

MTH 1050: DIFFERENTIAL EQUATIONS

Credit: 3 Hours

Pre-requisite: Calculus

Purpose of the Course

The course will introduce students to the theory and methods of ordinary differential equations

Expected Learning outcomes of the Course

Upon completion of this course, students will be able to:

1. Explain terminologies associated with differential equations and their solutions
2. Apply various methods for solving first-order linear differential equations, such as separation of variables, integrating factors, and exact differential equations.
3. Solve higher-order linear differential equations with constant coefficients, both homogeneous and non-homogeneous, using characteristic equations and undetermined coefficients.
4. Apply the inverse Laplace transform to convert Laplace domain solutions back to the time domain.

Course Content

The course will cover **Introduction to Differential Equations:** ordinary differential equations and partial differential equations, initial value problems, directive fields and autonomous equations, separable equations. **linear equations:** Bernoulli equations, exact equations and integrating factors, solutions by substitution, Euler's method, fundamental solutions of homogeneous linear equations with constant coefficients, nonhomogeneous equations, method of undetermined coefficients, variation of parameters, Cauchy-Euler equations. **Higher order differential equations:** spring-mass systems, elementary electric circuits, power series solutions about an ordinary point, solutions about singular points, Bessel equation, Legendre equation. **Laplace transform:** inverse Laplace transform, transforms of derivatives, solving initial-value problems using Laplace transforms, Dirac-delta function, solving systems by elimination, homogeneous linear systems.