

BIOINFORMATICS - MASTER OF SCIENCE

The Master of Bioinformatics degree has two tracks, a track for students without a BS/BA in computer science or equivalent degree (Track: *Non-Computing Background*) and a track for students with a BS/BA in computer science or equivalent degree (Track: *Computer Science Background*). In each of the track, two options are available, one with **thesis or project** option and a **course-work only** option.

- For **Thesis/Project option's students**: the requirements are listed in the tables below.
- For **Course-Work Only option's students**: Each student following this option is not required to complete a Thesis/Project but needs to take, in addition to the basic requirement (Core + Elective courses), **9 credits** of graduate courses that are listed for each track with the following restrictions:
 - One course can only be used to satisfy one requirement (e.g., if a course used to satisfy the core requirement category, it cannot be counted towards satisfying the requirements on **9 credits**).
 - At most 6 credits of CSCI 5996 Special Topics with different topics (i.e., with different subtitles) can be counted towards the degree program of the student.
 - No independent research or thesis/project (e.g., Computer Science course numbered > 5888) can be counted towards the degree program.

Track: Non-Computing Background

Prefix	Title	Credits
Required Courses		
<i>Core Courses</i>		
BIOL 550	Special Topics (Command Line Genomics)	3
A ST 505	Statistical Inference I	4
CSCI 4520	Python Programming I	3
BIOL 550 or CSCI 4530	Special Topics (R for ecological sciences) R Programming I	3
CSCI 5310	Bioinformatics Programming	3
Select one of the following		3
CSCI 5415	Introduction to Data Mining	
CSCI 5420	Applied Machine Learning I	
CSCI 5860	Algorithms in Systems Biology	
<i>Elective Courses (2 from the following list)</i>		6
CSCI 4545	Object Oriented Programming Transition	
CSCI 5305	Bioinformatics	
CSCI 5860	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
CSCI 5994 or CSCI 5999	Master's Project Master's Thesis	
Total Credits		31

¹ A student can write a thesis (CSCI 5999 Master's Thesis), undertake a research project (CSCI 5994 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.

Track: Computer Science Background

Prefix	Title	Credits
Required Courses ²		
CSCI 5415	Introduction to Data Mining	3
CSCI 5310	Bioinformatics Programming	3
CSCI 5505	Analysis of Algorithms	3
CSCI 5860	Algorithms in Systems Biology	3
CSCI 5810	Advanced Software Engineering	3
Select one from the following:		3
CSCI 5305	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: Central and Intermediary Metabolism	
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	
CSCI 5140	Database Management Systems I	
CSCI 5405	Artificial Intelligence I	
CSCI 5305	Bioinformatics	
CSCI 5215	Parallel Programming	
CSCI 5750	Artificial Intelligence II	
CSCI 5820	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
CSCI 5999 or CSCI 5994	Master's Thesis Master's Project	
Total Credits		30

¹ A student can write a thesis (CSCI 5999 Master's Thesis), undertake a research project (CSCI 5994 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.

Degree Road Map

- **For students with non-computing background**
 - Semester 1: BIOL 550 Special Topics (Command Line Genomics), CSCI 4530 R Programming I, A ST 505 Statistical Inference I
 - Semester 2: CSCI 4520 Python Programming I one elective course, CSCI 5310 Bioinformatics Programming
 - Semester 3: CSCI 5860 Algorithms in Systems Biology, Master's project/thesis/internship (3 credits), one elective
 - Semester 4: Master's project/thesis/internship (3 credits)
 - For students following the **Course Work Only** option, the Master's project/thesis/internship course in Semester 3 and 4 should be changed to a course on the list and an extra course in Semester 4.
- **For students with Computer Science background**
 - Semester 1: CSCI 5505 Analysis of Algorithms, CSCI 5305 Bioinformatics, A ST 505 Statistical Inference I
 - Semester 2: CSCI 5310 Bioinformatics Programming, CSCI 5415 Introduction to Data Mining ,CSCI 5810 Advanced Software Engineering
 - Semester 3: Master's project/thesis/internship (3 credits), CSCI 5860 Algorithms in Systems Biology, and an elective
 - Semester 4: Master's project/thesis/internship (3 credits)
 - For students following the **Course Work Only** option, the Master's project/thesis/internship course in Semester 3 and 4 should be changed to a course on the list and an extra course in Semester 4.

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
CSCI 4530	R Programming I	3
A ST 505	Statistical Inference I	4
BIOL 550	Special Topics (Command Line Genomics)	1-3
Credits		8-10
Semester 2		Credits
CSCI 4520	Python Programming I	3
CSCI 5310	Bioinformatics Programming	3
Elective Course		3
Credits		9
Semester 3		Credits
CSCI 5415	Introduction to Data Mining	3
CSCI 5860	Algorithms in Systems Biology	3
Master's Project/Thesis or Internship		3
Credits		9

Semester 4		Credits
Master's project/thesis or internship		3
Credits		3
Total Credits		29-31

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
CSCI 5415	Introduction to Data Mining	3
CSCI 5310	Bioinformatics Programming	3
BIOL 566	Advanced Bioinformatics and NCBI Database	3
Credits		9
Semester 2		Credits
CSCI 5305	Bioinformatics	3
CSCI 5505	Analysis of Algorithms	3
GENE 452	Applied Bioinformatics	3
Credits		9
Semester 3		Credits
CSCI 5810	Advanced Software Engineering	3
CSCI 5860	Algorithms in Systems Biology	3
Elective Course ¹		3
Credits		9
Semester 4		Credits
Master's project/thesis or internship		3
Elective Course ¹		3
Credits		6
Total Credits		33