

OHLONE COLLEGE
Ohlone Community College District
OFFICIAL COURSE OUTLINE

I. Description of Course:

1. **Department/Course:** MATH - 104
2. **Title:** Differential Equations
3. **Cross Reference:**
4. **Units:** 5
Lec Hrs: 5
Lab Hrs:
Tot Hrs: 90.00
5. **Repeatability:** No
6. **Grade Options:** Grade Only (GR)

7. **Degree/Applicability:**
Credit, Degree Applicable, Transferable -
CSU & UC (T)
8. **General Education:** CSU General
Education (Plan B)
B2 - Mathematics/Quantitative Reasoning
District General Education (Plan A)
IV-B. Analytical Thinking and Oral
Communication IGETC (Plan C)
2. Mathematical Concepts/Quantitative
Reasoning
9. **Field Trips:** Not Required
10. **Requisites:**
Prerequisite
MATH 101B Calculus With Analytic
Geometry
Advisory
MATH 103 Introduction to Linear Algebra
MATH 101C Calculus With Analytic
Geometry

12. Catalog Description:

This course includes the study of the traditional topics in ordinary differential equations as well as series solutions, Laplace transforms, systems of equations, numerical methods, and selected applications.

13. Class Schedule Description:

Traditional methods, series solutions, Laplace transforms, systems, numerical methods, applications.

14. Counselor Information:

This is the first mathematics class after the calculus sequence that is usually required of students who plan to major in mathematics, engineering or the physical sciences. It is considered upper division work at some schools.

II. Student Learning Outcomes

The student will:

1. Solve first and second order linear differential equations using techniques including the methods of separation of variables, reduction of order, constant coefficients, and undetermined coefficients.
2. Solve an ordinary differential equation through the use of infinite series.
3. Solve an ordinary differential equation through the use of Laplace Transforms.
4. Convert a higher order ordinary differential equation into a system of first order differential equations.
5. Solve a partial differential equation by the method of separation of variables.
6. Apply the methods of solving differential equations to problems in spring-mass systems, electrical circuits, exponential growth and decay, mixing, and Newton's Law of Cooling.
7. Use computer software to draw direction fields and solutions to differential equations.

III. Course Outline:

- A. Introduction to Differential Equations and Solving First Order D.E.
 1. First Order Differential Equations
 2. Separable Equations
 3. Applications - Growth and Decay, Mixing, Cooling and Heating Phenomena
 4. Directions Fields and Euler's Method
 5. Higher Order Numerical Methods (Optional)
- B. Second Order Equations
 1. Preliminary Theory
 2. Reduction of Order
 3. Homogeneous Equations with Constant Coefficients
 4. Nonhomogeneous Equations
 5. Method of Undetermined Coefficients
 6. Method of Variation of Parameters
 7. Mechanical Systems and Simple Harmonic Motion
 8. Unforced Damped Vibration
 9. Forced Vibrations
- C. Introduction to higher Order Systems (optional)
- D. Series Solutions
 1. Review of Power Series
 2. Power Series Expansions about Ordinary Points
 3. Power Series Expansions about Singular Points (optional)
- E. Laplace Transforms
 1. Definitions and Properties of Laplace Transform
 2. Inverse Laplace Transforms
 3. Initial Value Problems
 4. Step Functions and Delay Functions
 5. Differential Equations with Discontinuous Forcing Functions
 6. Impulse Forcing Functions
 7. The Convolution Integral
- F. System of Differential Equations
 1. Introduction to Linear Systems and the Elimination Method
 2. Basic Theory of First Order Systems
 3. Homogeneous Systems
 4. Nonhomogeneous Systems
- G. Partial Differential Equations

1. Fourier Series and Fourier Sine and Cosine Series
2. Introduction to Partial Differential Equations
3. Vibrating String Problem
4. Heat Equation and Separation of Variables

IV. Course Assignments:

- A. Reading Assignments
- B. Projects, Activities, and other Assignments
 1. Homework
- C. Writing Assignments

V. Methods of Evaluation:

- A. Exams
- B. Quizzes

VI. Methods of Instruction:

- A. Lecture

VII. Textbooks:

Recommended

1. Edwards, C. Henry, Penney, David E. *Differential Equations and Boundary Value Problems: Computing and Modeling* 3rd Edition, Prentice Hall, 2004 ISBN: 0-13-065245-8

Supplemental

VIII. Supplies:

CID 2201