MAT 451 —Mathematical Modeling, Spring 2017

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Course Description:

The goal of this course is to present different approaches in mathematical modeling. We will learn how to apply differential equation, discrete-time, and stochastic models in order to understand the underlying behavior of certain biological systems.

Although we will focus on mainly modeling biological systems or chemical reactions, the topics covered can benefit many students who are interested in application of mathematical modeling to diverse fields such as engineering, physics, biology and economics.

The prerequisite is introductory differential equations (MAT 275). Familiarity with linear algebra is recommended (in particular with matrices, eigenvalues and eigenvectors). No prerequisite knowledge of biology is required.

The main topics of this course is include:

-Population models in discrete and continuous time
-Interacting populations: competition, mutualism, prey-predator and host-parasite models.
-Infectious diseases: SIS, SIR, disease control.
-Biochemical kinetics: activation/inhibition and cooperation.
-*A*ge-structured models in discrete and continuous time
-*Stochastic models:* Markov processes, birth-death processes, branching processes.

Some computer programming experience would be helpful (such as Matlab or R).

Grading: During the semester, we will have 4 homework assignments, 2 exams, and 1 project working in small groups.