Course Type	Course Code	Name of Course	L	T	P	Credit
DE	**NMCD516**	Numerical Analysis	3	0	0	3

Course Objective

- The objective of the course is to provide knowledge of advanced numerical methods

Learning Outcomes

Upon successful completion of this course, students will:

- get knowledge of advanced Numerical Methods
- be able to apply Numerical Methods for solving Real World problems
- be able to analyze problems in terms of accuracy and precision

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1	Basic concepts: Error analysis, round-off, truncation errors, floating point numbers and arithmetic accuracy, precision, stability and convergence.	5	To learn the basics concept of Numerical Methods and Errors
2	Numerical Solution of linear and Nonlinear Equations: Introduction to methods for solving sparse linear systems, tridiagonal systems, solution of system of nonlinear equations, iterative methods, complex roots of nonlinear equations, Parallel Processing	7	To understand numerical solutions of linear and nonlinear equations
3	Interpolation and Curve Fitting: Interpolating Polynomials, Divided Differences, Central Difference,Hermite Interpolation, Spline Curves, Bezier Curves and B-Splines Curves, Interpolating on a Surface, Least-Squares	7	This unit will help student in understanding the advanced methods for Interpolation
4	Numerical Differentiation and Integration: Richardson Differentiation, Extrapolation, Adaptive Integration, Guassian Quadrature, Multiple Integrals. Solution of Integral Equations. Applications of Cubic Splines	7	Be able to perform Numerical Integration
5	Numerical Solution of Ordinary Differential Equations (ODEs): Explicit Runge-Kutta Methods, Adaptive Stepsize Control, Single Step Methods for Stiff Initial Value Problems, Multistep Methods, Extrapolation methods, Shooting Method, Boundary value problems. Finite Difference Methods, Convergence and Stability Analysis	9	Be able to solve linear and Nonlinear Equations using numerical methods
6	Numerical Solutions of Partial Differential Equations (PDEs): Solutions of Elliptic, Parabolic and Hyperbolic PDEs, Solving Discrete Equations,Finite Elements for Partial- Differential Equations	7	To understand methods for solving Partial Differential Equations (PDEs)
Total		**42**	

Text Books:

1. Applied Numerical Analysis by Curtis F. Gerald and Patrick O. Wheatley, Pearson Education India, 2004
2. An Introduction to Numerical Analysis by K. E. Atkinson, (2nd edition), Wiley-India, 1989.

Reference Books:

1. Numerical Methods for Engineers and Scientists by Joe D. Hoffman, Steven Frankel,CRC Press, 2001
2. Elementary Numerical Analysis - An Algorithmic Approach by S. D. Conte and Carl de Boor, 3rd edition, McGraw-Hill, 1981.