

Fall 2009 Syllabus for Math 251

COURSE DESCRIPTION: Ordinary and Partial Differential Equations (4:4:0)

First- and second- order equations; numerical methods; special functions; Laplace transform solutions; higher order equations; Fourier series, partial differential equations. Students who have passed Math 250 may only take a one credit section of this course. PREREQUISITE: Math 141

INTRODUCTION

- 1.1 Direction fields1/2
- 1.2 Solutions of Some DE's1/2
- 1.3 Classification of DE's1

FIRST ORDER DE's

- 2.2 Separable Equations1
- 2.1 Linear ODE's1
- 2.3 Modeling w/DE's4
- 2.4 Differences Between Linear and Nonlinear Equations1
- 2.5 Autonomous Equations, Population Dynamics
(cover stability and concavity)1
- 2.6 Exact Equations(omit integrating factors)1

SECOND ORDER LINEAR EQNS

- 3.1 Homogeneous Equations with Constant Coefficients1
- 3.2 Fundamental Solutions of Linear Homogeneous Equations1
- 3.3 Linear Independence and the Wronskian1
- 3.4 Complex Roots of the Characteristic Equations
(review complex arithmetic)2
- 3.5 Repeated Roots; Reduction of Order using Abel's Formula3/2
- 3.6 Nonhomogeneous Equations; Method of Undetermined Coeffs3
- 3.8 Mechanical Vibrations (omit electrical vibs)3/2
- 3.9 Forced Vibrations1

HIGHER ORDER LINEAR EQUATIONS

- 4.2 Homogeneous Equations with Constant Coefficients1

THE LAPLACE TRANSFORM

- 6.1 Definition of the Laplace Transform2
- 6.2 Solution of Initial Value Problems2
- 6.3 Step Functions1
- 6.4 DE' w/Discontinuous Forcing Functions2
- 6.5 Impulse Functions1

SYSTEMS OF FIRST ORDER LINEAR EQUATIONS

- 7.1 Introduction to Systems of Differential Equations1
- 7.5-9 Classification of critical pts; sketching phase portraits ..4

NONLINEAR DIFFERENTIAL EQUATIONS AND STABILITY

- 9.1-2 Phase portraits and stability3/2
- 9.5 Linearize a nonlinear system at each of its3/2
critical points. Phase portrait for predator-prey eqn

PARTIAL DIFFERENTIAL EQUATIONS AND FOURIER SERIES

- 10.1 Two Point Boundary Value Problems2
- 10.2 Fourier Series2
- 10.3 The Fourier Theorem1
- 10.4 Even and Odd Functions1
- 10.5 Separation of Variables; Heat in a Rod2
- 10.6 Other Heat Conduction Problems2
- 10.7 The Wave Equation: Vibrations of an Elastic String2
- 10.8 Laplace's Equation2