

Semester*	: III
Course Type	: SEC
Course Code**	: MAT-SEC-201
Name of the Course	: Numerical Methods
Learning level***	: 299
Credits	: 3
Contact Hours	: 45
Total Marks	: 100
End Semester Marks	: 80 (Theory - 50, Practical - 30)
Internal Marks	: 20

Course Objective

The objective of this course is to introduce the learners to the various aspects of numerical analysis including error analysis, finite differences, interpolation, numerical differentiation, integration, solutions of transcendental equations and simultaneous linear equations,.

Unit I

Exact and approximate numbers; Significant digits; Round off and truncation errors; Absolute and relative errors; Estimation of round off errors; Error propagation under arithmetic operations. Finite difference operators and their properties.

Unit II

Polynomial interpolation; Newton's forward and backward interpolation formulae; Lagrange's interpolation formula; errors in interpolation formulae and related numerical problems.

Unit III

Bisection method; False position method; Secant method, Fixed point iteration method; Newton-Raphson method; Convergence of the above methods and related problems.

Unit IV

Numerical differentiation using Newton's interpolation formulae; Error in numerical differentiation; General quadrature formula, Trapezoidal and Simpson's one third and three eighth rules for numerical integration.

Unit V

Gaussian elimination and Gauss-Jordan methods with and without pivoting; Jacobi and Gauss Seidel iterative methods and their convergence.

Practicals

List of Experiments (using any software)

1. Newton's forward interpolation
2. Newton's backward interpolation
3. Lagrange's interpolation
4. Bisection method
5. False position method
6. Fixed point iteration method
7. Newton-Raphson method
8. Numerical differentiation
9. Trapezoidal rule
10. Simpson's one third rule
11. Gaussian elimination method
12. Gauss-Jordan method
13. Jacobi method
14. Gauss-Siedel method

Text Books:

1. S. A. Mollah: Numerical Analysis and Computational Procedures; Books and Allied Pvt. Ltd., Kolkata.
2. E. Balagurusamy: Numerical Methods; Tata McGraw-Hill Publishing Company, New Delhi.

Reference Books:

1. G. Shankar Rao: Numerical Analysis; New Age International Publisher, New Delhi.
2. J. B. Scarborough: Numerical Mathematical Analysis; Oxford and IBH Publishing.
3. J. G. Chakraborty and P. R. Ghosh: Numerical Analysis; U. N. Dhur and Sons, Kolkata.
4. M. K. Jain, S. R. K. Iyengar and R. K. Jain: Numerical Methods for Scientific and Engineering Computation New Age International Publisher, New Delhi.

Course Outcomes:

1. Demonstrate proficiency in numerical methods and their applications in solving mathematical problems.
2. Apply appropriate techniques to analyze and estimate errors in numerical