

**MOREHOUSE COLLEGE
DEPARTMENT OF MATHEMATICS**

COURSE OUTLINE

DIFERENTIAL EQUATIONS (MATH 321)

TEXTBOOK:

A First Course In Differential Equations With Modeling Applications

Author: Dennis G. Zill ; Edition: 9TH: Publisher: Brooks/Cole CENGAGE Learning

GENERAL OBJECTIVES

The primary objectives of Math 321 are:

- (1) to expose the student to some of the more commonly used techniques for finding explicit solutions of ordinary differential equations:
- (2) to introduce several numerical techniques for finding approximate solutions to ordinary differential equations and;
- (3) to explore some of the applications of ordinary differential equations to the physical, behavioral and engineering sciences.

TOPICAL OUTLINE

- I. DIFFERENTIAL EQUATIONS AND THEIR SOLUTION (Chapter 1)
 - A. Classification of Differential Equations
 - B. Solutions and Initial Value Problems
- II. FIRST ORDER DIFFERENTIAL EQUATIONS (Chapter 2)
 - A. Direction Fields and Autonomous Equations
 - B. Separable Equations
 - C. Linear Equations and Bernoulli Equations
 - D. Exact Equations and Special Integrating Factors
 - E. Solutions by Substitutions
 - F. Euler's Method
 - G. Selected Applications (From Chapter 3)
 - (1) Growth and Decay
 - (2) Mixtures
- III. HIGHER ORDER DIFFERENTIAL EQUATIONS (Chapters 4)
 - A. Fundamental Solutions of Homogeneous Equations
 - B. Reduction of Order
 - C. Homogeneous Linear Equations with Constant Coefficients
 - D. Nonhomogeneous Differential Equations

- E. Method of Undetermined Coefficients
 - F. Variation of Parameters
 - G. Cauchy- Euler Equations
- IV. MODELING WITH HIGHER- ORDER DIFFERENTIAL EQUATIONS (Chapter5)
- A. Spring/Mass Systems
 - B. Elementary Electric Circuits
- V. SERIES SOLUTIONS OF LINEAR DIFFERENTIAL EQUATIONS (Chapter 6)
- A. Power Series Solutions About an Ordinary Point
 - B. Solutions About Singular Points (Optional)
 - C. Bessel's Equation and/or Legendre's Equation (Optional)
- VI THE LAPLACE TRANSFORM (Chapter 7)
- A. Definition and Properties of the Laplace Transform
 - B. Inverse Laplace Transform
 - C. Transforms of Derivatives
 - D. Solving Initial Value Problems Using Laplace Transforms
 - E. Operational Properties I and II
 - (1) A Piecewise –Defined Function
 - (1) Solving Initial Value Problems with Piecewise-Defined Functions
 - (2) Solving Integral Equations
 - F. The Dirac Delta Function
- VI SYSTEMS OF LINEAR DIFFERENTIAL EQUATIONS (Chapter 8)
- A. Solving Systems by Elimination (Chapter 4, Section 4.8)
 - B. Homogeneous Linear Systems (Chapter 8)
 - C. Nonhomogeneous Linear Systems (Optional; Chapter 8)
- VIII. NUMERICAL METHODS FOR DIFFERENTIAL EQUATIONS (Chapter 9)
- A. The Fourth Order Runge-Kutta Method
 - B. A Multistep Method (Optional)

REFERENCES

Introduction to Ordinary Differential Equation by Shepley L. Ross; Fourth Edition
John Wiley and Sons

Fundamentals of Differential Equations by Nagle, Saff, and Snider; Addison Wesley Publishers; Seventh Edition.

Differential Equations, Theory, Technique, and Practice by Simmons and Krantz; McGraw Hill Publishers; First Edition.

STUDENT RESPONSIBILITIES

- (1) Attend class regularly and take notes
- (2) Complete all assignments on time. Assignments

should be handed in at the beginning of the class.

- (3) Take all exams when scheduled or notify instructor in advance of conflicts.
- (4) Maintain a high level of personal integrity, including honesty on all graded work.