



COMPUTATIONAL BIOLOGY AND BIOINFORMATICS

An interdisciplinary minor in computational biology and bioinformatics prepares you to understand, use and develop advanced computational methods and tools for processing, visualizing, and analyzing biological data and for modeling biological processes. You can expect the coursework to involve biosciences, computer science, engineering, mathematics, and statistics.

You will be prepared for careers in biomedical, biotechnology, agricultural, pharmaceutical and engineering fields and for related graduate studies.

Academics

PREREQUISITE COURSES

- **CHEM 109** General Chemistry I (or equivalent)
- **LIFE 120 & LIFE 120L** Fundamentals of Biology I *and* Fundamentals of Biology I laboratory
- **LIFE 121 & LIFE 121L** Fundamentals of Biology II *and* Fundamentals of Biology II Laboratory
- **MATH 106** Calculus I (or equivalent)

CORE COURSES

- **CSCE 155T** Computer Science I: Informatics Focus
- **CSCE 311** Data Structures and Algorithms for Informatics
- **BIOS 237** Basic Applications of Bioinformatics
- **STAT 218** Introduction to Statistics *or*
STAT / MATH 380 Statistics and Applications

LIFE SCIENCE COURSE

Select a course from either LS 1 or LS 2 choices, depending on your major.

LS 1 - For students in life science majors.

- **BIOS 427** Practical Bioinformatics Laboratory
- **BIOS 428** Perl Programming for Biological Applications
- **BIOS / NRES 456** Mathematical Models in Biology
- **BIOS 477** Bioinformatics and Molecular Evolution
- **STAT / BIOS 442** Computational Biology

LS 2

- **BIOS / CHEM 431** Structure and Metabolism
- **BIOS / CHEM 432** Metabolism and Biological Information
- **BIOC / AGRO / BIOS / CHEM 434** Plant Biochemistry
- **BIOS / MBIO 420** Molecular Genetics
- **BIOS 425** Plant Biotechnology
- **BIOS 429** Phylogenetic Biology
- **BIOS 472** Evolution

COMPUTER SCIENCE/MATH/STATISTICS/ ENGINEERING (CMSE) COURSE

Select a course from either CMSE 1 or CMSE 2 choices, depending on your major:

CMSE 1 - For students in computer science, math, engineering and related majors.

- **CSCE 471** Introduction to Bioinformatics

CMSE 2

- **BSEN 414** Medical Imaging Systems
- **CHME 473** Biochemical Engineering
- **CHME 474** Advanced Biochemical Engineering
- **CSCE 410** Information Retrieval Systems
- **CSCE 413** Database Systems
- **CSCE 421** Foundations of Constraint Processing
- **CSCE 423** Design and Analysis of Algorithms
- **CSCE 435** Cluster and Grid Computing
- **CSCE 456** Parallel Programming
- **CSCE 472** Digital Image Processing
- **CSCE 474** Introduction to Data Mining
- **CSCE 476** Introduction to Artificial Intelligence
- **CSCE 478** Introduction to Machine Learning
- **CSCE 479** Introduction to Neural Networks
- **ECEN 450** Bioinformatics
- **MATH 439** Mathematical Models in Biology
- **MATH 452** Graph Theory
- **STAT 412** Introduction to Experimental Design
- **STAT 450** Introduction to Regression Analysis

For a complete list of applicable courses see minor advisor.



INFORMATICS

The Informatics minor is an interdisciplinary program that prepares you with core computational skill sets and competencies that allow you to solve problems within a chosen discipline or field. The program also builds interdisciplinary problem solving skills that are applicable and advantageous across academia and within industry. The minor's objectives are anchored around a set of core outcomes, such that students completing the minor will be able to:

Apply computational thinking to solve problems effectively and implement it using a programming language; apply statistical techniques to assess outcomes of empirical studies or experiments, and set up research designs to evaluate tools, techniques or hypotheses effectively; interact, use and manage data or databases and solve data-centric problems; organize, visualize, and communicate digital data effectively and efficiently; use creative competencies to generate creative solutions; and contribute one's expertise to the solution of interdisciplinary problems by effectively collaborating and communicating with those from other disciplines.

Academics

CORE COURSES

- **CSCE 100** Introduction to Informatics
- **CSCE 311** Data Structures and Algorithms for Informatics
- **CSCE 493A** Interdisciplinary Capstone

Area 1: Computational Thinking and Programming

Select one course:

- **CSCE 155A** Computer Science I
- **CSCE 155E** Computer Science I: Systems Engineering Focus
- **CSCE 155N** Computer Science I: Engineering and Science Focus
- **CSCE 155T** Computer Science I: Informatics Focus

Area 2: Statistical and Research Design

Select one course:

- **STAT 218** Introduction to Statistics
- **ECON 215** Statistics
- **STAT / MATH 380** Statistics and Applications
- **EDPS 459** Statistical Methods
- **PSYC 350** Research Methods and Data Analysis
- **SOCI 206** Introduction to Social Research II
- **SOCI 462** Basic Regression Analysis

Select one course from either Area 3 or Area 4.

Area 3: Data Analysis and Database Techniques

- **CSCE 413** Database Systems
- **CSCE 471** Introduction to Bioinformatics
- **CSCE 474** Introduction to Data Mining
- **CSCE 478** Introduction to Machine Learning
- **STAT 318** Introduction to Statistics II
- **JOUR 407** Data Visualization

Area 4: Visualization and Creative Thinking

- **CSCE 470** Computer Graphics
- **TMFD 121** Visual Communication and Presentation
- **ARTP 189H** University Honors Seminar
- **ARTS 398** Special Topics in Studio Art III
- **MUSC 483** Music Technology: Advanced Techniques and Applications

For a complete list of applicable courses see minor advisor.