BIOINFORMATICS AND COMPUTATIONAL BIOLOGY, M.S.

The use of computational techniques and information systems has revolutionized research in the biological sciences — from the analysis of DNA sequences and the understanding of gene expression and regulation to the structural modeling of proteins and RNAs and the evolutionary relationship between species. Saint Louis University's Master of Science in Bioinformatics and Computational Biology program brings together expertise from SLU in biology, chemistry, computer science, mathematics and statistics, biochemistry and molecular biology. Students in our program learn how to apply computational techniques to answer complex research questions.

Curriculum Overview

The 30-credit bioinformatics and computational biology program is designed for students with academic backgrounds in the life sciences, mathematics, computer science, health sciences, engineering and statistics. The curriculum consists of a mix of required courses that build a strong foundation in bioinformatics and computational biology and elective classes that allow students to specialize in their expertise. Full-time students can complete the program in 18 to 24 months. Part-time students are welcome in the program.

Fieldwork and Research Opportunities

Students in the bioinformatics and computational biology program must complete a research experience or internship. This experience can be with faculty at SLU or other academic institutions or at a biotechnology company. This requirement gives our M.S. students the opportunity for hands-on experience working with academic researchers or private industry.

Careers

There are many employment opportunities for graduates with a Master of Science in Bioinformatics and Computational Biology in the biotechnology, pharmaceutical, health care and software industries, as well as in academic, private and governmental research labs. St. Louis is home to many large and small biotech firms and is a national leader in biotech startups. St. Louis has medical schools at Saint Louis University and Washington University and is home to the Donald Danforth Plant Science Center, a world leader in plant and life sciences.

Admission Requirements

A bachelor's degree in biology, biochemistry, computer science, engineering, health science, mathematics, statistics or a similar scientific field is required. The faculty admissions committee considers the applicant's prior coursework or experience in genetics, biology and computer programming when determining the required coursework.

Application Requirements

- Application completion
- Transcript(s)
- One letter of recommendation is required; two more are optional
- Résumé
- Statement of professional goals
- GRE general test scores are optional

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Requirements for International Students

All Saint Louis University admission policies and requirements for domestic students apply to international students. International students applying to SLU must also meet the following additional requirements:

- Demonstrate English language proficiency (https://catalog.slu.edu/academic-policies/office-admission/undergraduate/english-language-proficiency/)
- Academic records must include an English translation. Unofficial copies may be accepted in some cases for initial admission review, however official copies must be received prior to enrollment. Course-by-course transcript evaluations are accepted and are required in some cases.

Students must submit financial documents to be issued an I-20 for their F-1 visa application. Proof of financial support must include:

- A letter of financial support from the person(s) or sponsoring agency funding the student's time at Saint Louis University
- A letter from the sponsor's bank verifying that the funds are available and will be so for the duration of the student's study at the University

Application Deadlines

- April 15 for Fall and November 15 for Spring

Tuition

Tuition	Total Program Cost
MS Bioinformatics and Computational Biology	$42,000

Additional charges may apply. Other resources are listed below:

Information on Tuition and Fees (https://catalog.slu.edu/academic-policies/student-financial-services/tuition/)

Miscellaneous Fees (https://catalog.slu.edu/academic-policies/student-financial-services/fees/)

Information on Summer Tuition (https://catalog.slu.edu/academic-policies/student-financial-services/tuition-summer-current/)

Scholarships, Assistantships and Financial Aid

Scholarships are available to both U.S. and international students. Research assistantships are offered to select second-year students working on faculty research projects.

Applicants should complete their applications by the program admission deadlines for priority consideration for scholarships.

For information about financial aid, visit the Office of Student Financial Services (https://www.slu.edu/financial-aid/).

Learning Outcomes

1. Graduates will be able to design and implement in silico experiments for biological problems.

2. Graduates will be able to apply and combine existing tools for processing and analysis of biological data sets.
3. Graduates will be able to use small- and large-scale quantitative data sets to model complex biological systems.
4. Graduates will be able to work as part of multidisciplinary teams in corporate or academic environments.
5. Graduates will be able to effectively communicate research approaches and findings.

