

Department: MATHEMATICAL SCIENCES

Semester Hours: 3

Course Title and Number: MATH 336 Ordinary Differential Equations

Course Description: Introduction to the theory of differential equations and their applications. Includes analytical and numerical techniques for solving differential equations, structure of solutions, existence and uniqueness of solutions, qualitative behavior of solutions. Taught as both a general education course and for majors in mathematics, science, and engineering.

PRQ: MATH 230.

Course Objectives:

- Students learn how derivatives commonly appear in equations that describe the world.
- Develop and improve students' problem solving skills and critical thinking.
- Students master mathematical techniques and concepts used to analyze and understand differential equations.
- Students learn to interpret the real world meanings and implications of the mathematical results they learn to discover and derive.

Content:

- Differential equations and mathematical models of real world problems: Basic concepts of differential equations, initial value problems, existence and uniqueness of solutions; population models, acceleration-velocity models, and other models.
- First order differential equations: Separable equations, linear equations, substitution methods, exact equation, integrating factor method.
- Linear equations of higher order: General solutions, Wronskian and its applications, characteristic roots, undetermined coefficients method, variations of parameters method; mechanical vibrations, electrical circuits, resonance.
- Numerical Methods: Euler's method, improved Euler's method, Runge-Kutta method.
- Laplace transforms: Definition and properties, derivatives, integrals and products of transforms, convolution; solutions of initial value problems by the Laplace transform method.
- Systems of differential equations: First order systems and applications, method of elimination, matrices and linear systems, qualitative behavior of solutions.

Course Requirements: Written explanation of problem solutions and writing involving concepts. Discussion and presentation involving concepts and problem solutions in class settings. Competency in the computational aspects of the course. Solutions of problems representing applications of differential equation to other disciplines.

Assessment Instruments: Judgment on student involvement and depth of contributions in class discussions. Competency examination on computational facility. Homework problem and writing assignments. Short quizzes. Hour examinations. Final examination.

Current Textbook: C.H. Edwards, Jr. and D. E. Penney, Elementary Differential Equations, Sixth Edition, Pearson Prentice Hall, 2008.