

Departmental Syllabus **Math 3830 -- Differential Equations II**

Textbook: Fundamentals of Differential Equations and Boundary Value Problems (Fourth Edition), by Nagle, Saff, and Snider

Prerequisites: MATH 3630 with a grade of "C" or better

Calculators: Graphing calculator required; TI-83, 84, 85, or 86 recommended. (NOTE: On occasion, individual instructors may restrict the use of any type of calculator).

Course Description: Linear systems of differential equations, nonlinear systems, series solutions of differential equations, partial differential equations, orthogonal sets, and Fourier series.

Topics and sections to be covered:

Chapter 8 – Series Solutions of Differential Equations

- 8.1 Introduction: The Taylor Polynomial Approximation
- 8.2 Power Series and Analytic Functions
- 8.3 Power Series Solutions to Linear Differential Equations
- 8.4 Equations with Analytic Coefficients
- 8.5 Cauchy-Euler (Equidimensional) Equations
- 8.6 Method of Frobenius
- 8.7 Finding a Second Linearly Independent Solution (optional)
- 8.8 Special Functions (optional)

Chapter 9 – Matrix Methods for Linear Systems

- 9.1 Introduction
- 9.2 Review 1: Linear Algebraic Equations
- 9.3 Review 2: Matrices and Vectors
- 9.4 Linear Systems in Normal Form
- 9.5 Homogeneous Linear Systems with Constant Coefficients
- 9.6 Complex Eigenvalues
- 9.7 Nonhomogeneous Linear Systems
- 9.8 The Matrix Exponential Function

Chapter 10 – Partial Differential Equations

- 10.1 Introduction: A Model for Heat Flow
- 10.2 Method of Separation of Variables
- 10.3 Fourier Series
- 10.4 Fourier Cosine and Sine Series
- 10.5 The Heat Equation

10.6 The Wave Equation

10.7 Laplace's Equation

If time permits:

Chapter 11 – Eigenvalue Problems and Sturm-Liouville Equations

11.1 Introduction: Heat Flow in a Nonuniform Wire

11.2 Eigenvalues and Eigenfunctions

11.3 Regular Sturm-Liouville Boundary Value Problems

Or

Chapter 12 – Stability of Autonomous Systems

12.1 Introduction: Competing Species

12.2 Linear Systems in the Plane

12.3 Almost Linear Systems