

Course No	Course Name	L-T-P-Credits
MA 101	Differential Calculus and Linear Algebra	3-1-0: 4

Prerequisite: nil

Course Objectives: The objective of the course is to introduce the fundamental concepts of differential calculus, ordinary differential equations and linear algebra and to apply these concepts in modeling and analyzing several engineering problems.

Course Outcomes: After successful completion of the course, students will be able to:

1. Understand the concept of limit, continuity and differentiation for functions of single and multivariables, and the consequences of different mean value theorems for differential functions.
2. Apply Taylor series to approximate differentiable functions of single and multivariables and estimate the error.
3. Understand the idea of optimization and be able to solve extreme value problems. Able to relate such problems with real world problems.
4. Solve ordinary differential equations analytically and apply the ODEs to model real world problems.
5. Understand the basic concepts of vector spaces and matrix algebra.
6. Solve to solve systems of linear equations.

SYLLABUS

Module	Contents	Hours
I	Differential Calculus of Single Variable: Limit; continuity; differentiation, Rolle's theorem, mean value theorems of Lagrange and Cauchy; Taylor's and Maclaurin's series, indeterminate forms, L'Hospital's rule.	8
II	Differential Calculus of Multi-variable: Real valued functions of two/three variables, limit, continuity, differentiability, partial differentiation; Euler's theorem for homogeneous functions; Taylor's and Maclaurin's series for function of two variables; Extreme values of functions of two variables; Lagrange's method of undetermined multipliers.	12
III	Ordinary Differential Equations: Linear differential equations with constant coefficients, Euler-Cauchy forms; Method of variation of parameters.	08
IV	Linear Algebra: Vector space over \mathbb{R} , subspaces, bases and dimension; Echelon	08

form, rank of a matrix, system of linear equations; eigen values and eigen vectors; Symmetric, skew-symmetric, Hermitian, skew-Hermitian, orthogonal, unitary matrices.

Essential Readings:

1. J. Stewart, "*Calculus*", Cengage Learning India Pvt. Limited, 7th edition, 2017.
2. E. Kreyszig, "*Advanced Engineering Mathematics*", John Wiley & Sons, 10th edition 2015.

Supplementary Readings:

1. R. K. Jain and S. R. K. Iyengar, "*Advanced Engineering Mathematics*", Narosa Publishing House, 5th edition, 2016.