

THE DEPARTMENT OF MATHEMATICAL SCIENCES

## MATH 227: Mathematical Modeling

### *Fall 2023 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	Professor C. Diekman

**Office Hours for All Math Instructors:** **Fall 2023 Office Hours and Emails**

**Required Textbook:**

No Book Required

**University-wide Withdrawal Date:** The last day to withdraw with a W is **Monday, November 13, 2023**. 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, 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:

Homework, Labs, and In-Class Participation	40%
Midterm Exam (Project)	30%
Final Exam (Project)	30%

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 a midterm project and a final project. The final project will consist of a written project report and an oral project presentation during Final Exam Week.

Midterm Project Assigned	October 20, 2023
Midterm Project Due	November 13, 2023
Final Project Assigned	November 22, 2023
Final Project Due	December 17 - December 23, 2023

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.

## ADDITIONAL RESOURCES

**Math Tutoring Center:** Located in the Central King Building, Lower Level, Rm. G11 (See: **Fall 2023 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 2023 Academic Calendar, Registrar**)

Date	Day	Event
September 4, 2023	Monday	Labor Day
September 5, 2023	Tuesday	First Day of Classes
September 11, 2023	Monday	Last Day to Add/Drop Classes
November 13, 2023	Monday	Last Day to Withdraw
November 21, 2023	Tuesday	Thursday Classes Meet
November 22, 2023	Wednesday	Friday Classes Meet
November 23 to November 26, 2023	Thursday and Saturday	Thanksgiving Recess - Closed
December 13, 2023	Wednesday	Last Day of Classes

December 14, 2023	Thursday	Reading Day 1
December 15, 2023	Friday	Reading Day 2
December 17 to December 23, 2023	Sunday to Saturday	Final Exam Period

## Course Outline

Week	Topic
1 - 2	Introduction to the Mathematical Modeling Process
3 - 6	Dynamical Modeling: Difference Equations
7 - 10	Stochastic Modeling: Markov Chains
11 - 12	Statistical Modeling: Regression
13 - 15	Optimization and Agent-based Models

*Updated by Professor C. Diekman - 9/1/2023  
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