SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: MATH 455 Department: Mathematics

Course Title: Differential Equations Semester: Fall Year: 1998

Objectives/Competencies

Course Objective	Competencies
1. Classification of ordinary differential equations.	1. To be able to classify any ordinary differential equation as to order, degree and linearity.
2. First order ordinary differential equations.	1. To be able to put a first order ordinary differential equation into its standard form, determine its method of solution and solve it. 2. To be able to solve/use the method of separation of variables, method of homogeneous coefficients, exact differential equations, integrating factor approach linear differential equations, and Bernoulli's equations. 3. To learn to mathematically model physical problems that lead to first order ordinary differential equations and be able to solve one dimensional heat conduction problems, LR Electrical Circuits, and exponential growth and decay problems (population/interest/cooling).
3. Linear ordinary differential equations.	1. To be able to solve any linear homogeneous differential equation of order two or greater using one of the

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	following techniques: a. Differential operator technique for equations with constant coefficients. b. D'Alembert's Reduction of Order Method for equations with constant or variable coefficients. 2. To be able to solve any linear nonhomogeneous differential equation of order two or greater using the following techniques: a. Method of Undetermined Coefficients. b. D'Alembert's Reduction of Order Technique. c. Variation of Parameters. 3. To be able to solve any order Cauchy-Euler differential equation.
4. Some applications of second order ordinary linear differential equations.	1. To learn how to mathematically model physical problems that lead to linear second order ordinary differential equations. Several examples are: a. LRC Electrical Circuit. b. Oscillating Spring Systems. c. Damped Oscillating Pendulum Problems
5. LaPlace Transforms.	1. To learn how to take the LaPlace Transform of algebraic and trigonometric functions, derivatives and integrals and consequently differential equations. 2. To learn how to take the Inverse LaPlace Transform of a transformed function or transferred equation. 3. To be introduced to the Unit Step Function, and how it

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	can be utilized to write a compound function as a single equation. 4. To learn what pulse and impulse functions are and how to take their LaPlace Transforms.
6. Solving a linear ordinary DE using LaPlace Transforms.	1. To be able to use the LaPlace Transform Technique to find the solution of a linear ordinary differential equation.
7. Using matrices to solve linear systems of differential equations.	1. To be able to solve a homogeneous system of linear differential equations with constant coefficients by matrix methods. 2. To be able to solve a nonhomogeneous system of linear differential equations using Variation of Parameters method.
8. Power series solutions to linear ordinary differential equations.	1. To be able to find the power series solution near an ordinary point of a linear ordinary differential equation. 2. To be able to find the power series solution near a regular singular point of a linear ordinary differential equation (optional).
9. Numerical methods for solving first order differential equations.	1. To be able to solve a first order differential equation numerically using one of the following techniques: Euler's Method, Improved Euler's Method, Three Term Taylor's Method, and Runge-Kutta Method. 2. To be able to solve a higher order differential equation numerically using Euler's Method and the Runge-Kutta

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	Method (optional).

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