

Biocomputational Engineering (BIOC)

Courses

BIOC 213 Fundamentals of Biomedical Signals 3 Credits

Fundamentals of analysis of data obtained from common quantitative techniques, including imaging, EEG, cardiograms, and bioinformatics. Introduction to sampling, Fourier transforms, filters, clustering, and classification. Common tools for data processing and application of programming.

Prerequisites: MATH 205 and PHY 021 and BIOE 210

Can be taken Concurrently: BIOE 210

BIOC 214 Fundamentals of Biological Modeling 3 Credits

Introduction to quantitative biology approaches through modeling. Practical methods of applying basic mathematical modeling and programming. Topics include linear and non-linear models, DNA and protein structures, ligand-receptor binding, reaction kinetics, electrical and mechanical cell dynamics, gene regulatory models, and fundamentals of epidemiology.

Prerequisites: MATH 205 and CSE 017 and PHY 021

BIOC 236 Biomolecular Modeling and Simulation 3 Credits

Concepts, methods, and tools for biomolecular modeling and simulation. Topics include molecular mechanics, minimization, molecular dynamics, Monte Carlo simulation, explicit and implicit solvation, continuum electrostatics, advanced sampling techniques, and free energy calculations. Overviews provided for UNIX operating system, text editors, Python programming, and Protein Data Bank. Lectures and hands-on practice with tools in CHARMM-GUI.

Concepts, algorithms, and applications to current biological problems. Students may not earn credit for both this course and BIOS 237.

Prerequisites: CSE 017

BIOC 240 Biocomputational Engineering - Capstone 1 3 Credits

Students work in teams on design projects in which they will integrate and apply concepts from numerous courses in the Biocomputational Engineering curriculum. Projects have constraints, including technical feasibility, engineering standards, and economic analysis, as well as global and/or social impact.

Prerequisites: BIOC 214 and BIOC 236

BIOC 241 Biocomputational Engineering - Capstone 2 3 Credits

Students continue their work on Biocomputational Engineering design projects from BIOC 240. Designs from the previous semester will be further developed, such that they have more technical depth and adhere to established constraints and standards.

Prerequisites: BIOC 240