MATH 222 Honors: Differential Equations - Honors
Spring 2024 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: Topics enhance those of Math 222 and concepts are studied in detail. Emphasizes science and engineering applications. Effective From: Fall 2012.

Number of Credits: 4

Prerequisites: MATH 112 H with a grade of B or better or MATH 112 with a grade of A.

Course-Section and Instructors:

Course-Section	Instructor
Math 222-H02	Professor J. Bechtold

Office Hours for All Math Instructors: Spring 2023 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, April 1, 2024**. It will be strictly enforced.

STUDENT RESPONSIBILITIES

- Read and understand the syllabus
- Adhere to all policies and procedures
- Report conflicts and/or special circumstances in a timely manner
- Report any instances of violations of Academic Integrity to your Instructor
- Communicate directly with your Instructor on ALL course-related matters, including material, procedures, policies and exams.
- Effectively manage time and devote sufficient time to succeeding in this course
- Keep track of your grades
- Make use of all resources available to help you learn
- Be respectful of peers and your instructor
- Accept responsibility for your grades – requests for extra credit opportunities will be denied

COURSE GOALS

Course Outcomes

Students should:

- Students should (a) learn elementary analytical solution techniques for the solution of ordinary differential equations (ODEs), (b) understand the solution structure of linear ODEs in terms of independent homogeneous solutions and non-homogeneous solutions, and (c) interpret the solutions using plots and methods of calculus. 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 should be prepared 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:

Quiz/HW	17%
Midterm Exam I	17%

Midterm Exam II	17%
Midterm Exam III	17%
Final Exam	32%

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

A	85 - 100	**C**	65 - 69
B+	80 - 84	**D**	60 - 64
B	75 - 79	**F**	0 - 59
C+	70 - 74		

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.

Quizzes: Quizzes will be given approximately once a week throughout the semester. They will be based on the lecture, suggested problems in the course outline below, homework and the in-class discussions.

Exams: There will be three midterm exams held during the semester and one comprehensive final exam. Midterm Exams will be held during normal class hours on the following days:

Midterm Exam 1	February 6, 2024 (T)
Midterm Exam 2	March 5, 2024 (T)
Midterm Exam 3	April 9, 2024 (T)
Final Exam Period	May 3 - May 9, 2024

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 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 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: Spring 2024 Academic Calendar, Registrar)

Date	Day	Event
January 16, 2024	Tuesday	First Day of Classes
January 22, 2024	Monday	Last Day to Add/Drop Classes
March 10, 2024	Sunday	Spring Recess Begins
March 16, 2024	Saturday	Spring Recess Ends
March 29, 2024	Friday	Good Friday - No Classes
April 1, 2024	Monday	Last Day to Withdraw
April 30, 2024	Tuesday	Friday Classes Meet
April 30, 2024	Tuesday	Last Day of Classes
May 1, 2024	Wednesday	Reading Day 1
May 2, 2024	Thursday	Reading Day 2
May 3 - May 9, 2024	Friday to Thursday	Final Exam Period

Course Outline

Lecture	Sections	Topic	Assignments for Review
1	1.1	Some Basic Models; Direction Fields	HWK 5, 6, 7, 11, 12, 19
2	1.2	Solutions of Some Differential Equations	HWK 1, 2, 4, 6, 9, 11, 12
3	1.3	Classification of Differential Equations	HWK 6(c), 8(c), 10, 11, 13(b,c)
4	2.1	Linear Equations; Integrating Factors	HWK 17, 18, 21, 23, 24, 25
5	2.2	Separable Equations	HWK 2, 4, 6, 9, 12
6	2.3	Modeling with First Order Equations	HWK 2, 5, 7, 12, 14(a)

7	2.7	Numerical Approximation; Euler's Method	HWK 2
8	3.1	Homogeneous Equations with Constant Coefficients	
9	3.1	Homogeneous Equations with Constant Coefficients/Review	3, 5, 6, 8, 10, 13, 15, 16
10		**EXAM #1**	
11	3.2	Solutions of Linear Homogeneous Equations and the Wronskian	
12	3.2	Solutions of Linear Homogeneous Equations and the Wronskian	HWK 2, 4, 5, 7, 9, 14, 17, 19, 20, 21, 23
13	3.3	Complex Roots of the Characteristic Equation	HWK 1, 2, 4, 5, 8, 12, 19
14	3.4	Repeated Roots; Reduction of Order	
15	3.4	Repeated Roots; Reduction of Order	HWK 1, 5, 7, 9, 11, 12, 19, 22
16	3.5	Nonhomogeneous Equations; Undetermined Coefficients	HWK 2, 4, 8, 13, 14
17	3.5	Undetermined Coefficients (Continued)	HWK 16(a), 17(a), 21(a)
18	3.6	Variation of Parameters	HWK 2, 6, 7, 9, 10, 12, 13
19	3.7	Mechanical and Electrical Vibrations	HWK 1, 2, 3, 4, 6, 7
20	3.7	Vibrations (Continued)	HWK 9, 11, 12, 13
21	3.8	Forced Vibrations	HWK 1, 4, 6
22		**EXAM #2**	
23	5.1	Review of Power Series	HWK 15, 17, 18, 19
24	5.2	Series Solutions of Second Order Linear ODEs with Nonconstant Coefficients; Solution Near an Ordinary Point	HWK 3(a,b), 5(a,b),6(a,b),7(a,b)
SPRING BREAK MARCH 12 – MARCH 20			
25	5.4	Euler's Equation; Regular Singular Points	HWK 1, 3, 6, 12, 17
26	5.5	Series Solutions Near a Regular Singular Point, Part I	HWK 1, 2, 3, 18
27	6.1 and 6.2	Definition of the Laplace Transform and Solution of Initial Value Problems	HWK (6.1) 3, 5, 10, 12, 16, 19, 20, 21, (6.2) 1, 2, 3, 4, 6, 10, 16,17
28	6.3	Step Functions	HWK (6.3) 1, 3, 5, 8, 10, 12,14, 15; (6.4) 2, 3, 4, 7
29	6.4	ODEs with Discontinuous Forcing Functions	HWK 11, 14
30	6.5	Impulse Functions	HWK 1, 2, 7
31	6.6	The Convolution Integral	HWK 4, 5, 7, 8, 9, 14

32	7.1	System of First Order Linear ODEs	HWK 1, 3, 4, 7(a,b)
33		**EXAM #3**	
34	7.2	Review of Matrices	HWK 1, 2, 4, 7, 17
35	7.3	Review of Linear Algebraic Equations, Eigenvalues, and Eigenvectors (2x2)	14, 15, 16
36	7.5	Homogeneous Linear Systems with Constant Coefficients	2b, 3b, 5b, 10, 11
37	7.6	Complex Eigenvalues	HWK 1(b), 4(b), 8, 11, 14,23
38	10.1	Two-Point Boundary Value Problems	HWK 1, 3, 5, 10, 14, 15, 18
39	10.2	Fourier Series	HWK 1, 5, 6, 7, 13, 15, 16
40	10.2	Fourier Series (Continued)	HWK 19(a,b), 20(a,b), 22(a,b)
41	10.4	Even and Odd Functions	HWK 2, 3, 4, 7, 9, 15, 16, 21,23(a,b), 27(a,b)
42		Review for Final Exam	
		FINAL EXAM	

Updated by Professor J. Bechtold - 12/18/2024
Department of Mathematical Sciences Course Syllabus, Spring 2024