

Bioinformatics and Computational Biology Graduate Program

Undergraduate Study

Undergraduates seeking a B.S. in Bioinformatics and Computational Biology should enroll in the undergraduate major BCBio, which is described in a separate section of this catalog. See Index, BCBio.

Undergraduates wishing to prepare for graduate study in Bioinformatics and Computational Biology should consider the undergraduate major in BCBio. Alternatively, they should obtain solid undergraduate training in at least one of the foundation disciplines: molecular biology, computer science, mathematics, statistics, and physics. They should also elect courses in basic biology, basic transmission and molecular genetics, chemistry, physics, mathematics at least through calculus, statistics, and computer programming.

Graduate Study

Work is offered for the master of science and doctor of philosophy degrees with a major in Bioinformatics and Computational Biology (BCB). Faculty are drawn from several departments: Agronomy; Animal Science; Astronomy and Physics; Biochemistry, Biophysics and Molecular Biology; Biomedical Sciences; Chemical and Biological Engineering; Chemistry; Computer Science; Ecology, Evolution, and Organismal Biology; Electrical and Computer Engineering; Entomology, Genetics, Development and Cell Biology; Materials Science and Engineering; Mathematics; Plant Pathology; Statistics; Veterinary Microbiology and Preventive Medicine; and Veterinary Pathology.

The BCB program emphasizes interdisciplinary training in nine related areas of focus: Bioinformatics, Computational Molecular Biology, Structural and Functional Genomics, Macromolecular Structure and Function, Metabolic and Developmental Networks, Integrative Systems Biology, information Integration and Data Mining, Biological Statistics, and Mathematical Biology. Additional information about research areas and individual faculty members is available at: www.bcb.iastate.edu.

BCB students are trained to develop an independent and creative approach to science through an integrative curriculum and thesis research projects that include both computational and biological components. First year students are appointed as research assistants and participate in BCB 697 Graduate Research Rotation, working with three or more different research groups to gain experience in both "wet" (biological) and "dry" (computer) laboratory environments. In the second year, students initiate a thesis research project under the joint mentorship of two BCB faculty mentors, one from the biological sciences and one from the quantitative/computational sciences. The M.S. and Ph.D. degrees are usually completed in two and five years, respectively.

Before entering the graduate BCB program, prospective BCB students should have taken courses in mathematics, statistics, computer science, biology, and chemistry. A course load similar to the following list would be considered acceptable:

MATH 265	Calculus III	4
STAT 341	Introduction to the Theory of Probability and Statistics I	3
COM S 207	Fundamentals of Computer Programming	3
COM S 208	Intermediate Computer Programming	3
COM S 330	Discrete Computational Structures	3
CPR E 310	Theoretical Foundations of Computer Engineering	3
CHEM 163	College Chemistry	4
CHEM 231	Elementary Organic Chemistry	3
BBMB 301	Survey of Biochemistry	3
BIOL 313	Principles of Genetics	3
BIOL 315	Biological Evolution	3

During the first year, BCB students are required to address any background deficiencies in calculus, molecular genetics, computer science, statistics and discrete structures, with specific courses determined by prior training. Among the total course requirements for Ph.D. students are four core courses in Bioinformatics:

BCB 567	Bioinformatics I (Fundamentals of Genome Informatics)	3
BCB 568	Bioinformatics II (Advanced Genome Informatics)	3

BCB 569	Bioinformatics III (Structural Genome Informatics)	3
BCB 570	Bioinformatics IV (Computational Functional Genomics and Systems Biology)	3

And also should include

GDCB 511	Molecular Genetics	
BCB 690	Student Seminar in Bioinformatics and Computational Biology	
BCB 691	Faculty Seminar in Bioinformatics and Computational Biology	
BCB 593	Workshop in Bioinformatics and Computational Biology	

M.S. students take the above background and core courses, take at least 6 credits of advanced coursework, and may elect to participate in fewer seminars and workshops. Additional coursework may be selected to satisfy individual interests or recommendations of the Program of Study Committee. All graduate students are encouraged to teach as part of their training for an advanced degree. (For curriculum details and sample programs of study, see: www.bcb.iastate.edu.)