

### **Mathematical Modeling through Differential and Difference equations:**

This course is an introduction to applications of mathematical concepts in developing, analyzing and simulating deterministic biological models. Mathematical methods may include discrete and continuous modeling, non-linear difference equations, as well as ordinary differential equations. Biological applications may include population dynamics, ecology, epidemiology, evolution, molecular biology, and physiology. We will first study some of the fundamental topics of mathematics that students might encounter in college-level differential equations and linear algebra courses (after calculus). More importantly, we will explore the relevance of differential equations to real-life problems. The course will cover the methods of discrete and continuous modeling process in biology and ecology through difference equations and ordinary and differential equations. Through literature reading, problem sets, Maple projects, and group discussions, students will 1) have a thorough understanding of classical models and their variations, 2) attain a skillful mastery of the linearization and phase-plane methods as well as the stability analysis for difference and differential equations, 3) learn some basic numerical packages for analysis and simulations, 4) answer some biological questions through a final paper on selected or developed model, using the concepts and methods introduced.

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