MATH 222: Differential Equations
Summer 2022 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: Methods for solving ordinary differential equations are studied together with physical applications, Laplace transforms, numerical solutions, and series solutions.

Number of Credits: 4

Prerequisites: 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 222-031	Professor M. Potocki-Dul
Math 222-131	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 #	WileyPLUS access only: 9781119499619 WileyPLUS access with print text: 9781119499688

University-wide Withdrawal Date: Please see the Summer 2022 Academic Calendar for the last day to withdraw based on the summer session you are registered for.

COURSE GOALS

Course Objectives

- Students should (a) learn elementary analytical solution techniques for the solution of ordinary differential equations (ODEs), and (b) understand the solution structure of linear ODEs in terms of independent homogeneous solutions and non-homogeneous solutions.
- Students should (a) understand by exposure to examples how systems and phenomena from science and engineering can be modeled by ODEs, and (b) how solution of such a model can be used to analyze or predict a system's behavior. A key example is the damped, forced, simple harmonic oscillator.
- Students should understand the role of initial value problems for ODEs in examples from science engineering, and should be introduced to the role of two-point boundary value problems and Fourier series.
- Students should understand an elementary method for the numerical solution of ODEs and have some familiarity with the solution of ODEs using MATLAB.

Course Outcomes

- Students have improved problem-solving skills, including knowledge of techniques for the solution of ODEs.
- Students have an understanding of the importance of differential equations in the sciences and engineering.
- Students are prepared for further study in science, technology, engineering, and mathematics.

Course Assessment: The assessment of objectives is achieved through homework assignments 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 and Quizzes	30%
Midterm Exam I	20%
Midterm Exam II	20%
Final Exam	30%

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

A	88 - 100	**C**	60 - 65
B+	83 - 87	**D**	45 - 59
B	73 - 82	**F**	0 - 44
C+	66 - 72		

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.

Homework: Homework is to be completed using the online WileyPLUS platform which is accessed through the Math 222 Commons Canvas page. Problems corresponding to each week's lectures are due Monday night of the following week. There is a 25% penalty for late work. In the few sections with no WileyPLUS problems available, students are to do the work assigned for that section in the syllabus and upload the work to the Commons Canvas page.

WileyPLUS Regrading Policy: WileyPLUS homework is worth 10% of the class grade. That's about one letter grade. Therefore it is imperative that students do all of the assignments. On the other hand, there are well over 100 problems assigned over the course of the semester, making each individual problem worth less than 0.1% of the overall grade and very unlikely to affect any student's letter grade. Therefore, our policy is not to adjust scores on individual problems.

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

Midterm Exam I	June 15, 2022
Midterm Exam II	July 20, 2022
Final Exam	August 8, 2022

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 2022 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/studentsuccess/accessibility/

Important Dates (See: Summer 2022 Academic Calendar, Registrar)

Date	Day	Event
May 23, 2022	Monday	**Full, First, and Middle** Summer Session Begins
May 25, 2022	Wednesday	Last Day to Add/Drop for **First Summer** Session
May 27, 2022	Friday	Last Day to Add/Drop for **Middle Summer** Session
May 30, 2022	Monday	Last Day to Add/Drop for **Full Summer** Session
May 30, 2022	Monday	Memorial Day - University Closed/No Classes Scheduled
June 11, 2022	Saturday	Last Day to Withdraw from **First Summer** Session
June 17, 2022	Friday	Last Day to Withdraw from **Middle Summer** Session
June 27, 2022	Monday	Last Day of Classes for **First Summer** Session
July 1, 2022	Friday	Last Day to Withdraw from **Full Summer** Session
July 3, 2022	Sunday	Independence Day - University Closed/No Classes Scheduled
July 4, 2022	Monday	Independence Day - Holiday Observance/No Classes
July 5, 2022	Tuesday	Second Summer Session Begins
July 6, 2022	Wednesday	Last Day to Add/Drop for Second Summer Session
July 18, 2022	Monday	Last Day of Classes for Middle Summer Session
July 21, 2022	Thursday	Last Day to Withdraw for Second Summer Session
August 8, 2022	Monday	Last Day of Classes for Full and Second Summer Session

