BIOMEDICAL ENGINEERING (BME)

BME 504: Numerical Methods for Chemists and Engineers

3 Credits

CHEM 504 is a 3-credit course designed to give graduate students an overview of basic numerical techniques. After completion of the course, the students will be able to perform simple computational tasks. The emphasis will be given to numerical solutions of ordinary and partial differential equations relevant to the chemical and biomedical research, such as reaction kinetics and transport phenomena. This 500-level course will contribute to the student¿s ability to expand the frontiers of knowledge, to perform independent research, work as a team, and make conference-style presentations.

Recommended Preparations: Working knowledge of calculus and familiarity with Matlab.
Cross-listed with: CHEM 504

BME 540: Biophysical Chemistry

3 Credits

This three-credit course will cover the key theories and experimental methods of contemporary biophysics and biophysical chemistry. The course discusses the structures and dynamics of biomolecules (such as proteins, DNAs, and RNAs), the statistical mechanical models to describe the behaviors of biopolymers and the biophysical methods to analyze the structures of biopolymers in solution, the biophysical theories for protein folding/unfolding and the experimental methods to measure the kinetics of protein folding/unfolding and the protein structural dynamics, the principles of biomolecule structure determination by X-ray crystallography and cryogenic electron microscopy, and fluorescence microscopes, as well as the theories to describe ligand binding to biological macromolecules (such as receptors, protein complexes, aptamers, etc.) and the experimental methods to measure ligand binding. For all the topics covered by this course, emphasis will be laid on both theoretical models and experimental methods will be discussed. Classic and modern biophysical and biochemical techniques ranging from spectroscopy and FRET to optical microscopy, including super-resolution and micromanipulation techniques, will be covered. Applications of these biophysical techniques will also be discussed.

Prerequisite: CHEM 450
Cross-listed with: CHEM 540

BME 590: Colloquium

1-3 Credits/Maximum of 3

Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.

Prerequisite: BME 590

BME 591: Bioengineering Ethics and Professional Development

1 Credits/Maximum of 999

Problem solving methods in ethical decision making, best practices in research communication, and strategies for professional development. This course will cover the main philosophical underpinnings of bioengineering ethics. It will then assist in developing methods for ethical decision making in the main areas of bioengineering professional practice. These areas include data collection, management and presentation, animal and human experimentation, peer review and authorship, and social implications of bioengineering research. The course will then assist in the professional development of students by instruction in tools for effective acquisition of discipline-specific conceptual knowledge, research skill development, communication, management, leadership.

BME 594: Research Topics

1-2 Credits/Maximum of 6

Supervised student activities on research projects identified on an individual or small-group basis.

BME 596: Individual Studies

1-9 Credits/Maximum of 9

Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.

BME 597: Special Topics

1-9 Credits/Maximum of 9

Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.