ACADEMIC PLANNER & UNITIZATION OF SYLLABUS

DEPARTMENT OF ELECTRONICS

ACADEMIC YEAR 2024-'25 (6th Semester) (January to July)

Prepared by: Dr. Arindam Sen, Associate Professor, Dept. of Electronics

Course Title: Numerical Techniques

Course Learning Objectives

- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Analyze and evaluate the accuracy of common numerical methods.
- Implement numerical methods in MATLAB.
- Write efficient, well-documented MATLAB code and present numerical results in an informative way.

Course Learning Outcomes: At the end of this course, students will be able to

- CO1: Understand the common numerical methods and how they are used to obtain approximate solutions to mathematical problems.
- CO2: Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- CO3: Analyze and evaluate the accuracy of common numerical methods.

MONTH/YEAR	WEEK	TOPICS TO BE TAUGHT
March 2023	2	a. Introduction to Numerical Methods b. Floating point representation of numbers
	3	a.. Error in numerical computation b. Types of error c. Error propagation
	4	a. Solution of Transcendental and Polynomial Equations b. Bisection method c. Problems and solutions of Bisection methods d. Program to implement Bisection Method using C (Practical)
	5	a. Secant Method b. Regula Falsi Methods c. General Iteration Methods d. Program to implement Secant Method using C (Practical)
MONTH/YEAR	**WEEK**	**TOPICS TO BE TAUGHT**
April 2023	1	a. Newton Raphson method, Rate of convergenc b. Newton's Method for Systems c. Method for Complex Roots d. Roots of Polynomial Equations e. Program to implement Regula falsi method using C (Practical)
	2	a. Interpolation and Polynomial Approximations b.Taylor Series and Calculation of Functions, c. Langrange Interpolation d. Program to implement Newton Raphson Method using C (Practical)
	3	a. Newton Forward Difference Interpolation formula b. Newton Backward Difference Interpolation
	4	a. Newton Divided Difference Interpolation formula b. Problem solving approach

	5	a. Curve Fitting: Least square fitting, b. Interpolation by Spline functions c. Class Test
MONTH/YEAR	**WEEK**	**TOPICS TO BE TAUGHT**
May 2023	1	a. Introduction to Numerical Integration b. Trapezoidal Rule, Error bounds and estimate for the Trapezoidal rule c. Program to implement Trapezoidal rule using C (Practical)
	2	b. Simpson's Rule b. Error in Simpson's rule c. Program to implement Simpson's rule using C (Practical)
	3	a. Introduction to Numerical Differentiation b. Finite difference method c. Applications to electrostatic boundary value problems d. Program to implement Euler-Cauchy Method using C (Practical)
	4	a. Numerical methods for first order differential equations b. Euler-Cauchy Method c. Heun's Method
	5	a. Classical Runge Kutta method of fourth order b. Methods for system and higher order equations c. Class Test
MONTH/YEAR	**WEEK**	**TOPICS TO BE TAUGHT**
June 2023	1	**a**. Numerical Methods in Linear Algebra **b.** Linear systems Ax=B
	2	a. Gauss Elimination b. Partial Pivoting
	3	a. LU factorization b. Doolittle's method
	4	a. Crout's Method b. Cholesky's method
	5	a. Finding Matrix Inversion b. Gauss-Jordon c. Gauss-Seidel Iteration d. Program to implement Gauss-Jordon Method using C (Practical) e. Class Test
MONTH/YEAR	**WEEK**	**TOPICS TO BE TAUGHT**
July 2023	1	a. Jacobian Iteration b. Finding Eigen value using Power Method c. Program to implement Gauss-Seidel Iteration using C (Practical)
	2	
	3	
	4	
	5	

Suggested Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons (1999).
2. M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods: Problems and Solutions, New Age International (2007).
3. B.S. Grewal, Numerical Methods in Engineering and Science with Programs in C and C++, Khanna Publishers (2012).