Requirements for Biology M.S. Program with Interdisciplinary Emphasis in Bioinformatics

Bioinformatics has grown from the creation of large biological databases that required computational approaches for efficient manipulation and analysis to a multi-faceted discipline that also includes microarray technology, statistical analysis, and molecular modeling. We offer Non-Thesis and Thesis options for this interdisciplinary degree. The Non-Thesis option requires a minimum of 40 semester hours of coursework and a Non-Thesis report. The Thesis option requires a minimum of 26 hours of coursework and 14 credit hours of research.

Coursework must include:

a. One course in biochemistry of at least 3 hours [normally Chem 6600 (5 hours) or 6610 (3 hours)] although higher-level courses may be selected. This requirement may be waived if the student has successfully passed an equivalent undergraduate course with a B or better (in case that the biochemistry work is waived, the student must still complete requisite hours of coursework).

b. Biol 6564 (Advanced Genetics), 4 hours.

c. Biol 6640 (Fundamental of Bioinformatics), 4 hours.

d. Biol 8700 (Graduate Research Seminar), 2 hours.

e. Fifteen hours of interdisciplinary coursework to be selected from among the following:

CSc 7350  Programming for Bioinformatics, (3) \(\rightarrow\) CSc 2301 - Computer Programming for Non-Majors
CSc 7351  System Programming for Bioinformatics (3) \(\rightarrow\) CSc 3320 - System-Level Programming
CSc 7352  Data Structure for Bioinformatics (3) \(\rightarrow\) CSc 2302 - Computer Programming II for Non-Majors
CSc 6310  Parallel and Distributed Computing (4)
(Prerequisites: CSc 7350 (Java)(3) and CSc 7351 (C++)(3)
CSc 6730  Scientific Visualization (4)
(Prerequisites: CSc 7350 (Java)(3) and CSc 7351 (C++)(3)
CSc 6350  Software Engineering (4)
(Prerequisites: CSc 7352 (Data Structure)(3), CSc 7350 and 7351 are prerequisites for CSc 7352)
CSc 6710  Database Systems (4)
(Prerequisites: CSc 7352 (Data Structure)(3), CSc 7350 and 7351 are prerequisites for CSc 7352)
CSc 8630 Advanced Bioinformatics (prerequisites Bio 6640 or equivalent and CSc 7352)
CSc 8710 Deductive Databases and Logic Programming (4) (Prerequisites: CSc 6710)
Math 6544 Biostatistics (3)
Math 6548 Methods of Variance and Analysis of Regression (3) (Prerequisites: Math 6544 or Biol 6744 (Biostatistics))
Stat 8050 Statistics for Bioinformatics (Prerequisites: Math 6544 or Biol 6744)
Stat 8540 Multivariable Methods in Biostatistics (3) (Prerequisites: Math 6544 or Biol 6744)

Non-Thesis option
1. 13 hours of electives which may include:
   a. Biology courses including four hours of research (Biol 8800)
   b. Chem 6110 (Physical Chemistry, 2 hours) and Chem 6450 (Molecular Modeling, 2 hours); Prerequisite: Chem 6110
   c. Additional computer science or math and statistics courses in excess of the 12 hour requirement.
   d. Bio 8888 (Laboratory or Literature-Based Research Paper)
      The guidelines for the research paper are similar to those for the Biology M.S. Non-Thesis research paper; however, one of the committee members must be from the math or computer science department.

Thesis option
1. An approved and successfully defended Thesis proposal. The guidelines for the written proposal and oral defense are similar to those for the written proposal and oral defense are similar to those for the Biology M.S. Thesis proposal; however, the Thesis topic must be in the area of bioinformatics and one of the Thesis committee members must be from the math or computer science department.
2. Fourteen hours Biol 8999 (Thesis Research).
3. A Thesis on research that incorporates bioinformatics.
4. A final oral presentation directed primarily to defense of the Thesis.