

## MATH 373: Introduction to Mathematical Biology

### *Spring 2016 Course Syllabus*

**NJIT Academic Integrity Code:** All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

### COURSE INFORMATION

**Course Description:** This course provides an introduction to the use of mathematical techniques applied to problems in biology. Discrete and continuous models of biological phenomena will be discussed. Biological topics discussed range from the subcellular molecular systems and cellular behavior to physiological problems, population biology and developmental biology. Techniques of phase plane analysis for differential equations are introduced in the course. No prior background in biology is necessary. Effective From: Spring 2009.

**Number of Credits:** 3

**Prerequisites:** Math 211 with a grade of C or better or 213 with a grade of C or better or 213H with a grade of C or better and Math 337 with a grade of C or better.

**Course-Section and Instructors**

Course-Section	Instructor
Math 373-002	Professor C. Diekman

**Required Textbook:**

Title	<i>A Primer on Mathematical Models in Biology</i>
Author	Lee A. Segel and Leah Edelstein-Keshet
Edition	---
Publisher	SIAM
ISBN #	978-1611972498
Software	XPP

**University-wide Withdrawal Date:** Please note that the last day to withdraw with a W is **March 28, 2016**. It will be strictly enforced.

### COURSE GOALS

### Course Objectives

- Be able to solve, analyze, and interpret mathematical models of biological phenomena.
- Be able to develop an appropriate mathematical model given a description of a biological system.

### Course Outcomes

- Students have improved geometrical thinking and qualitative problem-solving skills.
- Students have a greater understanding of mathematical modeling as a means of unifying related concepts.
- Students are prepared for further study in mathematics and biology.

Course Assessment: The assessment of objectives is achieved through homework and exams.

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## POLICIES

**DMS Course Policies:** All DMS students must familiarize themselves with, and adhere to, the **Department of Mathematical Sciences Course Policies**, in addition to official **university-wide policies**. DMS takes these policies very seriously and enforces them strictly.

**Grading Policy:** The final grade in this course will be determined as follows:

Homework	35%
Midterm Exam	30%
Final Exam	35%

Your final letter grade will be based on the following tentative curve.

A	90 - 100	C	70 - 74
B+	85 - 89	D	60 - 69
B	80 - 84	F	0 - 59
C+	75 - 79		

**Attendance Policy:** Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the **Math Department's Attendance Policy**. This policy will be strictly enforced.

**Homework Policy:** Homework is collected in class one week after it is assigned; **NO LATE HOMEWORK WILL BE ACCEPTED**.

**XPP:** XPP/XPPAUT is a computer simulation platform created and maintained by G. Bard Ermentrout. It is widely used by mathematical biologists and is freely available online. Students should download it to their computers from <http://www.math.pitt.edu/~bard/xpp/xpp.html>. For this course, you are required to write code and simulate models using this software.

**Exams:** There will be one midterm exam held in class during the semester and one comprehensive final exam. Exams are held on the following days:

Midterm Exam	March 11, 2016
Final Exam Period	May 6 - 12, 2016

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the **Math Department's Examination Policy**. This policy will be strictly enforced.

**Makeup Exam Policy:** There will be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event an

exam is not taken under rare circumstances where the student has a legitimate reason for missing the exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Math Department Office/Instructor that the exam will be missed.

**Cellular Phones:** All cellular phones and other electronic devices must be switched off during all class times.

## ADDITIONAL RESOURCES

**Math Tutoring Center:** Located in Cullimore, Room 214 (See: Spring 2016 Hours TBA)

**Further Assistance:** For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed on the Math Department's webpage for [Instructor Office Hours and Emails](#).

All students must familiarize themselves with and adhere to the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. The Department of Mathematical Sciences takes these policies very seriously and enforces them strictly.

**Accommodation of Disabilities:** NJIT is committed to providing students with documented disabilities equal access to programs and activities. If you have, or believe that you may have, a physical, medical, psychological, or learning disability that may require accommodations, please contact the Coordinator of Student Disability Services located in the Center for Counseling and Psychological Services, in Campbell Hall, Room 205, (973) 596-3414. Further information on disability services related to the self-identification, documentation and accommodation processes can be found on the webpage at:

- <http://www.njit.edu/counseling/services/disabilities.php>

**Important Dates** (See: [Spring 2016 Academic Calendar](#), [Registrar](#))

Date	Day	Event
January 19, 2016	T	First Day of Classes
January 25, 2016	M	Last Day to Add/Drop Classes
March 13 - 20, 2016	Su - Su	Spring Recess - No Classes, University Open
March 25, 2016	F	Good Friday - No Classes, University Closed
May 3, 2016	T	Friday Classes Meet/ Last Day of Classes
May 4 & 5, 2016	W & R	Reading Days
May 6 - 12, 2016	F - R	Final Exam Period

## Course Outline

Week	Date	Readings	Topic
1	1/19 1/22	1.1-1.11	Course Overview, Introduction to Biochemical Kinetics
2	1/26 1/29	2.1-2.6	Biochemical Kinetics
3	2/2	3.1-3.5	Review of Linear ODEs

	2/5		
4	2/9 2/12	4.1-4.3	Nondimensionalization and Scaling
5	2/16 2/19	5.1-5.3	Qualitative Behavior of ODEs
6	2/23 2/26	6.1-6.4	Developing a Model from the Ground Up
7	3/1 3/4	7.1-7.8	Phase Plane Analysis
8	3/8 3/11	-----	MIDTERM EXAM
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9	3/22 3/25	8.1-8.5	Quasi Steady State Approximation
10	3/29 4/1	9.1-9.8	Cooperativity
11	4/5 4/8	10.1-10.7	Neuronal Dynamics
12	4/12 4/15	11.1-11.6	Excitable Systems
13	4/19 4/22	12.1-12.3	Biochemical Modules
14	4/26 4/29	13.1-13.5	Discrete Networks of Genes and Cells
15	5/3	-----	Review for Final Exam

*Updated by Professor C. Diekman - 12/28/2015  
Department of Mathematical Sciences Course Syllabus, Spring 2016*

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