

Math 20D (Introduction to Differential Equations)

Course Topics: Ordinary Differential Equations

Instructor: TBA

Textbook(s):

- Boyce and Diprima, *Elementary Differential Equations*, 8th Edition, John Wiley and Sons, 2004, Chapters 1-7.

CATALOG DESCRIPTION: 20D. *Introduction to Differential Equations (4)*

Ordinary differential equations: exact, separable, and linear; constant coefficients, undetermined coefficients, variations of parameters. Systems. Series solutions. Laplace transforms. Computing symbolic and graphical solutions using Matlab. Formerly numbered Math. 21D. May be taken as repeat credit for Math. 21D. *Prerequisite: Math 20C (or Math 21C) with a grade of C- or better.*

LECTURES:

Lecture	Section(s)	Topics Covered
1	1.1-1.3	Introduction: Mathematical modeling with ODE, Classification of ODE and PDE
2	2.1	Linear equations; Method of Integrating Factors
3	2.2	Separable Equations
4	2.3,2.4	Modeling with First Order Equations; Differences Between Linear and Nonlinear Equations
5	2.5	Autonomous Equations and Population Dynamics
6	2.6	Exact Equations and Integrating Factors
7	3.1,3.2	Second Order Linear Equations: Fundamental Solutions of Linear Homogeneous Equations
8	3.3	Linear Independence and the Wronskian
9	3.4	Complex Roots of the Characteristic Equation
10	3.5	Repeated Roots; Reduction of Order
Week 4	Midterm 1	TOPICS COVERED: Boyce and DiPrima 1.1-3.4.
11	3.6	Nonhomogeneous Equations; Method of Undetermined Coefficients
12	3.7	Variation of Parameters
13	7.1,7.2	Systems of First Order Linear Equations: Introduction, Review of Matrices
14	7.3	Linear Algebraic Equations; Linear Independence, Eigenvalues, Eigenvectors
15	7.4	Basic Theory of Systems of First Order Linear Equations
16	7.5	Homogeneous Linear Systems with Constant Coefficients
17	7.6	Complex Eigenvalues
18	7.7,7.8	Fundamental Matrices, Repeated Eigenvalues
19	7.9	Nonhomogeneous Linear Systems
20	5.1	Review of Power Series; Using Power Series to Solve ODEs
Week 8	Midterm 2	TOPICS COVERED: Boyce and DiPrima 3.5-3.7,7.1-7.9.
21	5.2,5.3	Series Solutions Near an Ordinary Point
22	6.1	The Laplace Transform: Definition of the Laplace Transform
23	6.2	Solution of Initial Value Problems
24	6.3,6.4	Step Functions; Differential Equations with Discontinuous Forcing Functions
25	6.5	Impulse Functions.
Week 10	Review	REVIEW for Final Exam
Week 11	Final Exam	TOPICS COVERED: Boyce and DiPrima 1.1-7.9.