

JEFFERSON COLLEGE

COURSE SYLLABUS

MTH 205

DIFFERENTIAL EQUATIONS

3 Credit Hours

Prepared by:
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MTH205: Differential Equations

I. CATALOG DESCRIPTION

- A. Course pre-requisites/co-requisites: MTH 185 Calculus II with a grade of “C” or better, and reading proficiency
- B. 3 semester credit hours
- C. Differential Equations covers various classical methods for modeling and solving differential equations. This course is designed for students pursuing a degree in mathematics or engineering.
- D. Fulfills AS – Engineering emphasis degree requirement.
Elective course applies toward AA and AAT degree requirement.

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

Expected Learning Outcomes	Assessment Measures
Determine the order and degree of a given differential equation, determine whether or not the equation is linear, and solve a differential equation in the variable separable form	Homework Quizzes/tests
Solve first order linear differential equations using integrating factors, set up and solve differential equations for motion, growth model, decay model, and mixture problems, verify that a given function or functions are solutions to a differential equation, and the general solution to a linear homogeneous equation with constant coefficients with and without initial value conditions.	Homework Quizzes/tests
Find the Wronskian of two or more functions and determine whether the functions are linearly independent, and will use the method of undetermined coefficients to find the general solution to a linear non-homogeneous equation with and without initial value conditions	Homework Quizzes/tests
Solve second order differential equations using the method of variation of parameters	Homework Quizzes/tests
Find the Laplace transform and the inverse Laplace transform of functions and use them	Homework Quizzes/tests

to solve initial value problems. They will transform a second order equation into a system of first order equations and vice versa.	
Students will find the Eigen values and the corresponding Eigen vectors of square matrices and use them to solve systems of homogeneous linear equations with and without initial conditions.	Homework Quizzes/tests

III. COURSE OUTLINE

- A. Introduction
 1. Some basic mathematical models; direction fields
 2. Solutions of some differential equations
 3. Classification of differential equations

- B. First order linear equations
 1. Linear equations with variable coefficients
 2. Separable equations
 3. Modeling with first order equations
 4. Differences between linear and nonlinear equations
 5. Autonomous equations and population dynamics

- C. Second order linear equations
 1. Homogeneous equations with constant coefficients
 2. Fundamental solutions of linear homogeneous equations
 3. Linear independence and the Wronskian
 4. Complex roots for the characteristic equation
 5. Repeated roots; reduction of order
 6. Non-homogeneous equations; method of undetermined coefficients.
 7. Variation of parameters
 8. Mechanical and electrical vibrations
 9. Forced vibrations

- D. Higher order linear equations
 1. General theory of n th order linear equations
 2. Homogeneous equations with constant coefficients
 3. Method of undetermined coefficients
 4. Euler equations

- E. The Laplace Transform
 1. Definition of the Laplace Transform
 2. Solution of initial value problems
 3. Step functions

4. Differential equations with discontinuous forcing functions
 5. Impulse functions
- F. Systems of first order linear equations
1. Introduction to systems of first order linear equations
 2. Review of matrices
 3. Systems of linear algebraic equations; linear independence, Eigen values & Eigen vectors
 4. Basic theory of systems of first order linear equations
 5. Homogeneous linear systems with constant coefficients
 6. Complex Eigen values
 7. Repeated Eigen values

IV. METHODS OF INSTRUCTION

- A. Lectures
- B. Class discussion
- C. Textbook

V. REQUIRED TEXTBOOK

Boyce, William E., & DiPrima, Richard C. *Elementary Differential Equations and Boundary Value Problems* (Current Edition). New Jersey: John Wiley & Sons, Inc.

VI. REQUIRED MATERIALS

Graphics calculator required TI-83/84
Symbolic manipulating calculators prohibited

VII. SUPPLEMENTAL REFERENCES

Student solutions manuals

VIII. METHODS OF EVALUATION

- A. Homework, 0–20 %
- B. Quizzes, 0–20 %
- C. Tests, 30–60 %
- B. Comprehensive final examination, 15–25 %

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Technology Center 101; phone 636-481-3169).

X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College website, <http://www.jeffco.edu>).

XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details.

XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.