SYLLABUS
PART I
EDISON COMMUNITY COLLEGE
MTH 231S DIFFERENTIAL EQUATIONS
4 CREDIT HOURS

COURSE DESCRIPTION
Introduction to ordinary differential equations. Topics include: First order methods; existence and uniqueness; second order linear equations; Wronskian; undetermined coefficients; variation of parameter; series solutions; Laplace transform. Prerequisite: Grade of "C" or better in MTH 222S.

COURSE GOALS

The student will:

Bloom's Level		Gen Ed Outcomes
3	1. Solve first-order differential equations by making the appropriate substitutions, including homogeneous and Bernoulli equations	1, 3
3	2. Use linear or nonlinear first-order differential equations to solve application problems such as exponential growth and decay, population logistics growth, velocity, solution mixtures, two component series circuits and chemical reactions	1, 3
3	3. Demonstrate the relationship between slope fields and solution curves for differential equations and use a slope field and an initial condition to estimate a solution curve to a differential equation	1, 3
3	4. Use Euler's method to approximate solutions of first-order differential equations	1, 3
3	5. Solve higher-order homogeneous linear equations with constant coefficients	1, 3
3	6. Solve higher-order nonhomogeneous linear equations by the method of variation of parameters	1, 3
3	7. Use linear second-order differential equations to solve application problems such as spring/mass system motion problems, acceleration, or three component series circuits	1, 3
3	8. Use power series to solve higher-order differential equations about ordinary or singular points	1, 3
3	9. Perform operations with Laplace and inverse Laplace transforms to solve higher-order differential equations	1, 3

CORE VALUES
The Core Values are a set of principles which guide in creating educational programs and environments at Edison. They include communication, ethics, critical thinking, human diversity, inquiry/respect for learning, and interpersonal skills/teamwork. The goals, objectives, and activities in this course will introduce/reinforce these Core Values whenever appropriate.

TOPIC OUTLINE
1. Basic Mathematical Models; Direction Fields
2. Classification of Differential Equations
3. Linear Equations; Method of Integrating Factors

4. Separable Equations
5. Modeling with First Order Equations
6. Differences Between Linear and Nonlinear Equations
7. Autonomous Equations and Population Dynamics
8. Exact Equations and Integrating Factors
9. Numerical Approximations: Euler's Method
10. The Existence and Uniqueness Theorem
11. First Order Difference Equations
12. Homogeneous Equations with Constant Coefficients
13. Solutions of Linear Homogeneous Equations; the Wronskian
14. Complex Roots of the Characteristic Equation
15. Repeated Roots; Reduction of Order
16. Nonhomogeneous Equations; Method of Undetermined Coefficients
17. Variation of Parameters
18. Mechanical and Electrical Vibrations
19. Forced Vibrations
20. Definition of the Laplace Transform
21. Solution of Initial Value Problems
22. Step Functions
23. Differential Equations with Discontinuous Forcing Functions
24. Impulse Functions
25. The Convolution Integral
26. General Theory of nth Order Equations
27. Homogeneous Equations with Constant Coefficients
28. The Method of Undetermined Coefficients
29. The Method of Variation of Parameters
30. Review of Power Series
31. Series Solutions near an Ordinary Point
32. Euler's Equation; Regular Singular Points
33. Series Solutions near a Regular Singular Point
34. Bessel's Equation