Math 204 (Ordinary Differential Equations I)

<table>
<tr><td rowspan="2">Math 204</td><td rowspan="2">Ordinary Differential Equations I</td><td>Credits</td><td>Lec</td><td>Tut</td></tr>
<tr><td>3</td><td>3</td><td>1</td></tr>
<tr><td>Course Summary</td><td colspan="4">Basic concepts - First-order differential equations - Existences and Uniqueness for initial – boundary value problems - Separable variables - Homogeneous equations - Exact equations. Linear equations - Equations of Bernoulli - Ricatti. Substitutions - Picard's methods - Linear differential equations of higher-order - Homogeneous equations with constant coefficients, Method of undetermined coefficients, Method of variation of parameters. Differential equations with variable coefficients, Cauchy-Euler equations - Laplace Transform - Applications of Laplace transform to solve ordinary differential equations.</td></tr>
<tr><td>Prerequisites</td><td>Math 202</td><td colspan="3">Calculus II</td></tr>
<tr><td>Textbook</td><td>C. H. Edwards & D. E. Penney</td><td>Elementary Differential Equations with Boundary Value Problems, Sixth Edition.</td><td>Pearson Prentice Hill</td><td>2008</td></tr>
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Objectives:

1- This course is primarily designed for undergraduate students studying physics and various disciplines of engineering.

2- Deriving ODEs that describe various phenomena in physics, mechanics, chemistry, biology, etc.

3- Learning various methods for solving a great variety of differential equations.

4- Upgrading the skills of the student to understand more better the other branches physics, mechanics, chemistry, biology.

Course description:

1. Basic concepts: Definitions. Classifications of ODEs. Solutions types. Origin of ODEs.

2. First-order differential equations. Preliminary theory. existences and uniqueness for initial – boundary value problems. Separable variables, Homogeneous equations. Exact equations. Linear equations. Equations of Bernoulli, Ricatti. Substitutions. Picard's methods.

3. Linear differential equations of higher-order: Preliminary theory; existences and uniqueness for initial – boundary value problems. Basic concepts; Linear dependence and Linear independence, Superposition principle for homogeneous equations, fundamental set, Superposition principle for non-homogeneous equations, Constructing of a second solution from a known solution, Homogeneous equations with constant coefficients, Method of undetermined coefficients, Method of variation of parameters. Differential equations with variable coefficients, Cauchy-Euler equations.

4. Laplace Transform: Laplace transform, Inverse transform, Translation theorems, Differentiation and Integration of the Laplace Transform, Partial Fractions, Transform of derivatives, Convolution, Transform of periodic functions, Applications of Laplace transform to solve ordinary differential equations.

Teaching Schedule:

Delivery Type	Number	Lecture Length (hours)	Student Hours
Lecture	39	1	39
Tutorial	13	1	13
Private Study Hours			117
Total Contact Hours			52
Total Hours			169

Methods of Assessment:

1- Coursework

Assessment Type	Notes (paper HW/Online)	% of Formal Assessment
In-course Assessment	Weekly Paper HW	10
Total Percentage		10

2- Exams

Assessment Type	Notes (MCQ, etc …)	% of Formal Assessment
First Exam	MCQ & Written	25
Second Exam	MCQ & Written	25
Final Exam	MCQ & Written	40
Total Percentage		90