MATH 322: Differential Equations for Applications
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 : An applied science study using differential equations as the vehicle for comprehension of the unknown. Introduction to first -order differential equations and their applications to motion, cooling and electromechanical systems followed by higher order differential equations and their solutions. Study of methods of undetermined coefficients, variation of parameters, and many series and numerical methods. Includes Laplace transforms, matrix methods, and eigenvalue problems.

Number of Credits : 3

Prerequisites : MATH 112 with a grade of C or better, or MATH 133 with a grade of C or better or MATH 238 with a grade of C or better.

Course-Section and Instructors:

Course-Section	Instructor
Math 322-101	Professor B. Patiak

Required Textbook:

Title	*Differential Equations w/ Boundary -Value Problems (Bundle w/ WebAssign)* **Buy through WebAssign login page**
Author	Dennis G. Zill and Warren S. Wright
Edition	9th
Publisher	Pearson
ISBN #	978-1337604901
Technology	Laptop Computer

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 Objectives

- Derive solutions of separable and linear first-order differential equations.
- Interpret solutions of differential equation models in mechanics, circuits, &c.
- Derive solutions of linear second order equations or systems that have constant coefficients.
- Apply the Laplace transform to solve forced linear differential equations.

Course Outcomes

- Prepare students for further study in technological disciplines and more advanced mathematics courses.
- Students have an understanding of the importance of differential equations in the sciences and engineering.

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:

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

A	87 - 100	C	60 - 70
B+	82 - 86	D	50 - 59
B	76 - 82	F	0 - 49
C+	71 - 75	W	Withdrawn

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.

Midterm Exam I	20%
Midterm Exam II	20%
Quizzes	15%
Homework/Problem Sets	10%
Final Exam	35%

Exams: There will be two exams during the semester and a cumulative final exam during the final exam week:

Midterm Exam I	October 9, 2025
Midterm Exam II	November 6, 2025

Final Exam	December 18, 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 MAKEUP 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 mi ssing 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

Math Tutoring Center : Located in the Central King Building, Lower Level, Rm. G11 (See: Fall 2024 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 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 #	Section #	Subject Topic	Homework (HW) Assignment
Week 1 (9/4)	1.1 2.1	Definitions and Terminology Direction Fields and Autonomous DE IVP	1.1: 22, 23 2.1: 26
WEEK 2 (9/11)	2.2 2.3	Variable Separable and Linear Differential Equations	2.2: 8, 11, 27 2.3: 3, 17, 23, 28, 35
WEEK 3 (9/18)	2.6 3.1	Euler's Method Applications of Linear ODE	2.6: 7 9.1: 7 3.1: 5, 19, 21, 27
WEEK 4 (9/25)	3.1 4.1	More Applications of Linear ODE Homogeneous Linear DE - Distinct	3.1 - Worksheet 4.1: 15, 18, 27

		Real Roots	
WEEK 5 (10/2)	4.2	Reduction of order, Repeated Roots and Complex Imaginary Roots EXAM 1 REVIEW	4.2: 8 + Worksheet
WEEK 6 (10/9)	 4.4	EXAM 1 (1.14.1) The Method of Undetermined Coefficients - Part I	 4.4 Worksheet
WEEK 7 (10/16)	4.4 4.6	The Method of Undetermined Coefficients - Part II Variation of Parameters	4.4: 5, 12, 20, 31 4.6: 3, 12, 21
WEEK 8 (10/23)	5.1	Spring Mass System	5.1: 6, 27, 37
WEEK 9 (10/30)	8.1	Systems of Linear Differential Equations Exam 2 Review	8.1: 2, 5, 7, 8, 18
WEEK 10 (11/6)	 8.2	EXAM 2 (4.2 8.1) Homogeneous Linear Systems-Distinct Eigenvalues	 8.2: 1, 8, 14, 29, 41
LAST DAY TO WITHDRAW CLASSES NOVEMBER 10, 2025			
WEEK 11 (11/13)	8.2 7.1	Homogeneous Linear Systems Case 2: Complex Eigenvalues Laplace Transform	8.2: 1, 8, 14, 29, 43 Worksheet
WEEK 12 (11/20)	7.2 7.3	Inverse Laplace Transform Solving IVP using Laplace Methods	7.2: 5, 19, 23, 37, 39 Worksheet
WEEK 13 (11/25- Tues)	7.4 8.3	First Translation Theorem Boundary Value Problems and	Worksheet Worksheet

		Applications	
WEEK 14 (12/4)		Catch-up and Final Exam Review	
WEEK 15 (12/18)		Final Exam	

Updated by Professor Professor B. Patiak - 2025
Department of Mathematical Sciences Course Syllabus, Fall 2025