Requirements

Code	Title	Credits
Required Courses		
BCB 5200	Introduction Bioinformatics I	3
BCB 5250	Introduction Bioinformatics II	3
BCB 5300	Algorithms in Computational Biology	3
BCB 5810	Bioinformatics Colloquium	1
BIOL 5030	Genomics	3
Internship/Research Experience		**1-3**
Select one of the following:		
BCB 5910	Bioinformatics Internship	
BCB 5970	Research Topics	
BIOL 5970	Research Topics	
CHEM 5970	Research Topics	
CSCI 5970	Research Topics	
Bioinformatics & Computational Biology Electives		**14-16**
Select remaining courses to reach 30 credits:		
BIOL 5050	Molecular Techniques Lab	
BIOL 5070	Advanced Biological Chemistry	
BIOL 5080	Advanced Cell Biology	
BIOL 5090	Biometry	
BIOL 5190	Geographic Information Systems in Biology	
BIOL 5430	Advanced Principles of Virology	
BIOL 5520	Biochemical Pharmacology	
BIOL 5700	Advanced Molecular Biology	
BIOL 5780	Molecular Phylogenetic Analysis	
BME 5130	Medical Imaging	
BME 5150	Brain Computer Interface	
CHEM 5370	Computational Chemistry	
CHEM 5470	Medicinal Chemistry	
CHEM 5610	Biochemistry 1	
CHEM 5615	Biochemistry 2	
CHEM 5620	Biophysical Chemistry	
CSCI 5030	Principles of Software Development	
CSCI 5300	Software Engineering	
CSCI 5360	Web Technologies	
CSCI 5610	Concurrent and Parallel Programming	
CSCI 5620	Distributed Computing	
CSCI 5710	Databases	
CSCI 5730	Evolutionary Computation	
CSCI 5740	Introduction to Artificial Intelligence	
CSCI 5750	Introduction to Machine Learning	
CSCI 5760	Deep Learning	
CSCI 5830	Computer Vision	
HDS 5310	Analytics, Statistics & Visualization Methods in Health Data Science	
HDS 5330	Predictive Modeling and Health Machine Learning	
MATH 5021	Introduction to Analysis	
MATH 5023	Multivariable Analysis	
MATH 5080	Probability Theory	
STAT 5084	Time Series	
STAT 5085	Mathematical Statistics	
STAT 5087	Applied Regression	
STAT 5088	Bayesian Statistics and Statistical Computing	
Total Credits		**30**

Continuation Standards

Students must maintain a cumulative grade point average (GPA) of 3.00 in all graduate/professional courses.

Prerequisite Courses

The following courses may be required to fill in missing prerequisite coursework, such as data structures. These prerequisite courses do not count toward the 30 credits needed for graduation.

- General Biology: Information Flow and Evolution (BIOL 1240)/Principles of Biology I Laboratory (BIOL 1245)
- General Biology: Transformations of Energy and Matter (BIOL 1260)/Principles of Biology II Laboratory (BIOL 1265))
- General Chemistry 1 (CHEM 1110)/General Chemistry 1 Laboratory (CHEM 1115)
- General Chemistry 2 (CHEM 1120)/General Chemistry 2 Laboratory (CHEM 1125))
- Biochemistry and Molecular Biology (BIOL 3020) or Cell Structure & Function (BIOL 3040)
- Principles of Genetics (BIOL 3030)
- Introduction to Object-Oriented Programming (CSCI 1300)
- Data Structures (CSCI 2100)
- Calculus I (MATH 1510)
- STAT 1300 Elementary Statistics with Computers (3 cr), Foundation of Statistics (MATH 3850) or Mathematical Statistics (MATH 4850)

Students may complete these prerequisites as part of the program, but the courses will not count toward the 30 credits required for the degree.

Roadmap

This roadmap is just one example of a semester-by-semester plan of study for this program. There are other plans students can and do take. The plan of study for each particular student is established in consultation with each student's academic advisor; *this roadmap does not replace academic advising appointments.*

Roadmap notes:

- This Roadmap assumes full-time enrollment unless otherwise noted.
- Courses/Milestones marked with an "!" are critical and must be completed in the semester listed in the Roadmap to ensure a timely graduation.
- Course availability and sequencing are subject to change.

Course	Title	Credits
Year One		
Fall		
BCB 5200	Introduction Bioinformatics I	3
BIOL 5030	Genomics	3
	Credits	**6**
Spring		
BCB 5250	Introduction Bioinformatics II	3
BCB Electives		6
	Credits	**9**
Summer		
BCB 5910	Bioinformatics Internship	2
	Credits	**2**
Year Two		
Fall		
BCB 5300	Algorithms in Computational Biology	3
BCB 5810	Bioinformatics Colloquium	1
BCB Elective		3
	Credits	**7**
Spring		
BCB Electives		6
	Credits	**6**
	Total Credits	**30**

Contact Us

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For questions about the program or application process, please contact:

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