MATH 373: Introduction to Mathematical Biology
Spring 2025 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. Continuous models of biological phenomena expressed with Ordinary Differential Equations will be discussed. Biological topics discussed range from the subcellular molecular systems and cellular behavior to physiological problems, population biology and epidemiology. Techniques of phase plane analysis for differential equations are introduced in the course, and basic bifurcation theory is studied. No prior background in biology is necessary. Effective From: Spring 2025.

Number of Credits: 3

Prerequisites: Math 211 with a grade of C or better or Math 213 with a grade of C or better or 213H with a grade of C or better and Math 222 with a grade of C or better.

Course-Section and Instructors:

Course-Section	Instructor
Math 373-002	Professor J. MacLaurin

Office Hours for All Math Instructors: Spring 2025 Office Hours and Emails

Required Textbook:

Title	*A Primer on Mathematical Models in Mathematical Biology*
Author	Edelstein-Keshet and Segel
Edition	2nd
Publisher	Springer
ISBN #	978-1-611972-49-8

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 7, 2025**. It will be strictly enforced.

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	25%
Quizzes (in-class)	10%
Attendance	5%
Midterm Exam I	20%
Midterm Exam II	20%
Final Project	20%

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.

Religious Observance: NJIT is committed to supporting students observing religious holidays. Students must notify their instructors in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence.

Homework: Homework is due in class - typically one week after it is assigned. Late homework will either be penalized or not accepted.

Exams: There will be two midterm exams during the semester and a final project.

Midterm Exam I	March 11, 2025

Midterm Exam II	April 22, 2025

Project: The final project will include an oral presentation made during the final exam period (May 10 - May 18, 2025) and a written report.

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.

Software: For this class, you will be required to write code and simulate models using computer programming. It is recommended that you use MATLAB, since I will provide examples and can most easily assist you with MATLAB. However, those adept with other languages, such as Python, R, or Julia, can use those if they prefer. MATLAB is a mathematical software program that is used throughout the science and engineering curricula. Students can download it to their computers from the IST software downloads page. If you require more help with MATLAB, try the textbook `MATLAB for Engineers' by Moore, 5th Edition.

Canvas: The course will be administered through Canvas. I will usually contact the entire class by sending a message through Canvas, so make sure to check this regularly. New assignments will be uploaded to canvas. The assignments should be submitted on paper during class, or under my door (CULM 614) after class.

ADDITIONAL RESOURCES

Math Tutoring Center: Located in the Central King Building, Lower Level, Rm. G11 (See: Spring 2025 Hours)

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.

Accommodation of Disabilities: The Office of Accessibility Resources and Services (OARS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please If you need an accommodation due to a disability please contact the Office of Accessibility Resources and Services at oars@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibility Resources and Services office authorizing your accommodations will be required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Office of Accessibility Resources and Services (OARS) website at:

https://www.njit.edu/accessibility/

Important Dates (See: Spring 2025 Academic Calendar, Registrar)

Date	Day	Event
January 21, 2025	Tuesday	First Day of Classes

January 27, 2025	Monday	Last Day to Add/Drop Classes
March 16, 2025	Sunday	Spring Recess Begins
March 22, 2025	Saturday	Spring Recess Ends
April 3, 2025	Thursday	Wellness day
April 7, 2025	Monday	Last Day to Withdraw
April 18, 2025	Friday	Good Friday - No Classes
April 20, 2025	Sunday	Easter Sunday - No Classes Scheduled
May 6, 2025	Tuesday	Thursday Classes Meet
May 7, 2025	Wednesday	Friday Classes Meet
May 7, 2025	Wednesday	Last Day of Classes
May 8, 2025	Thursday	Reading Day 1
May 9, 2025	Friday	Reading Day 2
May 10 - May 16, 2025	Friday to Thursday	Final Exam Period

Course Outline

Week	Dates	Reading	Topic
1	1/21	1.1-1.11	Course Overview
	1/24	2.1-2.6	Biochemical Kinetics
2	1/28	3.1-3.5	Review: Linear ODEs
	1/31	4.1-4.3	Nondimensionalization and Scaling
3	2/4		Nondimensionalization and Scaling

	2/7	5.1-5.3	Qualitative Behavior of 1D Nonlinear ODEs
4	2/11		Qualitative Behavior of 1D Nonlinear ODEs
	2/14	6.1-6.4	Case Study: Spread of an Infection
5	2/18		Case Study: Spread of an Infection
	2/21	7.1-7.8	Qualitative Behavior of 2D Nonlinear ODEs
6	2/25		Qualitative Behavior of 2D Nonlinear ODEs
	2/28		Neuronal Dynamics Excitable Systems
7	3/4		Neuronal Dynamics Excitable Systems
	3/7		Review
8	3/11	10.1-10.7	**MIDTERM EXAM I**
	3/14	12.1-12.3	Excitable Systems
9	3/18	11.1-11.6	**SPRING BREAK**
	3/21	11.1-11.5	**SPRING BREAK**
10	3/25	12.1-12.3	Excitable Systems
	3/28	----------	Excitable Systems
11	4/1	Handout	Epidemiology

	4/8	Handout	Epidemiology
12	4/15		Various Math Bio Models from the Literature
	4/18		**GOOD FRIDAY (NO CLASS)**
13	4/22		**MIDTERM EXAM II**
	4/19		**FINAL PROJECT**
14	4/29		**FINAL PROJECT**
	5/2		**FINAL PROJECT**
15	5/6		**FINAL PROJECT**