MATH 373: Introduction to Mathematical Biology
Spring 2021 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	Assistant Professor J. MacLaurin

Office Hours for All Math Instructors: Spring 2021 Office Hours and Emails

Required Textbook:

Title	*A Primer on Mathematical Models in Mathematical Biology*
Author	Edelstein-Keshet and Segel
Edition	2
Publisher	Springer
ISBN #	978-1611972498

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 5, 2021**. 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, exams, and a final project.

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%
Quiz and Attendance	15%
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.

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

Quiz Policy: There will be a 5 minute written quiz at the beginning of certain lectures on Thursdays.

Project: The final project will include an oral presentation made during the final exam period (May 4 – May 10).

Exams: There will be two midterm exams held in class during the semester. Exams are held on the following days:

Midterm Exam I	March 10, 2021
Midterm Exam II	April 12, 2021

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 can assist you with MATLAB). However those adept with other languages, such as Python or XPP can use these 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.

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 and quizzes will be uploaded to canvas. The assignments must be submitted to Canvas as well.

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

ADDITIONAL RESOURCES

Math Tutoring Center: Located in the Central King Building, Lower Level, Rm. G11 (See: Spring 2021 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.

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.

Students should contact me during my office hours, which are 1-3 pm on Mondays. These office hours will be held virtually on Webex. Make sure that you come to my personal room (send me an email to let me know that you are there if I don't notice)
https://njit.webex.com/meet/maclaurinjit.edu

I can also consult you at different times: just send me an email to organize a meeting.

Additional Textbooks: Other textbooks include "Mathematical Biology" by Jim Murray and "Methods and Models in Mathematical Biology" by Muller and Kuttler. These are very comprehensive reference sand good for your projects.

Some good online MATLAB Resources: It is strongly recommended that you do some of the introductory courses on MATLAB offered by Mathworks (the company that designed MATLAB)
https://matlabacademy.mathworks.com/

You can also check out these courses from MIT:
https://ocw.mit.edu/resources/res-18-002-introduction-to-matlab-spring-2008/other-matlab-resources-at-mit/

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 contact Chantonette Lyles, Associate Director of the Office of Accessibility Resources and Services at 973-596-5417 or via email at lyles@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibilty

Resources and Services 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/studentsuccess/accessibility/

Important Dates (See: Spring 2021 Academic Calendar, Registrar)

Date	Day	Event
January 19, 2021	T	First Day of Classes
January 23, 2021	S	Saturday Classes Begin
January 25, 2021	M	Last Day to Add/Drop Classes
March 14 - March 21, 2021	Su - Su	Spring Recess - No Classes
April, 2, 2021	F	Good Friday - No Classes
April 5, 2021	M	Last Day to Witdraw
May 4, 2021	T	Friday Classes Meet
May 4, 2021	T	Last Day of Classes
May 5 & May 6, 2021	W & R	Reading Days
May 7 - May 13, 2021	F - R	Final Exam Period

Course Outline

Week	Dates	Reading	Topic
1	1/20	1.1-1.11	Course Overview
2	1/25	2.1-2.6	Biochemical Kinetics
	1/7		Linear ODEs
3	2/1	3.1-3.5	
	2/3		Qualitative Behavior of ODEs
4	2/8	4.1-4.3	
	2/10		Nondimensionalization and Scaling
5	2/15	5.1-5.3	Markov Chains and Further Biochemical Kinetics
	2/17		
6	2/22		
	2/24		
7	3/1	7.1-7.8	Phase Plane Analysis
	3/3		
8	3/8		
	3/10		**MIDTERM EXAM I**
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9	3/22	8.1-8.5	Quasi Steady State Approximation
	3/24	9.1-9.8	Cooperativity
10	3/29	10.1-10.7	Neuronal Dynamics
	3/31	11.1-11.6	Excitable Systems
11	4/5	Handout	Epidemiology
	4/7		
12	4/212		**MIDTERM EXAM II**
	4/14		
13	4/19		**FINAL PROJECT**
	4/21		
14	4/26		**FINAL PROJECT**
	4/28		
15	5/3		**FINAL PROJECT**