SEMESTER – VII
MJC-15: Numerical Methods

Course Outcomes

After the completion of the course, the student will be able to understand:

CO1: Various numerical techniques to find the zeroes of nonlinear functions of single variable and solution of a system of linear equations up to a certain given level of precision.

CO2: Interpolation techniques to compute the values of functions for equal and unequal intervals.

CO3: Applications of numerical differentiation and integration to convert differential equations into difference equations for numerical solutions.

	MJC-15: Numerical Methods (6 credits) Full Marks-100	
Unit	**Topics to be covered**	**No. of Lectures**
1	Errors: Relative, Absolute, Round off, Truncation, Finding roots of Transcendental and Polynomial equations: Bisection method, Secant method, Regula-Falsi method, Newton-Raphson method, Fixed point iteration method, Rate of convergence.	12
2	Solution of system of linear algebraic equations: Partial pivoting, LU decomposition and its applications, Gaussian Elimination and Gauss Jordan methods, Gauss Jacobi method, Gauss Seidel method, SOR methods and their convergence analysis.	12
3	Finite differences, Interpolation, Newton's Forward and Backward interpolation, Stirling's Formula, Bessel formula, Newton's divided difference, Lagrange's Interpolation, Inverse Interpolation.	12
4	Numerical differentiation, Numerical Integration: Newton Cotes formula, Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpsons $3/8^{th}$ rule, Gauss quadrature formula.	12
5	Solution of difference equation of the first order, General solution, Linear difference equation with constant co-efficient, Solution of ordinary differential equations one step method: Euler's and modified Euler's method, Picard's method, Runge-Kutta methods.	12
	TOTAL	60

Book References:

1. S. S. Sastry, Introductory Methods of Numerical Analysis: Prentice-Hall of India, 5th edition, 2012.
2. S. R. K. Iyengar, R. K. Jain and M. K. Jain, Numerical Methods for Scientific and Engineering Computation: New Age International, 6th edition, 2012.
3. V. Rajaraman, Computer oriented Numerical Methods: Prentice-Hall of India, 3rd edition, 2004.
4. E. Balaguruswamy, Numerical Methods: Mcgraw Hill Education, 1st edition, 1999.
5. Bradie, Brian. (2006). A Friendly Introduction to Numerical Analysis. Pearson Education, India. Dorling Kindersley (India) Pvt. Ltd. Third impression 2011.