

## **MATH 227: Mathematical Modeling** *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 along with computer implementation of models during lab sessions. 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. Effective From: Fall 2014.

Number of Credits: 4

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. Co-requisite: MATH 211 or MATH 213.

Course-Section and Instructors

Course-Section	Instructor
Math 227-001	Professor A. Bose
Math 227-003	Professor A. Bose

Required Textbook:

Title	(No Book)
Author	---
Edition	---

Publisher	---
ISBN #	---
Notes	---

University-wide Withdrawal Date: Please note that the last day to withdraw with a W is **November 3, 2014**. It will be strictly enforced.

## COURSE GOALS

### Course Objectives

- Students should learn what a mathematical model is.
- 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 all computer simulations.

### Course Outcomes

- Students have improved logical thinking and problem-solving 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 homework, exams and labs.

## 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	20%
Labs	30%
Midterm	20%
Final Exam	30%

Your final letter grade will be based on the following tentative curve. NOTE: This course needs to be passed with a grade of C or better in order to proceed to Math 113, Math 135 or Math 138.

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 one midterm exam held in class during the semester and one comprehensive final exam. The final exam will be held during the following week:

Final Exam Week	December 15 - 19, 2014
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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 EXAMS during the semester. In the event the Final Exam is not taken, under rare circumstances where the student has a legitimate reason for missing the final exam, a makeup exam will be administered by the math department. In any case the student must notify the Math Department Office and the Instructor that the exam will be missed and present written verifiable proof of the reason for missing the exam, e.g., a doctors note, police report, court notice, etc., clearly stating the date AND time of the mitigating problem.

## ADDITIONAL RESOURCES

Further Assistance: For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed at the Math Department link. Teaching Assistants are also available in the [Math Learning Center](#).

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.

Important Dates (See: [Fall 2014 Academic Calendar, Registrar](#))

Date	Day	Event
September 2, 2014	T	First Day of Classes
September 8, 2014	M	End of Add/Drop Period
November 3, 2014	M	Last Day to Withdraw
November 25, 2014	T	Thursday Classes Meet

November 26, 2014	W	Friday Classes Meet
November 27 - 30, 2014	R - S	Thanksgiving Recess Starts
December 10, 2014	W	Last Day of Classes
December 11 & 12, 2014	R & F	Reading Days
December 15 - 20, 2014	M - S	Final Exam Period

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## Course Outline

### 1. Discrete Time Models

- Deterministic models arising in Biology (Chapter 2 of De Vries et al)
- Deterministic models arising in the theory of interest (Chapter 1 of Tung)
- Probabilistic models and Markov processes (Handout)

### 2. Data fitting and Least Squares Method (Chapter 4 Giordano et al)

### 3. Hypothesis Testing (Handout)

### 4. Harmonic motion, undamped pendulum (any 1st year physics book)

### 5. Dimensional Analysis (Chapter 9 Giordano et al)

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