HOSTOS COMMUNITY COLLEGE
DEPARTMENT OF MATHEMATICS

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: Elementary Differential Equations, 10th Edition, Wiley, 2012, ISBN: 978-0-470-45832-7** **Use of graphing calculator is recommended.**
REFERENCE TEXTS;	**Rainville: Elementary Differential Equations 8th Edition, Prentice Hall** **Ross: Differential Equations, 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)