

BIOE 5060

Biomolecular Dynamics & Control

Spring 2015

Instructor:

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Departments of Bioengineering
& Chemical Engineering

This course will focus on the principles of thermodynamics and kinetics applied to the analysis and design of biomolecular systems. Foundational topics, such as mass and energy balances, chemical equilibria, enzyme kinetics and the effect of external fields (e.g., mechanical forces, electric potential) on biomolecular reaction equilibria and kinetics, will be covered in a biological context at an advanced pace. The bulk of the course will focus on applying these foundational concepts to the analysis of naturally occurring small- and large-scale biomolecular networks and the design of synthetic biocircuits, with a focus on the role of feedback and feedforward control and network connectivity on the dynamical behavior of these networks.

Pre-requisites: Students from all disciplines are invited to enroll. Prior experience with differential and integral calculus, systems of ordinary differential equations and linear algebra is required. Coding in Matlab will be essential to tackle problem sets. Familiarity with basic concepts of chemical kinetics and thermodynamics is expected.