NJIT New Jersey's Science & Technology University

THE COLLEGE OF SCIENCE AND LIBERAL ARTS

THE DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 651: Methods of Applied Mathematics I
Graduate 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: A survey of mathematical methods for the solution of problems in the applied sciences and engineering. Topics include: ordinary differential equations and elementary partial differential equations. Fourier series, Fourier and Laplace transforms, and eigenfunction expansions.

Number of Credits: 3

Prerequisites: Math 222 or departmental approval.

Course-Section and Instructors

Course-Section	Instructor
Math 651-001	Professor Enkeleida Lushi

Office Hours for All Math Instructors: Fall 2020 Office Hours and Emails

Recommended Textbooks: 1) Elementary Applied Partial Differential Equation, with Fourier Series and Boundary Value Problems, by Richard Haberman.
2) Nonlinear Dynamics and Chaos, by Steven H. Strogatz
3) Elementary Differential Equations, by William E. Boyce and Richard C. DiPrima
4) Advanced Analytic Methods in Applied Mathematics, science and Engineering, by Hung Cheng.

University-wide Withdrawal Date: The last day to withdraw with a **W** grade is **Monday, November 9, 2020**. It will be strictly enforced.

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	50%
Midterm Exam	20%
Final Exam	30%

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

A	90 - 100	**C+**	76 - 79
B+	86 - 89	**C**	60 - 75
B	80 - 85	**F**	<60

Attendance Policy: Attendance at all virtual classes will be recorded and is **mandatory**. Please make sure you read and fully understand the Math Department's Attendance Policy.

Homework Policy: Homework assignments/projects will be assigned and collected every week. Each assignment must be uploaded on the due date in a pdf document that is legible. Late assignments are NOT accepted without a documented excuse or a prior arrangement.

Exams: There will be one midterm exam during the semester and one comprehensive final exam, both held virtually. 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 EXAMS during the semester. In the event the Final Exam is not taken, under rare circumstances where the student has a legitimate reason for missing the final exam, a makeup exam will be administered by the Mathematics Department. In any case the student must notify the Math Department Office and the Instructor that the exam will be missed 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.

Important Dates (See: Fall 2020 Academic Calendar, Registrar)

Date	Day	Event
September 1, 2020	T	First Day of Classes
September 8, 2020	T	Last day to add or drop a class
September 8, 2020	T	Monday classes meet
November 9, 2020	M	Last day to drop a class with a W grade
November 26-29, 2020	Th - Su	Thanksgiving Break
December 10, 2020	Th	Last Day of Classes
December 11-14, 2020	F - M	Reading Days
December 15-21, 2010	T - M	Final Exam Period

Course Outline (subject to changes)

Week	Dates	Topic
1	9/1 & 9/3	Linear ODEs: Integrating Factors, Separable Equations, Modeling with 1st order ODE-s, differences from Nonlinear Eqs.
2	9/10	Autonomous Eqs, Population Dynamics, Exact Eqs and Integrating Factors, Existence and Uniqueness, Difference Eqs.
3	9/15 & 9/17	Homogenous Eqs with Constant Coefficients, the Wronskian, Characteristic Equation, Repeated Roots and Order Reduction
4	9/22 & 9/24	Method of Undetermined Coefficients, Method of Variation of Parameters, Higher order Linear ODEs.
5	9/29 & 10/1	Power Series, Solutions near and Ordinary Point, Euler Eqs, Solutions near a Singular Point, Bessel's Equation.
6	10/6 & 10/8	Systems of First order ODEs, Linear Algebraic Equations, Homogenous Systems with Constant Coefficients, Complex Eigenvalues, Fundamental Matrices, Repeated Eigenvalues.
7	10/13 & 10/15	Nonlinear Systems and Stability, Phase Planes, Autonomous Systems, Predator-Prey Eqs, Liapunov's Method, Limit Cycles.
8	10/20 & 10/22	**MIDTERM WEEK**, Method of Characteristics for First Order Wave Eq. and First Order PDE-s d'Alembert's Solution
9	10/27 & 10/29	Semi-infinite domains, Reflections, Quasilinear PDEs, Traffic Flow and Shock Waves, 1st order Nonlinear PDEs, Eikonal Eq.
10	11/3 & 11/5	Method of separation of variables, Heat Eq, Laplace's Eq.
11	11/10 & 11/12	Sturm-Liouville Eigenvalue Problems, Self-Adjoint Operators
12	11/17 & 11/19	S-L, Rayleigh Quotient, Boundary Conditions of the 3rd kind
13	11/24	Heat Flow with Sources or Nonhomogenous BC-s.
14	12/1 & 12/3	Method of Eigenfunction Expansion with or without homogenous BC-s, Poisson Equation.
15	12/8 & 12/10	Review and/or additional topics.