



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Mechanics of Biomolecular Systems

MECHENG 5180

Credit Hours:

3.00

Course Levels:

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

Introduction to biomolecules and systems in the context of cellular functions. In particular the course focuses on the physical properties of biomolecules and the physical interactions that mediate their functions.

Prerequisites and Co-requisites:

Prereq: Sr or Grad standing in Engineering, or permission of instructor.

Course Goals / Objectives:

- Introduces students to biological systems at the cellular and molecular scale and the importance of physical properties and interactions at that length scale
 - Gain understanding of how to utilize mechanical engineering concepts to describe biological systems
 - Learn about the physical structure of biological cells and learn about cellular processes such as migration and division
 - Learn how to combine traditional mechanics (i.e. beam mechanics) with statistical approaches to develop mechanical models for biological systems
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Course Topics:

- Basics of structure of biological cells and molecules
 - Diffusion of small molecules with and without applied forces
 - Receptor-ligand binding kinetics
 - Protein unfolding and refolding under force
 - Rate-dependence of unfolding
 - Function, structure, and stepping mechanisms of molecular motors
 - Force generation and velocities of Molecular Motors
 - Polymerization dynamics of biological filaments
 - Thermal fluctuations of biopolymers
 - Force-extension behavior of single polymers
 - Microstructural modeling of biological networks and tissues
 - Force Spectroscopy methods in biophysics
 - Basic principles and methods for fluorescence microscopy
 - Biomolecular Nanotechnology
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Designation:

Elective