MATH 222: Differential Equations
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: Methods for solving ordinary differential equations are studied together with physical applications, Laplace transforms, numerical solutions, and series solutions.

Number of Credits: 4

Prerequisites: Prerequisite: MATH 112 with a grade of C or better or MATH 133 with a grade of C or better.

Course-Section and Instructors:

Course-Section	Instructor
Math 222-001	Professor C. Turc
Math 222-003	Professor S. Alptekin
Math 222-005	Professor M. Potocki-Dul
Math 222-007	Professor M. Potocki-Dul
Math 222-009	Professor S. Alptekin
Math 222-011	Professor R. Bouayad
Math 222-013	Professor R. Bouayad
Math 222-101	Professor Professor M. Potocki-Dul

Office Hours for All Math Instructors: Office Hours and Emails

Required Textbook:

Title	*Elementary Differential Equations and Boundary Value Problems*
Author	Boyce and DiPrima
Edition	11th
Publisher	John Wiley & Sons, Inc.
ISBN #	978-1119447399

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, November 10, 2025.** It will be strictly enforced.

COURSE GOALS

Course Outcomes

Students should:

- Learn elementary analytical solution techniques for the solution of ordinary differential equations (ODEs).
- Interpret the solutions using plots and methods of calculus.
- Understand the solution structure of linear ODEs in terms of independent homogeneous solutions and nonhomogeneous solutions.
- Understand, by exposure to examples, how systems and phenomena from science and engineering can be modeled by ODEs, a principal example being the linear spring subject to forcing and damping
- Understand how the solution of such a model ODE can be used to analyze or predict a system's behavior.
- Understand the role of initial value problems for ODEs in examples from science & engineering.
- Understand an elementary method for the numerical solution of ODEs and have some familiarity with the solution of ODEs using MATLAB.
- Be introduced to two-point boundary value problems and Fourier series.

Course Outcomes

- Improved problem-solving skills, including knowledge of techniques for the solution of ODES.
- An understanding of the importance of differential equations in the sciences and engineering
- Preparation for further study in science, technology, engineering, and mathematics.

Course Assessment: The assessment of objectives is achieved through homework assignments, weekly quizzes, and common examinations with common grading.

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	8%
Quizzes	12%
MATLAB Assignments	0%
Common Midterm Exam I	20%
Common Midterm Exam II	25%
Final Exam	35%

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

A	88 - 100	**C**	65-71
B+	83 - 87	**D**	60-64
B	77 - 82	**F**	0 - 59
C+	72-76		

Attendance: 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. Quizzes and in-class MATLAB activities.

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.

Homework: Weekly homework assignments are listed on the course outline. They are to be handed or uploaded on the Canvas in according to your instructor's schedule. Each week, a 15—20 minute quiz will be given on the material covered in the previous week's homework.

Exams: There will be two common midterm exams held during the semester and one comprehensive common final exam. Exams are held on the following days:

Common Exam I	October 8, 2025
Common Exam II	November 19, 2025
Final Exam	December 14 - December 20, 2025

The time of the midterm exams is **4:15—5:40 PM** for daytime students and **6:00-7:25 PM** for evening students. 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: To properly report your absence from a midterm or final exam, please review and follow

the required steps under the DMS Examination Policy found here:

- http://math.njit.edu/students/policies_exam.php

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

ADDITIONAL RESOURCES

Math Tutoring Center: Located in the Central King Building, Lower Level, Rm. G11 (See: Fall 2025 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 are in need of accommodations due to a disability please If you need an accommodation due to a disability please contact the Office of Accessibility Resources and Services at oars@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 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
October 2, 2025	Thursday	Wellness Day
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 and Sunday	Thanksgiving Recess - Closed
December 11, 2025	Thursday	Last Day of Classes
December 12, 2025	Friday	Reading Day

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

COURSE OUTLINE

Week + Dates	Section # + Topic		Assignments
WEEK 1:	1.1	Some Basic Models; Direction Fields	5, 6, 7, 11, 12, 18
	1.2	Solutions of Some Differential Equations	2, 4, 11
	1.3	Classification of Differential Equations	2, 3, 6, 8, 11
WEEK 2:	2.1	Linear Equations; Integrating Factors	2, 6, 10, 18
	2.1	Integrating Factors (Continued)	23, 24
	2.2	Separable Equations	2, 4, 6, 9, 12
WEEK 3:	2.3	Modeling with First Order Equations	2, 5, 7, 12
	2.7	Numerical Approximation; Euler's Method	2
	MATLAB Project 1		
WEEK 4:	3.1	Homogeneous Equations with Constant Coefficients	2, 6, 8, 10, 13, 16
	3.2	Solutions of Linear Homogeneous Equations and the Wronskian	2, 4, 7, 9, 14, 17, 19, 20, 23
	3.3	Complex Roots of the Characteristic Equation	2, 4, 6, 8, 12, 19
WEEK 5:	3.4	Repeated Roots; Reduction of Order	1, 5, 9, 12, 19
	3.5	Nonhomogeneous Equations; Undetermined Coefficients	2, 4, 8, 13, 14

	REVIEW FOR EXAM 1		
WEEK 6:	3.5	Undetermined Coefficients (Continued)	16(a), 17(a), 21(a)
	3.6	Variation of Parameters	2, 6, 10, 12
	3.7	Mechanical and Electrical Vibrations	1, 3, 4, 6
WEEK 7:	3.7	Vibrations (Continued)	9, 11, 13
	3.8	Forced Vibrations	1, 4, 6
	7.1	System of First Order Linear ODEs	1, 3, 4, 7(a,b)
WEEK 8:	7.2	Review of Matrices	1, 4, 7, 17
	7.3	Review of Linear Algebraic Equations, Eigenvalues, and Eigenvectors (2x2)	15, 16, 17
	7.5	Homogeneous Linear Systems with Constant Coefficients	2(b), 3(b), 5(b), 11
WEEK 9:	7.6	Complex Eigenvalues	1(b), 4(b), 23
	6.1	Definition of the Laplace Transform	3, 5, 10, 12, 19
WEEK 10:	6.2	Laplace Transform Solution of Initial Value Problems	1, 3, 4, 10, 16
	6.3	Step Functions	1, 3, 8, 10, 14, 15
	6.4	ODEs with Discontinuous Forcing Functions	2, 3, 4, 7, 11
WEEK 11:	6.5	Impulse Functions	1, 2, 7
	6.6	The Convolution Integral	4, 5, 8, 9, 14
	5.1	Review of Power Series	15, 17, 18, 19

WEEK 12:	5.2	Series Solutions of Second Order Linear ODEs with Nonconstant Coefficients; Solution Near an Ordinary Point	3(a,b), 5(a,b), 7(a,b)
	5.4	Euler's Equation; Regular Singular Points	3, 6, 12, 17
	REVIEW FOR EXAM 2		
WEEK 13:	5.5	Series Solutions Near a Regular Singular Point, Part I	2, 3
	10.1	Two-Point Boundary Value Problems	1, 3, 5, 14, 15
	10.2	Fourier Series	1, 6, 7, 13, 15
WEEK 14:	10.2	Fourier Series (Continued)	1, 6, 7, 13, 15
	10.4	Even and Odd Functions	19(a,b), 27(a,b)
	REVIEW FOR FINAL EXAM		
WEEK 15:	**REVIEW FOR FINAL EXAM**		
FINAL EXAM PERIOD: Dec 14 - Dec 20, 2025			