

## MATH 651: Methods of Applied Mathematics I

### *Fall 2022 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:** A survey of mathematical methods for the solution of problems in the applied sciences and engineering. Topics include: ordinary differential equations and elementary partial differential equations. Fourier series, Fourier and Laplace transforms, and eigenfunction expansions.

**Number of Credits:** 3

**Prerequisites:** MATH 222 or departmental approval.

**Course-Section and Instructors:**

Course-Section	Instructor
Math 651-001	Professor M. Booty

**Office Hours for All Math Instructors:** [Fall 2022 Office Hours and Emails](#)

**Required Textbook:**

There is no required book for the course. Course material will be drawn from the following sources, which are on reserve in the library.

**Recommended Textbooks:**

- 1) Advanced Mathematical Methods for Scientists and Engineers: Asymptotic Methods and Perturbation Theory. By Carl M. Bender and Steven A. Orszag.
- 2) Advanced Analytic Methods in Applied Mathematics, Science and Engineering. By Hung Cheng.
- 3) Nonlinear Dynamics and Chaos. By Steven H. Strogatz
- 4) Elementary Applied Partial Differential Equations, with Fourier Series and Boundary Value Problems. By Richard Haberman.

**University-wide Withdrawal Date:** The last day to withdraw with a M is **Monday, November 14, 2022**. 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	55%
Midterm Exams (2)	15%
Final Exam	30%

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

A	87 - 100	C	62 - 67
B+	81 - 86	D	55 - 61
B	75 - 80	F	0 - 54
C+	68 - 74		

**Homework Policy:** Homework assignments will be given frequently. Assignments must be submitted by the due date. Late assignments are NOT accepted. Solutions will be graded for correctness, completeness, and clarity.

**Exams:** There will be one midterm exam during the semester and one comprehensive final exam, both held in class.

Midterm Exam	TBA
Final Exam Period	December 16 - 22, 2022

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 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.

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

## 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 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 contact Scott Janz, Associate Director of Disability Support Services at [973-596-5417](tel:973-596-5417) or via email at [scott.p.janz@njit.edu](mailto:scott.p.janz@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.

**Important Dates** (See: [Fall 2022 Academic Calendar](#), [Registrar](#))

Date	Day	Event
September 5, 2022	Monday	Labor Day
September 6, 2022	Tuesday	First Day of Classes
September 12, 2022	Monday	Last Day to Add/Drop Classes
November 14, 2022	Monday	Last Day to Withdraw
November 22, 2022	Tuesday	Thursday Classes Meet
November 23, 2022	Wednesday	Friday Classes Meet
November 24 to November 25, 2022	Thursday and Friday	Thanksgiving Recess - Closed
November 26, 2022	Saturday	Saturday Classes Meet
December 14, 2022	Wednesday	Last Day of Classes
December 15, 2022	Thursday	Reading Day
December 16 to December 22, 2022	Friday to Thursday	Final Exam Period

## Course Outline

Week	Dates	Topic
1	9/6 and 9/8	Linear ordinary differential equations (ODEs), definitions and theory. Linear homogeneous equations, examples
2	9/13 and 9/15	Inhomogeneous equations: methods and solution techniques
3	9/20 and 9/22	More examples and solution techniques. Cauchy-Euler equations
4	9/27 and 9/29	Regular and singular points of linear ODEs. Series solutions

5	10/4 and 10/6	The method of Frobenius, examples. Nonlinear ODEs: theory, methods and examples. Singular points in the phase plane
6	10/11 and 10/13	Nonlinear ODEs, examples. Numerical solution of an initial value problem. Some basic methods and examples.
7	10/18 and 10/20	Introduction to partial differential equations (PDEs). Definitions and examples. Linear PDEs
8	10/25 and 10/27	Separation of variables and the Sturm-Liouville eigenvalue problem
9	11/1 and 11/3	Examples. Inhomogeneous boundary conditions and Green's theorem
10	11/8 and 11/10	Solution of linear PDEs by eigenfunction expansion, examples
11	11/15 and 11/17	Higher spatial dimensions and different geometries. Eigenvalues of the Laplacian
12	11/22 and 11/29	Solution of linear PDEs by Fourier and Laplace Transforms
13	12/1 and 12/6	Solution of linear PDEs by Fourier and Laplace Transforms
14	12/8 and 12/13	Additional Topics

*Updated by Professor M. Booty - 7/28/2022  
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