This course provides students with an introduction to the theory, techniques and applications of ordinary differential equations. The topics covered include first-order differential equations, higher-order differential equations, power series solutions, Laplace transforms, systems of differential equations and numerical methods. C-ID MATH 240

### JUSTIFICATION FOR COURSE:

### PREREQUISITES:
- MATH G185: Calculus 2 with a minimum grade of C or better
- MATH C185: Calculus 2 with a minimum grade of C or better
- or
- MATH A185: Calculus 2 with a minimum grade of C or better
- or
- MATH A185H: Calculus 2 Honors with a minimum grade of C or better

### COREQUISITES:

### ADVISORIES:

### ASSIGNED DISCIPLINES:
Mathematics

### MATERIAL FEE:
Yes [ ] No [X] Amount: $0.00

### CREDIT STATUS:
Noncredit [ ] Credit - Degree Applicable [X] Credit - Not Degree Applicable [ ]

### GRADING POLICY:
Pass/No Pass [ ] Standard Letter [X] Not Graded [ ] Satisfactory Progress [ ]

### OPEN ENTRY/OPEN EXIT:
Yes [ ] No [X]

### TRANSFER STATUS:
CSU Transferable[ ] UC/CSU Transferable[X] Not Transferable[ ]

### BASIC SKILLS STATUS:
Yes [ ] No [X] LEVELS BELOW TRANSFER: Not Applicable

### CALIFORNIA CLASSIFICATION CODES:
- Y - Not Applicable
- NON CREDIT COURSE CATEGORY: Y - Not applicable, Credit Course
- OCCUPATIONAL (SAM) CODE: E
- REPEATABLE ACCORDING TO STATE GUIDELINES: No [X] Yes [ ] NUMBER REPEATS:
- REQUIRED FOR DEGREE OR CERTIFICATE: No [ ] Yes [X]
  - Liberal Arts: Emphasis in Mathematics(Associate in Arts)
  - Mathematics(Associate in Science for Transfer)
  - Mathematics(Associate in Arts)
GE AND TRANSFER REQUIREMENTS MET:
IGETC Area 2: Mathematical Concepts and Quantitative Reasoning
2A: Mathematics
CSU GE Area B: Scientific Inquiry and Quantitative Reasoning
B4 - Mathematics/Quantitative Thinking

COURSE LEVEL STUDENT LEARNING OUTCOME(S) Supported by this course:

1. find the general solution to a second order nonhomogeneous linear differential equation.
2. use power series to solve an ordinary differential equation.
3. solve an initial value problem using Laplace transforms.
4. utilize matrices to solve systems of linear equations.

COURSE OBJECTIVES:
1. Classify ordinary differential equations and determine the existence of a solution.
2. Select and apply the appropriate techniques for solving first-order equations.
3. Select and apply the appropriate techniques for solving higher-order equations.
4. Utilize power series to find solutions to ordinary differential equations.
5. Demonstrate an understanding of the theory of Laplace transforms and apply this theory to solve initial value problems.
6. Demonstrate the fundamentals of matrix algebra and utilize matrices to solve systems of linear equations.
7. Apply numerical methods to approximate solutions to ordinary differential equations and systems of equations.

COURSE CONTENT:

LECTURE CONTENT:

A. Introduction
   1. Basic definitions and terminology
   2. Classification of differential equations
   3. Direction fields
B. First-order differential equations
   1. Existence and uniqueness of solutions
   2. Separable variables
   3. Homogeneous differential equations
   4. Exact differential equations
   5. Linear differential equations
   6. Substitutions
   7. Applications
C. Higher-order linear differential equations
   1. Linear independence and the Wronskian
   2. Homogeneous linear differential equations
   3. Nonhomogeneous linear differential equations
   4. Variation of parameters
   5. Cauchy-Euler equations
   6. Applications
      a. Mechanical and electrical vibrations
      b. Forced vibrations
D. Power series solutions
1. Solutions about ordinary points
2. Solutions about singular points and the method of Frobenius
   a. Regular singular points
   b. Irregular singular points
3. Bessel's equation
4. Legendre's equation
E. Laplace transforms.
   1. Definition
   2. Inverse Laplace transform
   3. Solutions to initial value problems
   4. Step functions
   5. The convolution integral
F. Systems of linear differential equations
   1. Matrices
      a. Definitions and terminology
      b. Matrix algebra
      c. Gaussian and Gauss-Jordan elimination methods
      d. Eigenvalues and eigenvectors
   2. First-order linear systems
   3. The phase plane
   4. The fundamental matrix
   5. Homogeneous linear systems
   6. Nonhomogeneous linear systems
      a. Undetermined coefficients
      b. Variation of parameters
G. Numerical Methods
   1. Euler’s method
   2. Improved Euler's method
   3. The Runge-Kutta method
   4. Multistep methods
   5. Errors and stability
   6. Higher-Order equations and systems

METHODS OF INSTRUCTION:
A. Lecture:
B. Independent Study:

INSTRUCTIONAL TECHNIQUES:

COURSE ASSIGNMENTS:
Reading Assignments
Textbook
Out-of-class Assignments

Writing Assignments
Homework, activities, worksheets, quizzes, exams and computer assignments.

METHODS OF STUDENT EVALUATION:
Midterm Exam
Final Exam
Short Quizzes
Written Assignments
Essay Examinations
Objective Examinations
Report
Projects (ind/group)
Problem Solving Exercises
Oral Presentations
Skills Demonstration

Demonstration of Critical Thinking:
The completion of written assignments requiring critical thinking and problem solving skills, including but not limited to homework, activities, worksheets, quizzes, exams and computer assignments.

Required Writing, Problem Solving, Skills Demonstration:
Homework, activities, worksheets, quizzes, exams and computer assignments.

TEXTS, READINGS, AND RESOURCES:

TextBooks:

LIBRARY:
Adequate library resources include:

Comments:

Attachments:  
Attached Files