



Mathematical Models in Biology

Math 475 / 475G

Spring 2011

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Course Description:

Mathematical modeling for biological systems using difference equations and discrete time Markov chains

Prerequisites:

Calculus II (Math 134), and an introductory statistics course (Stat 276 or Stat 171), or consent of the instructor

Course Objectives:

I. Study discrete time deterministic models
(difference equation models)

- Evaluate local and global stability of equilibria
- Study sensitivity to parameter values (bifurcations)
- Study delay difference equations
- Develop and study models for biological systems
- Some specific models include population, age-structured, two-gender, host-parasitoid, predator-prey, epidemic, genetic, and pharmacokinetic models

II. Study discrete time stochastic models
(discrete time Markov chains)

- Apply basic theorems for Markov chains
- Evaluate stationary probability distributions
- Develop and study Markov chain models for biological systems
- Some specific examples include birth-and-death processes, logistic growth, age-structured, genetic, cellular, susceptible-infected-susceptible (SIS) and binomial epidemic models

This course is designed to

- provide experience *applying* mathematics to real world problems
- teach mathematics specifically related to studying models

(No biology prerequisite required.)

Math majors welcome!

Biology majors welcome!

Other majors welcome!