**Indian Institute of Space Science and Technology**

**Thiruvananthapuram**

**MA 121 Vector Calculus and Differential Equations 2-1-0-3**

# Differential Equations:

- **Introduction**—Modeling Physical and Geometrical problems, Formation of Differential Equation, classification of Differential Equations.

- **First order ordinary differential equations** — Separable, Homogeneous and Exact Equations, Conditions of Exactness, Integrating Factor, Rules of finding Integrating Factors, Linear Equation, Equations reducible to Linear form, Applications—Orthogonal Trajectories, Clairaut's Equation, Singular Solution.

- **Existence and Uniqueness of Solution of Initial Value Problem (IVP)**—The Method of Successive Approximations, Picard's Existence and Uniqueness Theorem, Non-local Existence Theorem, Existence of IVP associated with $n^{th}$-Order Linear Differential Equation.

- **$n^{th}$-Order Linear Differential Equations**—Linear Independence and Dependence, Wronskian, General Solution, Methods of Solution of Linear Homogeneous Equations with constant coefficients and variable coefficients, Methods of Solution of Linear Non-Homogeneous Equations—Method of Variation of Parameters – Cauchy-Euler Equation.

- **Series Solution of Second-Order Linear Equations**—Ordinary and Singular Points, Power Series Solution, Series Solution about a Regular Singular Point–Frobenius method.

- **Special Functions**—Legendre Polynomials, Bessel's Function, and their properties.
- **Sturm-Liouville Problems**

Textbooks:


- Kreyszig, E., Advanced Engineering Mathematics, John Wiley.
- Ross, S.L., Differential Equations, John Wiley & Sons.


Instructor: Dr. Kaushik Mukherjee