HOSTOS COMMUNITY COLLEGE DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

MAT 360:	DIFFERENTIAL EQUATIONS
CREDIT HOURS:	3.0
EQUATED HOURS:	3.0
CLASS HOURS:	3.0
PREREQUISITES:	Math 310 Calculus III with C or higher
SUGGESTED TEXTS:	Boyce/De Prima: <u>Elementary Differential Equations</u> , 10 th Edition, Wiley, 2012, ISBN: 978-0-470-45832-7 Use of graphing calculator is recommended.
REFERENCE TEXTS;	Rainville: <u>Elementary Differential Equations</u> 8 th Edition, Prentice Hall
	Ross: <u>Differential Equations</u> , Second Edition, Xerox Publisher
DESCRIPTION:	The student will formulate and solve differential equations of the first and and higher order linear equations with constant coefficients, undetermined coefficients, variation of parameters, applications; Euler's equation, Laplace Transforms, series solutions, linear systems; elementary partial differential equations and separation of variables; Fourier series.
EXAMINATIONS:	A minimum of four partial tests and a comprehensive final examination.
GRADES:	A, A ⁻ , B ⁺ , B, B ⁻ , C ⁺ , C, D, I, F

Student Learning Outcomes

- 1. Interpret and draw appropriate inferences of differential equations and their properties such as determining consistency of a system of equations.
- 2. Use algebraic, numerical and graphical methods to solve differential equations and systems of differential equations by various methods including variation of parameters, Laplace transforms and series solutions.
- 3. Represent quantitative problems expressed in natural language in suitable algebraic or functional form that leads to a solvable equation.
- 4. Effectively communicate solutions to mathematical problems in written, graphical or analytic form.
- 5. Evaluate solutions to problems and graphs of functions for reasonableness by inspection.
- 6. Apply calculus based methods to problems in other fields of study such as Physics, Economics, Geometry, Chemistry or Biology.

COURSE OUTLINE

I. INTRODUCTION

- a. Examples of differential equations
- b. Definitions (order, degree, linear, non-linear, ordinary, partial etc)
- c. Elimination of arbitrary constants
- d. Historical Remarks

II. FIRST ORDER DIFFERENTIAL EQUATIONS

- a. Method of separation of variables
- b. Exact Equations
- c. Equations with homogeneous co-efficients
- d. Integrating Factors
- e. Elementary applications to chemistry and physics

III. HIGHER-ORDER LINEAR DIFFERENTIAL EQUATIONS

- a. Higher-Order Linear Differential Equations
- b. Linear Independent and Dependent Functions
- c. The Wronskian
- d. Linear Equations with constant coefficients, Euler's equation
- e. Homogeneous Equations where the Auxiliary Equation contains:
 - 1. Distinct Roots
 - 2. Repeated Roots
 - 3. Imaginary Roots

- f. Non-Homogeneous Equations Soved by:
 - 1. Method of Undetermined co-efficients
 - 2. Inspection
- g. Variation of Parameters
- h. Reducation of Order

MAT 360 COURSE OUTLINE

IV. APPLICATION OF HEGHER-ORDER LINEAR DIFFERENTIAL EQUATIONS

- a. Vibration of a Spring
- b. Undamped Motion
- c. Damped Motion
- d. Resonance Phenomena
- e. Electric Circuit Problems

V. LAPLACE TRANSFORM

- a. Definition of the Laplace Transform and Transform of Elementary Functions
- b. Inverse Transform and the Convolution Integral
- c. Solution of Simple Boundary Value Problems
- d. Solution of Elementary Integral Equations
- e. The Gamma Function
- f. Solution of Systems of Linear Equations

VI. SERIES SOLUTION OF LINEAR DIFFERENTIAL EQUATIONS

- a. Linear Equations and Power Series
- b. Convergence of Power Series (ordinary points and singular points)
- c. Solutions near and ordinary Pint
- d. Regular Singular Points
- e. Solutions About Singular Points; The Method of Frovenius

VII. FOURIER SERIES AND PARTIAL DIFFERENTIAL EQUATIONS

- a. Fourier Series: An Expansion Theorem
- b. Examples of Fourier Series
- c. Fourier Sine and Cosine Series
- d. Solution of Partial Differnetial Equations by means of Separation of Variables
- e. Solution of the Heat Equation (1 dimensional) (*optional)
- f. Solution of the Wave Equation (1 dimensional) (*optional)