MASTER COURSE OUTLINE
Prepared By: Date: September 2017

COURSE TITLE
Differential Equations

GENERAL COURSE INFORMATION

Dept.: MATH	Course Num: 230	(Formerly:)
CIP Code: 27.0101	Intent Code: 11	Program Code:
Credits: 5		
Total Contact Hrs Per Qtr.: 55		
Lecture Hrs: 55	Lab Hrs: 0	Other Hrs: 0

Distribution Designation: Math Science MS, Symbolic or Quantitative Reasoning SQR

COURSE DESCRIPTION (as it will appear in the catalog)
This course will introduce the student to the solution of elementary differential equations and standard applications of differential equations in science. It will include the solution of first order linear differential equations with applications to exponential growth and decay problems, mixture problems, orthogonal trajectories, etc., solutions to second order differential equations with applications to harmonic motion, and the LaPlace transform.

PREREQUISITES
MATH&163 or instructor permission

TEXTBOOK GUIDELINES
Appropriate college level text as chosen by the instructor

COURSE LEARNING OUTCOMES
Upon successful completion of the course, students should be able to demonstrate the following knowledge or skills:

1. Solve first order linear equations of all types
2. Solve application problems using first order linear equations
3. Solve higher order differential equations using various methods, such as variation of parameters, differential operators, etc.
4. Apply the solution of higher order differential equations to harmonic motion problems
5. Solve differential equations using Laplace Transforms
6. Solve differential equations using series solutions

INSTITUTIONAL OUTCOMES
IO2 Quantitative Reasoning: Students will be able to reason mathematically.

COURSE CONTENT OUTLINE
1. Introduction to differential equations
   Basic definitions and terminology

- Origins of differential equations

2. First ordered differential equations
   - Preliminary theory
   - Separable equations
   - Homogeneous equations
   - Exact equations
   - Linear equations
   - Bernoulli equations
3. Applications of differential equations
   - Exponential growth and decay
   - Newton's Law of Cooling
   - Mixture problems
   - Chemical reactions
   - Misc. Applications
4. Linear equations of higher order
   - Initial value and boundary value problems
   - Linear dependence and Independence
   - Solution to linear equations
   - Finding a second solution from a known solution
   - Homogeneous linear equations with constant coefficients
   - Undetermined coefficients
   - Differential operators
   - Solving non-homogenous equations
   - Variation of parameters
5. Applications of second order equations
   - Simple harmonic motion
   - Damped motion
   - Forced motion
6. Differential equations with variable coefficients
   - Cauchy Euler Equation
   - Power series solutions around ordinary points
   - Power series solutions around singular points
   - Regular singular points
   - Method of Frobenius
7. Laplace Transforms
   - The Laplace Transform
   - The inverse transform
   - Operational properties
   - Translation theorems and derivatives of a transform
   - Transforms of derivatives and integrals

DEPARTMENTAL GUIDELINES *(optional)*

In order to give the instructor the greatest flexibility in assigning a grade for the course, grades will be based on various instruments at the instructor's discretion. However, to maintain instructional integrity there must be four class exams or three class exams and a project. A final exam will be given if there are less than four exams or a project may be substituted for the final exam if there are four in-class exams. At least 60% of the grade will be based on quantifiable work (exams, homework, quizzes, etc.). The remaining portion of the grade may be based on quantifiable work, attendance, projects, journal work, etc., at the instructor's discretion. The following is a compilation of acceptable grading instruments: in class exams and a final, attendance,

homework or quizzes, research paper, modeling projects on the calculator or computer. Other projects or assignments may be assigned as deemed appropriate at the instructor's discretion.

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DIVISION CHAIR APPROVAL **DATE**