MATH 322: Differential Equations for Applications
Spring 2025 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.

Please be sure you read and fully understand our DMS Online Exam Policy.

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 322-102	Professor B. Patiak

Office Hours for All Math Instructors: Spring 2025 Office Hours and Emails

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, April 7, 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,
- 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:

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

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.

Homework : Textbook assignments are due the class day following the section lecture and will be collected/reviewed at the beginning of class.

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

Exam I	February 20,, 2025
Exam II	April 3, 2025
Final Exam	May 15, 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.

ADDITIONAL RESOURCES

Math Tutoring Center : Located in the Central King Building, Lower Level, Rm. G11 (See: Spring 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

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: Spring 2025 Academic Calendar, Registrar)

Date	Day	Event
January 21, 2025	Tuesday	First Day of Classes
January 27, 2025	Monday	Last Day to Add/Drop Classes
March 16, 2025	Sunday	Spring Recess Begins
March 22, 2025	Saturday	Spring Recess Ends
April 3, 2025	Thursday	Wellness day
April 7, 2025	Monday	Last Day to Withdraw
April 18, 2025	Friday	Good Friday - No Classes
April 20, 2025	Sunday	Easter Sunday - No Classes Scheduled
May 6, 2025	Tuesday	Thursday Classes Meet
May 7, 2025	Wednesday	Friday Classes Meet
May 7, 2025	Wednesday	Last Day of Classes
May 8, 2025	Thursday	Reading Day 1
May 9, 2025	Friday	Reading Day 2

May 10 - May 16, 2025	Friday to Thursday	Final Exam Period

Course Outline

Week #	Section #	Subject Topic	Homework (HW) Assignment
Week 1 (1/23)	1.1 2.1	*Definitions and Terminology Direction Fields and Autonomous DE IVP*	*1.1: 22, 23 2.1: 26*
WEEK 2 (1/30)	2.2 2.3	*Variable Separable and Linear Differential Equations*	*2.2: 8, 11, 27 2.3: 3, 17, 23, 28, 35*
WEEK 3 (2/6)	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 (2/13)	3.1	*More Applications of Linear ODE Review for Exam 1*	*3.1 - Worksheet*
WEEK 5 (2/20)	4.1	**EXAM 1** *Homogeneous Linear DE - Distinct Real Roots*	*4.1: 15, 18, 27*
WEEK 6 (2/27)	4.2 4.4	*Reduction of order, Repeated Roots and Complex Imaginary Roots* *The Method of Undetermined Coefficients - Part I*	*4.2: 8 + Worksheet*
WEEK 7 (3/6)	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 (3/13)	5.1	*Spring Mass System*	*5.1: 6, 27, 37*
SPRING RECESS (3/16 - 3/23)			
WEEK 9 (3/27)	7.1	*Laplace Transform* **Exam 2 Review**	*Worksheet*
WEEK 10 (4/3)	7.2	**Exam 2** *Inverse Laplace Transform*	*7.2: 5, 19, 23, 37, 39*
LAST DAY TO WITHDRAW CLASSES - APRIL 7, 2025			

WEEK 11 (4/10)	7.3	*Solving IVP using Laplace Methods*	*Worksheet*
	7.4	*First Translation Theorem*	*Worksheet*
WEEK 12 (4/17)	8.1	*Systems of Linear Differential Equations*	*8.1: 2, 5, 7, 8, 18*
	8.2	*Homogeneous Linear Systems - Distinct Eigenvalues*	*8.2: 1, 8, 14, 29, 41*
WEEK 13 (4/24)	8.2	*Homogeneous Linear Systems Case 2: Complex Eigenvalues*	*8.2: 1, 8, 14, 29, 43*
	8.3	*Boundary Value Problems and Applications*	*Worksheet*
WEEK 14 (5/1)		*Catch-up and Final Exam Review*	
WEEK 15 (5/15)		*Final Exam*	