COURSE CODE: **1151EE116**	COURSE TITLE: **NUMERICAL METHODS**	L	T	P	C
		3	**0**	**0**	**3**

COURSE CATEGORY:

Program Core

PREAMBLE :

This course provides an introduction to the basic concepts and techniques of numerical solution of algebraic equation, system of algebraic equation, numerical solution of differentiation, integration, statistical and ANOVA methods and their inter- relations and applications to computer science and engineering, and science areas and develops problem solving skills with both theoretical and computational oriented problems.

PREREQUISITE COURSES:

Engineering Mathematics-I

RELATED COURSES:

Power system Analysis, power system operation & control and allied subjects related numerical interpolation and transcendental equation.

COURSE EDUCATIONAL OBJECTIVES :

The objectives of the course are to make the students,

- To develop the mathematical skills of the students in the areas of numerical methods.
- To teach theory and applications of numerical methods in a large number of engineering subjects which require solutions of linear systems, finding eigen values, eigenvectors, interpolation and applications, solving ODEs, PDEs and dealing with statistical problems like testing of hypotheses.
- To lay foundation of computational mathematics for post-graduate courses, specialized studies and research.

COURSE OUTCOMES :

Upon the successful completion of the course, students will be able to:

CO Nos.	**Course Outcomes**	**Level of learning domain (Based on revised Bloom's taxonomy)**
CO1	Apply numerical methods to find our solution of algebraic equations using different methods under different conditions, and numerical solution of system of algebraic equations.	K3
CO2	Apply various interpolation methods and finite difference concepts.	K3
CO3	Work out numerical differentiation and integration whenever and wherever routine methods are not applicable.	K3
CO4	Work numerically on the ordinary differential equations using different methods through the theory of finite differences.	K3

CO5	Work numerically on the partial differential equations using different methods through the theory of finite differences.	K3

CORRELATION OF COs AND POs

COs	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	L	M								
CO2	H	H	L	M								
CO3	H	H	L	M								
CO4	H	H	L	M								
CO5	H	H	L	M								

COURSE CONTENT:

UNIT I	**SOLUTION OF TRANSCENDENTAL EQUATIONS AND EIGENVALUE PROBLEMS**	**9**

Solution of equations – iteration method – Newton-Raphson Method – solution of linear system by Gaussian elimination and Gauss-Jordan method – iterative methods – Gauss-Jacobi and Gauss-Seidel methods – inverse of a matrix by Gauss-Jordon method –finding the eigenvalues of a matrix by power method

UNIT II	**INTERPOLATION**	**9**

Lagrangian interpolating polynomials – interpolation with equal intervals – Newton's forward and backward difference formulae – central difference formulae – interpolation with unequal intervals – divided differences – Newton's divided difference formula.

UNIT III	**NUMERICAL DIFFERENTIATION AND INTEGRATION**	**9**

Differentiation using interpolation formulae – numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – two and three point Gaussian quadrature formulae – double integrals using trapezoidal and Simpson's rules.

UNIT IV	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	**9**

Single-step methods – Taylor series method – Euler method for first order equation – Fourth order Runge-Kutta method for solving first and second order equations – multi-step methods – Milne's and Adam's predictor and corrector methods

UNIT V	**NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS**	**9**

Classification of second order PDE - finite-difference approximations to partial derivatives – solution of Laplace and Poisson equations – solution of one-dimensional heat equation – solution of two-dimensional heat equation - solution of wave equation

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S.S. Sastry, Introductory Methods of Numerical Analysis, 4th edition, PHI Learning Private Limited, New Delhi, 2007.
2. B.S. Grewal and J.S. Grewal, Numerical Methods in Engineering and Science, 6th edition, Khanna Publishers, New Delhi, 2004.
3. John H. Mathews and Kurtis D. Fink, Numerical Methods using MATLAB, 4th edition, PHI Learning Private Limited, New Delhi, 2007.

4. C.F. Gerald and P.O. Wheatley, Applied Numerical Analysis, 6th edition, Pearson Education, Asia, New Delhi, 2006.

REFERENCE BOOKS:

1. A.K. Ray and K.M.Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGraw Hill International Edition, 2000
2. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, 2nd Edition, Penram International Publishers (India), New Delhi, 1996.
3. M. Rafi Quazzaman, Microprocessors Theory and Applications: Intel and Motorola prentice Hall of India, Pvt. Ltd., New Delhi, 2003.