasets across areas such as genomics, environmental biology, biotechnology, and personalized medicine. With breakthroughs in gene sequencing, computational modeling, and machine learning, the bioinformatics field is expanding rapidly, offering diverse opportunities for professionals skilled in data-driven biological research.

At Roosevelt, we emphasize analytical and critical thinking skills by fostering high-level scholarly inquiry and rigorous research methods. Students will take courses across computational, natural science, and health informatics disciplines, developing expertise in the creation, application, and extension of bioinformatics tools and approaches to solve complex biological challenges. Students interested in programs focused on health informatics should also consider our related Master of Science in Health Informatics (https://catalog.roosevelt.edu/graduate/health-science/health-informatics-ms/#text) and our Healthcare Ethics, Analytics, and Law (https://catalog.roosevelt.edu/graduate/health-science/certificate/healthcare-ethics-analytics-certificate/) graduate certificate.

Career Connections

Graduates of the Master's in Bioinformatics and Computational Biology program will be prepared to thrive in a wide variety of professional settings, including research institutes, pharmaceutical companies, hospitals, government agencies, private companies, universities, and laboratories.

Specific job options for graduates include roles such as bioinformatics programmer, bioinformatics and genome analyst, research scientist, computational biologist, genetic data manager, software developer, sequence and genomic informatics, and clinical database specialist.

Admission

Applicants should consult the graduate admission resources (https://www.roosevelt.edu/admission/graduate/) on the Roosevelt University website for details on the application process. The graduate program director and department faculty evaluate each applicant's record of academic achievement, professional experience, and self-assessment. Weakness in one or more areas of preparation does not preclude a positive admission decision. Admissions decisions are at the discretion of the graduate program director or department chair.

APPLICATION MATERIALS

REQUIRED DOCUMENTS

- **Graduate application**: Application (https://applyru.roosevelt.edu/apply/) to the College of Science, Health and Pharmacy at Roosevelt University.
- **Transcript(s)**: Unofficial transcripts from all undergraduate and graduate institutions attended. International applicants must submit official transcripts, and all applicants must have official transcripts on file before starting graduate studies.
- **Proof of English language proficiency** (for international students): See the University English Language Proficiency requirement (https://www.roosevelt.edu/admission/international/english-language-proficiency/) for details. Applicants may receive an admissions decision if this requirement is not met but may need to complete ELP coursework before beginning graduate studies.

Optional Documents

- **Resume/Curriculum vitae**: Include a detailed account of academic and extracurricular experiences, including employment, teaching, leadership, and research.
- **Letter of intent**: A brief (one-page) personal statement outlining personal and professional goals.
- **Letter of recommendation**: Referees may include professors, academic advisors, employment supervisors, or others familiar with the applicant's preparation for graduate study.
- **Official GRE, MCAT, PCAT, or DAT score**: Official score from one of the graduate admissions tests, no more than three years old.

Prerequisites

Applicants to the MS in Bioinformatics and Computational Biology program must hold a bachelor's degree with a minimum cumulative GPA of 2.75 (4.0 scale) in a science, health, mathematics, computer science, or related field.

- **Natural Science Foundation:** For students with a primary degree in biology, biochemistry, chemistry, or a related natural science field who will be obtaining foundational computational coursework.
  - **Natural Science Required courses**: General Chemistry (2 courses), Organic Chemistry (1 course), Cellular/Molecular Biology (1 course), and Statistics (1 course).
- **Computational Foundation:** For students with a primary degree in computer science, mathematics, or a related computational field who will be obtaining foundational coursework in natural science.
  - **Computational Required courses:** Programming Fundamentals (2 courses), Data Structures and Algorithms (1 course), Discrete Mathematics (1 course), and Statistics (1 course).

Due to the rapidly changing nature of this field, computing courses taken more than four years ago may not count toward degree requirement.

Students lacking prerequisite coursework may be admitted provisionally until outstanding courses have been completed satisfactorily (grade of B- or better). Prerequisite courses cannot be applied toward the requirements for the master's degree.

Credit Policies

Graduate transfer credit (up to 9 credit hours) may be applied to the MS Bioinformatics and Computational Biology degree within one semester of admission. Credits from a previously earned degree are not transferable. Exceptions to specific course requirements may be granted to students who have previously completed graduate coursework in a related area and maintain good academic standing after one semester of study at Roosevelt. All transfer credits and exceptions must be approved by the graduate program director or department chair.

Advising

New students must consult with a graduate student advisor upon admission to the program. Each graduate student is required to meet with a faculty advisor at least once each semester to select appropriate courses for the following semester. Continuing students who have completed at least one semester of graduate study (or six credit hours) with a grade average of 3.0 or higher should consult with their advisors to discuss research, internship, independent study, and other experiential learning opportunities.

Do you want to explore how bridge courses might be included here?

The Master of Science degree in Bioinformatics and Computational Biology requires a minimum of 36 credit hours, with at least 27 credit hours completed at Roosevelt University. Students who lack foundational prerequisites must complete 9 credits in the corresponding foundational courses, which are applied towards the degree. In addition to the foundational courses, the program consists of 9 credits in core bioinformatics courses, at least 6 credits of natural science electives, at least 6 credits of computational electives, at least 3 credits of health informatics electives, and 3 credits of independent research. Students interested in health informatics should also consider our related Master of Science in Health Informatics (https://catalog.roosevelt.edu/graduate/health-science/health-informatics-ms/#text) or our Healthcare Ethics, Analytics, and Law (https://catalog.roosevelt.edu/graduate/health-science/certificate/healthcare-ethics-analytics-certificate/) graduate certificate. Each student will collaborate with a faculty advisor to create an individualized academic plan.