Course Outline

Section	Subject Topic	Homework (HW) Assignment
1.1	Some Basic Models; Direction Fields	*HWK 5, 6, 7, 11, 12, 19*
1.2	Solutions of some Differential Equations	*HWK 1, 7, 10*
1.3	Classification of Differential Equations	*HWK 1, 2, 4, 6, 9, 11, 12*
2.1	Linear Equations; Integrating Factors	*HWK 6(c), 8(c), 10, 11, 13(b,c)*
2.1	Linear Equations; Integrating Factors (Continued)	*HWK 17, 18, 21, 23, 24, 25*
2.2	Separable Equations	*HWK 2, 4, 6, 9, 12*
2.3	Modeling with First Order Equations	*HWK 2, 5, 7, 12, 14(a)*
2.5	Autonomous equations and population Dynamics	*HWK 2, 4, 6, 8, 10, 11*
2.7	Numerical Approximation; Euler's Method	*HWK 2*
3.1	Homogeneous Equations with Constant Coefficients	*HWK 3, 5, 6, 8, 10, 13, 15, 16*
3.2	Solutions of Linear Homogeneous Equations: The Wronskian	*HWK 2, 4, 5, 7, 9, 14, 17, 19, 20, 21, 23*
3.3	Complex Roots of the Characteristic Equation	*HWK 1, 2, 4, 5, 8, 12, 19*
3.4	Repeated Roots; Reduction of Order	*HWK 1, 5, 7, 9, 11, 12, 19, 22*
3.5	Nonhomogeneous Equations; Undetermined Coefficients	*HWK 2, 4, 8, 13, 14*
3.5	Undetermined Coefficients (Continued)	*HWK 16(a), 17(a), 21(a)*
	REVIEW FOR EXAM 1	
	EXAM 1	
3.6	Variation of Parameters	*HWK 2, 6, 7, 9, 10, 12, 13*
3.7	Mechanical and Electrical Vibrations	*HWK 1, 2, 3, 4, 6, 7*
3.7	Vibrations (Continued)	*HWK 9, 11, 12, 13*
3.8	Forced Vibrations	*HWK 1, 4, 6*
6.1	Definition of the Laplace Transform	*HWK (6.1) 3, 5, 10, 12, 16, 19, 20, 21*
6.2	Solution of Initial Value Problems	*HWK (6.2) 1, 2, 3, 4, 6, 10, 16, 17*
	REVIEW EXAM 2	
	EXAM 2	
6.3	Step Functions	*HWK (6.3) 1, 3, 5, 8, 10, 12,14, 15; (6.4) 2, 3, 4, 7*
6.4	ODEs with Discontinuous Forcing Functions	*HWK 11, 14*

6.5	Impulse Functions	*HWK 1, 2, 7*
6.6	The Convolution Integral	*HWK 4, 5, 7, 8, 9, 14*
7.1	System of First Order Linear ODEs	*HWK 1, 3, 4, 7(a,b)*
7.2	Review of Matrices	*HWK 1, 2, 4, 7, 17*
7.3	Review of Linear Algebraic Equations, Eigenvalues, and Eigenvectors (2x2)	*HWK 14, 15, 16*
7.5	Homogeneous Linear Systems with Constant Coefficients	*HWK 2b, 3b, 5b, 10, 11*
7.6	Complex Eigenvalues	*HWK 1(b), 4(b), 8, 11, 14, 23*
10.1	Two-Point Boundary Value Problems	*HWK 1, 3, 5, 10, 14, 15, 18*
10.2	Fourier Series	*HWK 1, 5, 6, 7, 13, 15, 16*
10.2	Fourier Series (Continued)	*HWK 1, 5, 6, 7, 13, 15, 16*
10.4	Even and Odd Functions	*HWK 1, 5, 6, 7, 13, 15, 16*
	REVIEW FOR FINAL EXAM	
	FINAL EXAM	

Updated by Professor M. Potocki-Dul - 03/31/2022
Department of Mathematical Sciences Course Syllabus, Summer 2022