

THE DEPARTMENT OF MATHEMATICAL SCIENCES

## MATH 227: Mathematical Modeling

### *Fall 2024 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:** An introduction to the theory and practice of mathematical modeling. Techniques include scaling and dimension, fitting of data, linear and exponential models, elementary dynamical systems, probability, optimization, Markov chain modeling. Models are drawn from applications including biology, physics, economics, finance, and chemistry.

**Number of Credits:** 3

**Prerequisites:** MATH 112 with a grade of C or better or MATH 133 with a grade of C or better and CS 115 with a grade of C or better or CS 113 with a grade of C or better or CS 100 with a grade of C or better or CS 101 with a grade of C or better.

**Course-Section and Instructors:**

Course-Section	Instructor
Math 227-001	Professor C. Diekman

**Office Hours for All Math Instructors:** Fall 2024 Office Hours and Emails

**Required Textbook:**

No Book Required

**University-wide Withdrawal Date:** The last day to withdraw with a W is **Monday, November 11, 2024**. It will be strictly enforced.

### COURSE GOALS

**Course Objectives**

- Students should learn how to create a mathematical model.
- Students should learn various mathematical techniques to analyze models.

- Students should be able to interpret mathematical results in terms of the model.
- Students should be able to use MATLAB to do computer simulations.

### Course Outcomes

- Students have improved logical thinking, problem-solving, and teamwork skills.
- Students are prepared for further study in mathematics as well as science, engineering, computing, and other areas.

**Course Assessment:** The assessment of objectives is achieved through in-class participation, homework, labs, exams, and projects.

## 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:

Attendance and In-Class Participation	5%
Homework and Labs	30%
Midterm Exam 1	15%
Midterm Exam 2	15%
Midterm Project	15%
Final Project	20%

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

A	90 - 100	C	60 - 69
B+	85 - 89	D	50 - 59
B	75 - 84	F	0 - 49
C+	70 - 74		

**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.

**MATLAB:** MATLAB is a mathematical software program that is used throughout the science and engineering curricula. Students should download it to their computers from the IST software downloads page. For this class, you are required to write code using this software.

**Exams:** There will be 2 midterm exams, a midterm project, and a final project. The final project will consist of a written project report and an oral project presentation during the Final Exam Period.

Midterm Exam 1	October 15, 2024
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Midterm Exam 2	November 22, 2024
Final Project Due	December 15-21, 2024

The final project 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.

**Generative AI:** Students are expected to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, AI usage is not permitted throughout this course under any circumstance.

## ADDITIONAL RESOURCES

**Math Tutoring Center:** Located in the Central King Building, Lower Level, Rm. G11 (See: **Fall 2024 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 need an accommodation due to a disability, please contact the Office of Accessibility Resources and Services at [oars@njit.edu](mailto:oars@njit.edu), or visit Kupfrian Hall 201 to discuss your specific needs. A Letter of Accommodation Eligibility from the office authorizing student accommodations is 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: **Fall 2024 Academic Calendar, Registrar**)

Date	Day	Event
September 2, 2024	Monday	Labor Day
September 3, 2024	Tuesday	First Day of Classes
September 9, 2024	Monday	Last Day to Add/Drop Classes
November 11, 2024	Monday	Last Day to Withdraw
November 26, 2024	Tuesday	Thursday Classes Meet

November 27, 2024	Wednesday	Friday Classes Meet
November 28 to December 1, 2024	Thursday and Sunday	Thanksgiving Recess - Closed
December 11, 2024	Wednesday	Last Day of Classes
December 12, 2024	Thursday	Reading Day 1
December 13, 2024	Friday	Reading Day 2
December 15 to December 21, 2024	Sunday to Saturday	Final Exam Period

## Course Outline

Week	Topic
1	Introduction to the Mathematical Modeling Process
2 - 4	Discrete-Time Dynamical Models
5 - 7	Continuous-Time Dynamical Models
8 - 12	Stochastic and Statistical Models
13 - 15	Optimization and Agent-based Models

*Updated by Professor C. Diekman - 8/30/24  
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