

INSTITUTE OF MATHEMATICS
College of Science
University of the Philippines Diliman

Math 122 Course Syllabus

A. Course Catalogue Description

Course Number	Math 122
Course Title	Differential Equations and Applications
Course Description	First order ordinary differential equations (ODEs); homogeneous and non-homogeneous linear second order ODEs; systems of linear equations; series solutions of ODEs; stability analysis of nonlinear ODEs; Laplace transforms; applications of ODEs
Prerequisite	Math 22/equiv. or Math 30/equiv.
Course Credit	3 units
Number of Hours	3 hours/week

B. Course Content

- I. Course Introduction and Orientation
- II. First Order Differential Equations
 1. Definition and Examples of Differential Equations
 2. Families of Curves
 3. Existence and Uniqueness of Solutions
 4. Separable Equations
 5. Exact Equations
 6. Integrating Factors
 7. Substitution Methods
 - a. Equations with homogeneous coefficients
 - b. Equations with linear coefficients
 - c. Bernoulli's equation
 8. Applications
 - a. Population Models
 - b. Acceleration-Velocity Models
- III. Linear (Homogeneous) Differential Equations of Higher Order
 1. Existence and Uniqueness of Solutions
 2. Linear independence of solution and the Wronskian
 3. General Solutions of Linear DE's
 4. Differential Operators
 5. Homogeneous Equations with Constant Coefficients
- IV. Linear (Nonhomogeneous) Differential Equations of Higher Order
 1. Method of Undetermined Coefficients
 2. Variation of Parameters
 3. Applications
 - a. Undamped Vibrations
 - b. Damped Vibrations and Resonance
 - c. Electrical Circuits
 4. Endpoint Problems and Eigenvalues
- V. Power Series Methods
 1. Power series representation of elementary functions
 2. Series solutions near ordinary points

VI. Laplace Transform Methods

1. Definition of Laplace Transform and Inverse Laplace Transform
2. Transforms of Derivatives
3. Derivatives of Transforms
4. Translation and Partial Fractions
5. Solving Differential Equations using Laplace Transform

VII. Linear Systems of Differential Equations

1. First-order differential systems with constant coefficients
2. Method of Elimination
3. Matrices and Linear Systems
4. Eigenvalue Method for Homogeneous Systems
5. Nonhomogeneous Linear Systems

VIII. Introduction to Nonlinear Systems

For a more detailed syllabus, send an email request to ddapr@math.upd.edu.ph.