Computational Foundational Courses

Code	Title	Credit Hours
Required for students without a Computation Foundation. Select three of the following courses:		**9**
CST 280	INTRODUCTION TO ALGORITHMS	
CST 354	INTRODUCTION TO PROGRAMMING	
MATH 245	DISCRETE STRUCTURES	
MATH 246	LINEAR ALGEBRA	

Natural Science Foundational Courses

Code	Title	Credit Hours
Required for students without a Natural Science Foundation. Select three of the following courses:		**9**
BIOL 202	ECOLOGY, EVOLUTION, AND GENETICS (Lecture Only)	
BIOL 301	CELLULAR &MOLECULAR BIOLOGY (Lecture Only)	
CHEM 201	GENERAL CHEMISTRY I (Lecture Only)	

Required Courses:

Code	Title	Credit Hours
Core Bioinformatics Course - Select three of the following courses:		**9**
BIOL 453	MOLECULAR BIOLOGY	
BIOL 463	INTRODUCTION TO GENOME ANALYSIS	
CST 436	COMPUTING WITH DATA IN PYTHON	
CST 467	WEB-BASE DATABASE APPLICATIONS	
Electives		
Students must complete a minimum of 6 credits in natural science electives, 6 credits in computational electives, and 3 credits in health informatics electives from the following options, or other approved courses as advised:		
Natural Science Electives		**6**
BCHM 455	BIOCHEMISTRY	
BIOL 418	BIOSTATISTICS	
BIOL 425	VIROLOGY	
BIOL 450	CANCER BIOLOGY	
BIOL 451	GENERAL GENETICS	
BIOL 458	CELL BIOLOGY	
BIOL 467	IMMUNOLOGY	
BIOL 480	APPLICATIONS OF BIOTECHNOLOGY	
BIOL 483	SPECIAL TOPICS IN BIOLOGY	
CHEM 436	ANALYTICAL CHEMISTRY	
CHEM 452	MEDICINAL CHEMISTRY	
Computational Electives		**6**
CST 405	ALGORITHM DESIGN	
CST 406	BIG DATA	
CST 411	INTELLIGENCE SYSTEMS	
CST 421	DATA MINING	
or MATH 409	DATA MINING	
CST 423	GAME THEORY AND APPLICATIONS	
CST 436	COMPUTING WITH DATA IN PYTHON	
CST 461	DEEP LEARNING	
CST 486	INFORMATION RETRIEVAL	
MATH 428	LINEAR PROGRAMMING & OPTIM	
MATH 449	REGRESSION & TIME SERIES	
ECON 436	QUANTITATIVE ANALYSIS FOR MANAGERS	
Health Informatics Electives		**0-3**
HIN 430	HIN PYTHON PROGRAMMING	
HIN 440	ADVANCED DATA MANAGEMENT & ANALYTICS IN HEALTHCARE	
HIN 450	DATA SCIENCE AND STATISTICS	

INFS 412	DATABASE SYSTEMS	
Capstone Project: [1]		**3**
BIOL 492	RESEARCH IN BIOLOGY	
or BIOL 491	BIOLOGY INTERNSHIP	
Total Credit Hours		**24-27**

[1] Students will complete a graduate capstone project, engaging in independent research (BIOL 492 RESEARCH IN BIOLOGY) or project-based coursework under the guidance of a faculty member. The capstone project may involve developing a practical tool or resource, such as a web-based application or database, in collaboration with a sponsoring faculty member. The goal is to demonstrate the ability to apply bioinformatics concepts to real-world problems while building a portfolio-ready product.
Students will present their work at internal research events, such as department seminars or symposiums, providing an opportunity to communicate their findings and solutions to the academic community.
The capstone project may be completed in a single term for 3 credit hours or incrementally for a total of 3 credit hours.
Students may alternatively complete an internship (BIOL 491 BIOLOGY INTERNSHIP) as part of their capstone experience, provided the internship incorporates significant independent bioinformatics work and results in a portfolio-ready deliverable.

Students with Computational Background

Your degree map is a general guide suggesting courses to complete each term on the academic pathway to your degree. It is based on the most current scheduling information from your academic program. Your program's degree map is reviewed annually and updated as schedules change (although you retain the same course requirements as long as you are continuously enrolled in your degree program).

Always work closely with your academic advisor to understand curriculum requirements and scheduling, as each student's academic plan can look slightly different.

Year 1

Fall	Credit Hours Spring	Credit Hours
CHEM 201[1]	3 BIOL 202[1]	3
BIOL 301[1]	3 BIOL 463	3
BIOL 480	3 CST 467	3
	9	**9**

Year 2

Fall	Credit Hours Spring	Credit Hours
BIOL 418	3 BIOL 453	3
BIOL 451	3 CST 461	3
CST 436	3 BIOL 492	3
	9	**9**

Total Credit Hours 36

[1] Lecture Only

Students with Biological Backgrounds

Your degree map is a general guide suggesting courses to complete each term on the academic pathway to your degree. It is based on the most current scheduling information from your academic program. Your program's degree map is reviewed annually and updated as schedules change (although you retain the same course requirements as long as you are continuously enrolled in your degree program).

Always work closely with your academic advisor to understand curriculum requirements and scheduling, as each student's academic plan can look slightly different.

Year 1

Fall	Credit Hours Spring	Credit Hours
MATH 245	3 CST 354	3
CST 280	3 MATH 246	3
BIOL 480	3 BIOL 453	3
	9	**9**

Year 2

Fall	Credit Hours Spring	Credit Hours
BIOL 418	3 BIOL 463	3
BIOL 451	3 CST 467	3
CST 436	3 BIOL 492	3
	9	**9**

Total Credit Hours 36