***MA108 Numerical Methods for Engineers (Elective-II)***

**L-T-P-Cr: 3-0-0-3**

**Course objectives**: At the end of the course, a student will be equipped with basic techniques of numerical methods like root finding, numerical integration, differentiation and will be able to attempt solving ODEs numerically. If they can implement these by writing codes, they will be ready to handle projects in their respective fields.

**Syllabus:**

Unit 1. **Introduction**: When a fixed data is available for a process, how interpolation can help estimating the value at any other desired print where data is not available be highlighted. For example, estimating population, prey – predator models be discussed. **2 Lectures**

Unit 2. **Iterative Techniques for solution of equations:** Solutions of Non - linear equations – Simple iteration schemes, Bisection method, Newton-Raphson method, Secant method, order and rate of convergence of each of these methods. **8 Lectures**

Unit 3. **Solutions of linear equations** – Gaussian elimination, Gaussian Jordan Method, LU decomposition and Jacobi & Gauss Seidal iteration methods. **6 Lectures**

Unit 4. **Interpolation** – Interpolation, various forms of interpolating polynomials like Lagrangian interpolation of polynomials, Newton’s Divided Interpolation and Newton’s forward & backward difference formula, curve fitting**. 8 Lectures**

Unit 5. **Numerical Integration** – Newton Cotes type methods, Trapezoidal methods, Simpson’s rule 1/3rd, 3/8th rule, order of errors in integration, Numerical Differentiation, derivation and error of methods. **6 Lectures**

Unit 6. **Solution of initial value problems**– Single step methods: Euler’s method and Modified Euler’s method, Runge– Kutta Second order method(with proof) &Runge’s Kutta Fourth order methods(without proof); Multi step Methods: Predictor Corrector (Milne’s) Methods, Solution of Boundary value problems using finite difference methods, definition of convergence and stability. **10 Lectures**

**Suggested Readings:**

1. Numerical Methods for Scientific & Engineering Computations, M.K.Jain, S.R.K.Iyengar & R.K.Jain, New Age International Publishers, New Delhi

2. Introductory Methods of Numerical Analysis – S.S.Sastry – Prentice Hall of India Pvt. Ltd.

3. Advance Engineering Mathematics - E.Kreyszig, 8th edition , John Wiley & Sons, New York

4. A friendly introduction to Numerical Analysis, Brain Bradie, Pearson Education Low Price Edition