DSC-3C	BCS-C301	NUMERICAL COMPUTING	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.

PREREQUISITES	:	Knowledge of C/C++ programming, Data Structure, Linear Algebra and Calculus
COURSE OBJECTIVES/ LEARNING OUTCOMES	:	Upon completion of this course, the student will be able to: • obtain an intuitive and working understanding of numerical methods for the basic problems of numerical analysis • demonstrate a basic knowledge of the techniques for accurate and efficient solution of models based on linear and nonlinear systems of equations, ordinary differential equations and partial differential equations. • apply these techniques to practical problems in Engineering

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Solution to Transcendental and Polynomial Equations: Iterative methods, bisection method, secant method, Newton-Raphson method, fixed point iteration, methods for finding complex roots. **12L**

Matrices and Linear System of Equations: LU decomposition method for solving systems of equations, Symmetric positive definite matrices and least square approximation, iterative algorithms for linear equations. **10L**

Interpolation: Polynomial interpolation, Newton-Gregory, Stirling's, Bessel's and Lagrange's interpolation formula, Newton's divided differences interpolation formulae. **10L**

Curve fitting: B-spline and Approximation: Fitting linear and non-linear curves, weighted least square approximation, method of least square for continuous functions. **10L**

Numerical Differentiation and Integration: Numerical differentiation and errors in numerical differentiation, Newton-Cotes formulae, trapezoidal rule, Simpson's rule, Gaussian integration. **8L**

Numerical Solutions of Ordinary Differential Equations: Picard's and Taylor's series, Euler's and Runge-Kutta (RK) methods. **5L**

Finite Element Method: Boundary value problems, Rayleigh and Galerkin methods of approximation, applications. **5L**

BOOKS RECOMMENDED :

1. K.E. Atkinson, W. Han, Elementary Numerical Analysis, 3rd Ed., Wiley, 2003.
2. C. Xavier, S.S. Iyengar, Introduction to Parallel Algorithms, Wiley-Interscience, 1998.
3. A. Kharab, R.B. Guenther, An Introduction to Numerical Methods: A MATLAB Approach, 1st Ed., Chapman and Hall/CRC, 2001.
4. B. Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, 2007.
5. S.R. Otto and J.P. Denier, An Introduction to Programming and Numerical Methods in MATLAB, Springer, 2005.
6. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, 7th Ed., New Age International Publishers, 2007.