Course Name Numerical Methods and Computer Programming

Course Code CS(EE)301

Course Credit 3

Contact Hour 3L-1T

Prerequisite Mathematics, C Programming

Course Objective

The objectives of this course are

1. To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.
2. To solve problems in the field of Applied Mathematics, Theoretical Physics and Engineering which requires computing of numerical results using certain raw data.
3. To solve complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations.
4. To deal with various topics like finding roots of equations, solving systems of linear algebraic equations, interpolation and regression analysis, numerical integration & differentiation, solution of differential equation, boundary value problems, solution of matrix problems.
5. To facilitate numerical computing.

Course Outcome

On completion of the course students will be able to

1. Apply Numerical analysis which has enormous application in the field of Science and some fields of Engineering.
2. Familiar with finite precision computation.
3. Familiar with numerical solutions of nonlinear equations in a single variable.
4. Familiar with numerical integration and differentiation, numerical solution of ordinary differential equations.
5. Familiar with calculation and interpretation of errors in numerical method.
6. Familiar with programming with numerical packages like MATLAB

CO Mapping with departmental POs

H: High, M: Medium, L: Low

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1		H				L	H			M	L	H
CO 2		M			L	M		L	M			L
CO 3		M			L	M		L	M			
CO 4	H			L	M		L	M	M			L
CO 5	H		L		M							M
CO 6	H			M				L				

Course Content

Module I: **6L**

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors and corresponding programming.

Module II: **10L**

Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation and corresponding programming.

Module III: **6L**

Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms and corresponding programming.

Module IV: **8L**

Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method and corresponding programming.

Module V: **6L**

Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, Newton-Raphson method and corresponding programming.

Module VI: **8L**

Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector Methods and Finite Difference method and corresponding programming.

Text Books

1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).

Reference Books

1. Balagurusamy: Numerical Methods, Scitech.
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
5. Srimanta Pal: Numerical Methods, OUP.