

THE DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 651: Methods of Applied Mathematics I

Fall 2025 Course Syllabus

NJIT Academic Integrity Code: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: NJIT Academic Integrity Code.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

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 X. Zhao

Office Hours for All Math Instructors: [Fall 2025 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 W is **Monday, November 10, 2025**. 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	50%
Midterm Exam	20%
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	October 23, 2025 (Tentatively)
Final Exam Period	December 14 - December 20, 2025

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.

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.

Religious Observance: NJIT is committed to supporting students observing religious holidays. Students must notify their instructors in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence.

Generative AI: This course expects students 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 for any assignment or exam throughout this course under any circumstance.

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 need an accommodation due to a disability, please contact the Office of Accessibility Resources and Services at 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 2025 Academic Calendar, Registrar](#))

Date	Day	Event
September 1, 2025	Monday	Labor Day
September 2, 2025	Tuesday	First Day of Classes
September 8, 2025	Monday	Last Day to Add/Drop Classes
November 10, 2025	Monday	Last Day to Withdraw
November 25, 2025	Tuesday	Thursday Classes Meet
November 26, 2025	Wednesday	Friday Classes Meet
November 27 to November 30, 2025	Thursday to Sunday	Thanksgiving Recess - Closed
December 11, 2025	Thursday	Last Day of Classes
December 12, 2025	Friday	Reading Day 1

December 13, 2025	Saturday	Saturday Classes Meet
December 14 to December 20, 2025	Sunday to Saturday	Final Exam Period

Course Outline

Week	Dates	Topic
1	9/2 and 9/4	Linear ordinary differential equations (ODEs), definitions and theory. Linear homogeneous equations, examples
2	9/9 and 9/11	Inhomogeneous equations: methods and solution techniques
3	9/16 and 9/18	More examples and solution techniques. Cauchy-Euler equations
4	9/23 and 9/25	Regular and singular points of linear ODEs. Series solutions
5	9/30 and 10/2	The method of Frobenius, examples. Nonlinear ODEs: theory, methods and examples. Singular points in the phase plane
6	10/7 and 10/9	Nonlinear ODEs, examples. Numerical solution of an initial value problem. Some basic methods and examples
7	10/14 and 10/16	Introduction to partial differential equations (PDEs). Definitions and examples. Linear PDEs
8	10/21 and 10/23	Separation of variables and the Sturm-Liouville eigenvalue problem
9	10/28 and 10/30	Examples. Inhomogeneous boundary conditions and Green's theorem
10	11/4 and 11/6	Solution of linear PDEs by eigenfunction expansion, examples
11	11/11 and 11/13	Higher spatial dimensions and different geometries. Eigenvalues of the Laplacian
12	11/18 and 11/20	Solution of linear PDEs by Fourier and Laplace Transforms
13	11/25 and 12/2	Solution of linear PDEs by Fourier and Laplace Transforms
14	12/4 and 12/9	Additional Topics

*Updated by Professor X. Zhao - 2025
Department of Mathematical Sciences Course Syllabus, Fall 2025*