Interdisciplinary Studies: Bioinformatics
Winn Haynes

Bioinformatics is a relatively new and rapidly growing discipline. As technologies to gather information about biological processes develops, traditional tools for biological analysis are simply overwhelmed. Bioinformatics combines the ideas of mathematics and computer science to analyze many aspects of biology. Prominent areas of research include genetic sequence analysis, computational evolutionary biology, and protein structure prediction.
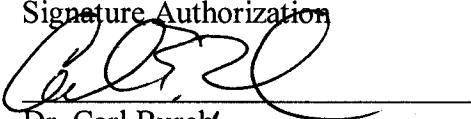
Research in bioinformatics entails an advanced knowledge of a diversity of disciplines. Due to the advanced knowledge required, a graduate degree is necessary to pursue a career in bioinformatics. Since the goal of this major is to prepare one to enter into the study of bioinformatics, the major needs to fit into the admission requirements for graduate programs. In the design of this major, the admissions requirements into the graduate bioinformatics programs at Duke University, Carnegie Mellon University, and Stanford University were examined.

Comparable undergraduate majors at the Rochester Institute of Technology and the University of California at Santa Cruz along with the previously mentioned graduate admission requirements were used as a framework for designing this major. A consistent theme amongst these programs was the integration of upper-level courses in biology, mathematics, and computer science along with some more basic chemistry courses. When choosing biology courses, courses with a microbiological focus were particularly pertinent to current work in bioinformatics. These especially included courses in genetics and cell biology. The upper level computer science courses required from the different universities focused on algorithms and databases. The mathematics courses focused on the diversity mathematical approaches that are utilized to solve and analyze biological data. Every program, both undergraduate and graduate, that was examined requested a probability and statistics course along with varying levels of calculus and
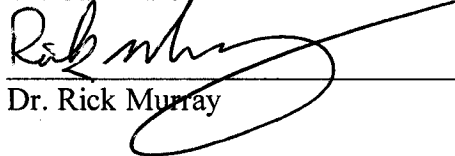
linear algebra. In addition, some lower level work in chemistry was required by every program.

The mathematics or computer science senior capstone was chosen as the required senior capstone experience course. These capstones are appropriate for this major since either one requires the completion of a final research project which is written and presented. A bioinformatics project would fit neatly into the same guidelines because any research in bioinformatics intrinsically requires the use of computer science and mathematics. Enrollment in either the mathematics or computer science senior seminar will be appropriately determined once the area of research for the project has been chosen.

Signature Authorization

Dr. Carl Burch

Dr. Rick Murray

All of the following:

CSCI 150	Foundations of Computer Science I
CSCI 151	Foundations of Computer Science II
CSCI 280	Algorithms and Problem Solving Paradigms
CHEM 110	General Chemistry I
CHEM 120	General Chemistry II
BIOL 150	Cell Biology
BIOL 220	Zoology
BIOL 250	Genetics
MATH 130	Calculus I
MATH 140	Calculus II
MATH 240	Discrete Mathematics

MATH 215 (Statistical Analysis) OR MATH 310 (Mathematical Probability and Statistics)
Senior Capstone Experience: MATH 497 OR CSCI 497

At least 2 of the following:

MATH 260	Differential Equations
MATH 270	Linear Algebra
MATH 260	Introduction to Advanced Mathematics
CHEM 240	Organic Chemistry I

At least four 300- or 400-level courses selected from MATH 310 and the following:

CSCI 340	Database System
CSCI 385	Scientific Computing
BIOL 310	Developmental Biology
BIOL 325	Cellular/Molecular Neuroscience
BIOL 450	Advanced Cell Biology
BIOL 460	Evolution
BIOL 470	Advanced Genetics
MATH 340	Combinatorics