MATH 322: Differential Equations for Applications
Summer 2023 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: 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 C or better.

Course-Section and Instructors:

Course-Section	Instructor
Math 322-141	Professor B. Patiak

Office Hours for All Math Instructors: Office Hours and Emails

Required Textbook:

Title	*Differential Equations with Boundary-Value Problems, 9th + Enhanced WebAssign*
Author	Dennis G. Zill and Warren S. Wright
Edition	9th
Publisher	Pearson
ISBN #	978-1337652483 (bound) 978-1337604901 (looseleaf)

University-wide Withdrawal Date: Please see the Summer 2023 Academic Calendar for the last day to withdraw based on the summer session you are registered for.

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.
- Determine the behavior of solutions near critical points of planar systems.
- Express the solutions of analytic differential equations in power series.

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	15%
Final Exam	30%

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

A	90 - 100	**C**	70 - 74
B+	85 - 89	**D**	55 - 69
B	80 - 84	**F**	0 - 54
C+	75 - 79		

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. Students are expected to attend class. Each class is a learning experience that cannot be replicated through simply "getting the notes." To pass this class with a C or better your overall average must be at least 65% AND you need to earn at least 60% on one of the exams.

Homework Policy: Homework is an expectation of the course. All homework for the summer session is listed, by section, below.

Quizzes: There will be a quiz every meeting and will be given at the beginning of each class.

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

Midterm Exam I	June 7, 2023
Midterm Exam II	June 28, 2023
Final Exam	July 17, 2023

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: Summer 2023 Hours)

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 or via email at 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 at:

https://www.njit.edu/accessibility/

Important Dates (See: Summer 2023 Academic Calendar, Registrar)

Date	Day	Event
May 22, 2023	Monday	**Full, First, and Middle Summer** Session Begins
May 24, 2023	Wednesday	Last Day to Add/Drop for **First Summer** Session

May 26, 2023	Friday	Last Day to Add/Drop for **Middle Summer** Session
May 29, 2023	Monday	Last Day to Add/Drop for **Full Summer** Session
May 29, 2023	Monday	Memorial Day - University Closed/No Classes Scheduled
June 10, 2023	Saturday	Last Day to Withdraw from **First Summer** Session
June 16, 2023	Friday	Last Day to Withdraw from **Middle Summer** Session
June 16, 2023	Friday	Juneteenth - University Closed/No Classes Scheduled
June 26, 2023	Monday	Last Day of Classes for **First Summer** Session
June 30, 2023	Friday	Last Day to Withdraw from **Full Summer** Session
July 4, 2023	Tuesday	Independence Day - University Closed/No Classes Scheduled
July 5, 2023	Wednesday	**Second Summer** Session Begins
July 6, 2023	Thursday	Last Day to Add/Drop for **Second Summer** Session
July 17, 2023	Monday	Last Day of Classes for **Middle Summer** Session
July 20, 2023	Thursday	Last Day to Withdraw for **Second Summer** Session
August 8, 2023	Tuesday	Last Day of Classes for **Full and Second Summer** Session

Course Outline

Week #	Section #	Subject Topic	Homework (HW) Assignment
Week 1 (5/22 - 26)	1.1 2.1	*Definitions and Terminology* *Direction Fields and Autonomous DE IVP*	*1.1: 22, 23* *2.1: 26*
	2.2 2.3	*Variable Separable and* *Linear Differential Equations*	*2.2: 8, 11, 27* *2.3: 3, 17, 23, 28, 35*
Week 2 (5/29 - 6/2)	2.6 3.1	*Euler's Method* *Applications of Linear Equations*	*2.6: 7* *9.1: 7* *3.1: 5, 19, 21, 27*
Week 3	3.1	*More Applications*	*3.1 - Worksheet*

(6/5 - 9)		*Review for Exam 1*	
	4.1	*EXAM 1* *Homogeneous Linear DE*	*4.1: 15, 18, 27*
Week 4 (6/12 - 16)	4.2	*Reduction of order, Repeated Roots* and Complex Imaginary Roots	*4.2: 8 + Worksheet*
	4.4 4.6	*The Method of Undetermined Coefficients* *Variation of Parameters*	*4.4: 5, 12, 20, 31* *4.6: 3, 12, 21*
Week 5 (6/19 - 23)	5.1 7.1	*Spring Mass System* *Definition of Laplace Transform*	*5.1: 6, 27, 37* *7.1: 11, 20, 29, 37*
	7.2	*Inverse Transforms* *Solving DE by Laplace*	*7.2: 5, 19, 23, 37, 39*
Week 6 (6/26 - 6/30)		*Review for Exam 2* *Review of Matrices, Eigenvalues and Eigenvectors*	
	8.1	***Exam 2*** *Systems of Linear Differential Equations*	*8.1: 2, 5, 7, 8, 18*
Week 7 (7/3 - 7)	8.2	*Homogeneous Linear Systems* *Case 1: Distinct Eigenvalues* *Case 2: Complex Eigenvalues*	*8.2: 1, 8, 14, 29, 43*
Week 8 (7/10 - 14)	9.2	*Runge-Kutta Methods*	*9.2 - Worksheet*
		Catch-up and Review for Final Exam	
Week 9 (7/17)		*Final Exam*	