Course Type	Course Code	Name of Course	L	T	P	Credit
DC	**NMCC516**	Advanced Numerical Methods	3	1	0	4

Course Objective

- This course aims to deliver methods for numerical integration and advanced methods to find numerical solution of non-linear equations, ordinary differential equations and partial differential equations with initial and boundary conditions.

Learning Outcomes

- It is expected that students will learn Advanced Numerical methods to solve non-linear equations, ordinary and partial differential equations and integral equations which will help them to solve real world problems.

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1	Solution of tridiagonal system, Solution of simultaneous non-linear equations, Central Difference interpolation formulae, Numerical evaluation of double and triple integrals with constant and variable limits and its application, Solution of integral equations	10L+2T	In this unit students will learn to solve tridiagonal system, numerical solution of non-linear equations and interpolations formulae. Also they will learn numerical integration and its application.
2	Numerical Solution of ODE: Solution of initial-value problem by single and multistep methods. Solution of simultaneous first order and second order ordinary differential equations with initial conditions. Solution of Boundary value problems by Finite Difference method. Solution of mixed boundary value problem.	8L+3T	Students will learn numerical solution of first and second order ordinary differential equations with initial and boundary conditions.
3	Numerical Solution of elliptic partial differential equation: Solution of Laplace and Poisson equations in two variables. Algorithm for elliptic equation in three variables.	8L+3T	This unit will help students to understand the numerical solution of elliptic type of PDE.
4	Solution of parabolic partial differential equation in two variables by explicit and implicit methods, Solution of parabolic equation in three variables by ADE and ADI methods.	8L+3T	This unit will help students to learn different methods for numerical solution of parabolic PDE.
5	Solution of hyperbolic equation in two variables by explicit and implicit methods and algorithm for hyperbolic equation in three variables, Stability of finite difference schemes for parabolic and hyperbolic equations.	8L+3T	This unit will describe methods for numerical solution of hyperbolic PDE and stability analysis of used methods.
	Total	**42L+14T**	

Text Books:

1. Numerical Mathematics and Computing, by Ward Cheney and David Kincaid, International Thomson Publishing Company, (2013).

2. Applied Numerical Analysis, by Curtis Gerald and Patrick Wheatley, Addison-Wesley. Pearson Education India; 7 edition (2007).

Reference Books:

1. Numerical Solution of Partial Differential Equations: Finite Difference Methods, by G. D. Smith, Oxford University Press, 1985
2. Dey, S. Gupta, Numerical Methods, MCGraw Hill Education (India) Private Limited, 2013