

BIOINFORMATICS - MASTER OF SCIENCE

The degree requirements include 30-31 graduate credit hours. The degree has **two tracks**, one for students with non-computing background and another for students with Computer Science background. The requirements for each track are structured as follows.

Track: Non-Computing Background

Prefix	Title	Credits
Required Courses		
<i>Core Courses</i>		
BIOL 550	Special Topics (Command Line Bioinformatics)	3
A ST 505	Statistical Inference I	4
C S 453	Python Programming I	3
BIOL 550 or C S 458	Special Topics (R for ecological sciences) R Programming I	3
C S 509	Bioinformatics Programming	3
C S 508 or C S 519	Introduction to Data Mining Applied Machine Learning I	3
<i>Elective Courses (2 from the following list)</i>		6
C S 462	Object Oriented Programming Transition	
C S 516	Bioinformatics	
C S 586	Algorithms in Systems Biology	
GENE 452 or BIOL 566	Applied Bioinformatics Advanced Bioinformatics and NCBI Database	
A ST 550	Special Topics (Statistical bioinformatics course)	
A ST 550	Special Topics (Current topics in bioinformatics - open issues)	
<i>Master's Project/Thesis/Internship</i> ¹		6
C S 598 or C S 599	Master's Project Master's Thesis	
Total Credits		31

¹ A student can write a thesis (C S 599 Master's Thesis), undertake a research project (C S 598 Master's Project), or participate in an internship related to the degree. In each case, six graduate credits are required and a written approval from the student's advisor must be obtained before the student undertakes this part of the study. For students with thesis or project, the students are required to sustain a final exam, covering the thesis/research project.

² One course to cover prerequisites to enter GENE 315 Molecular Genetics and BCHE 341 Survey of Biochemistry is required.

Track: Computer Science Background

Prefix	Title	Credits
Required Courses ²		
C S 508	Introduction to Data Mining	3
C S 509	Bioinformatics Programming	3
C S 570	Analysis of Algorithms	3
C S 586	Algorithms in Systems Biology	3
C S 581	Advanced Software Engineering	3
Select one from the following:		3
C S 516	Bioinformatics	

GENE 452	Applied Bioinformatics	
BIOL 566	Advanced Bioinformatics and NCBI Database	
<i>Elective Courses (2 from the following list)</i>		6
A ST 505	Statistical Inference I	
A ST 506	Statistical Inference II	
BCHE 546	Biochemistry II	
BCHE 649	Topics in Biochemistry	
BIOL 474	Immunology	
BIOL 475	Virology	
BIOL 478	Molecular Biology of Microorganisms	
BIOL 490	Neurobiology	
BIOL 520	Molecular Cell Biology	
BIOL 566	Advanced Bioinformatics and NCBI Database	
C S 502	Database Management Systems I	
C S 505	Artificial Intelligence I	
C S 516	Bioinformatics	
C S 521	Parallel Programming	
C S 575	Artificial Intelligence II	
C S 582	Database Management Systems II	
GENE 452	Applied Bioinformatics	
GENE 486	Genes and Genomes	
MOLB 542	Biochemistry I	
MOLB 546	Biochemistry II	
MOLB 590	Discussions in Molecular Biology	
<i>Master Thesis/Project/Internship</i> ¹		6
C S 599 or C S 598	Master's Thesis Master's Project	
Total Credits		30

¹ A student can write a thesis (C S 599 Master's Thesis), undertake a research project (C S 598 Master's Project), or participate in an internship related to the degree. In each case, six graduate credits are required and a written approval from the student's advisor must be obtained before the student undertakes this part of the study. For students with thesis or project, the students are required to sustain a final exam, covering the thesis/research project.

² One course to cover prerequisites to enter GENE 315 Molecular Genetics and BCHE 341 Survey of Biochemistry is required.

Degree Road Map

- **For students with non-computing background**
 - Semester 1: Command Line bioinformatics, C S 458 R Programming I, A ST 505 Statistical Inference I
 - Semester 2: C S 453 Python Programming I, one elective course, C S 509 Bioinformatics Programming
 - Semester 3: C S 508 Introduction to Data Mining, Master's project/thesis/internship (3 credits), one elective
 - Semester 4: Master's project/thesis/internship (3 credits)
- **For students with Computer Science background**
 - Semester 1: The course to cover the prerequisites to enter GENE 315 Molecular Genetics and BCHE 341 Survey of Biochemistry, A ST 505 Statistical Inference I, C S 508 Introduction to Data Mining
 - Semester 2: C S 509 Bioinformatics Programming, GENE 315 Molecular Genetics, BCHE 341 Survey of Biochemistry

- Semester 3: Master's project/thesis/internship (3 credits), two electives
 - Semester 4: Master's project/thesis/internship (3 credits)

Elective Course ¹	3
Credits	6
Total Credits	33

A Suggested Plan of Study for Students (with non-computing background)

It is only a suggested plan of study for students and is not intended as a contract. Course availability may vary from fall to spring semester and may be subject to modification or change.

Semester 1		Credits
C S 458	R Programming I	3
A ST 505	Statistical Inference I	4
Command Line Bioinformatics		3
Credits		10
Semester 2		Credits
C S 453	Python Programming I	3
C S 509	Bioinformatics Programming	3
Elective Course		3
Credits		9
Semester 3		Credits
C S 508	Introduction to Data Mining	3
Elective Course		3
Master's Project/thesis or internship		3
Credits		9
Semester 4		Credits
Master's project/thesis or internship		3
Credits		3
Total Credits		31

A Suggested Plan of Study for Students (with a Computer Science background)

It is only a suggested plan of study for students and is not intended as a contract. Course availability may vary from fall to spring semester and may be subject to modification or change.

Semester 1		Credits
C S 508	Introduction to Data Mining	3
C S 509	Bioinformatics Programming	3
BIOL 566	Advanced Bioinformatics and NCBI Database	3
Credits		9
Semester 2		Credits
C S 516	Bioinformatics	3
C S 570	Analysis of Algorithms	3
GENE 452	Applied Bioinformatics	3
Credits		9
Semester 3		Credits
C S 581	Advanced Software Engineering	3
C S 586	Algorithms in Systems Biology	3
Elective Course ¹		3
Credits		9
Semester 4		Credits
Master's project/thesis or internship		3