



Alabama Community College System

MTH 238 Applied Differential Equations I

I. MTH 238 Applied Differential Equations I– 3 Semester Hours

II. Course Description

This course is an introduction to techniques for solving differential equations with applications. Topics include solving first order differential equations, applications to various models (e.g. populations, motion, chemical mixtures, etc.), solving higher order linear differential equations with constant coefficients (general theory, undetermined coefficients, reduction of order and the method of variation of parameters, and Laplace transform). Series solutions and solutions to systems are also covered

III. Prerequisite

Corequisite of MTH 227

IV. Textbook

Due to the varied selection of quality college-level textbooks, each college will select the textbook needed to meet the requirements of this course.

V. Course Objectives

By the end of the course, students will be able to:

1. distinguish types and solutions of differential equations,
2. analyze first order differential equations,
3. solve mathematical models involving ordinary differential equations,
4. classify and solve higher order linear differential equations, and
5. solve initial value problems using Laplace Transforms.

VI. Course Outline of Topics

Required Topics

1. Definitions and terminology, initial value problems
2. Differential equations as models
3. First order differential equations
 - a. Separable equations
 - b. Exact equations
 - c. Linear equations using integrating factor
 - d. Solutions by substitutions
 - e. Systems of linear and nonlinear equations
4. Second and higher order differential equations
 - a. Homogenous and non-homogenous equations
 - b. Reduction of order
 - c. Homogenous linear equations with constant coefficients
 - d. Undetermined coefficient
 - e. Variation of parameters
 - f. Cauchy - Euler equation
 - g. Systems of linear equations
 - h. Nonlinear equations
 - i. Spring/Mass systems
 - j. Linear equations: boundary value problems
5. Nonlinear equations - numerical solutions
6. Power series solutions
7. Solutions about ordinary points
8. Solutions about singular points
9. Laplace Transforms
10. Applications of Laplace Transforms

Optional Topics

1. Step functions
2. Discontinuous forcing functions
3. Impulse functions

VII. Evaluation and Assessment

Grades will be given based upon A = 90 – 100%, B = 80 – 89%, C = 70 – 79%, D = 60 – 69%, and F = below 60%.

VIII. Attendance

Students are expected to attend all classes for which they are registered. Students who are unable to attend class regularly, regardless of the reason or circumstance, should withdraw from that class before poor attendance interferes with the student's ability to achieve the objectives required in the course. Withdrawal from class can affect eligibility for federal financial aid.

IX. Statement on Discrimination/Harassment

It is the official policy of the Alabama Community College System and entities under its control, including all Colleges, that no person shall be discriminated against on the basis of any impermissible criterion or characteristic, including, without limitation, race, color, national origin, religion, marital status, disability, sex, age, or any other protected class as defined by federal and state law. (ACCS Policies 601.02 and 800.00)

X. Americans with Disabilities

The Rehabilitation Act of 1973 (Section 504) and the Americans with Disabilities Act of 1990 state that qualified students with disabilities who meet the essential functions and academic requirements are entitled to reasonable accommodations. It is the student's responsibility to provide appropriate disability documentation to the College.