Course Delivery Plan

Department of Computer Science and Engineering

Semester: Fall -2020

Course Code: CSE 235 **Credit Hours**: 3

Course Title: Numerical Methods

Course Intended Learning Outcome: **Students will be able to**

1. Solve algebraic or transcendental equations using appropriate numerical methods
2. Approximate functions using appropriate numerical methods
3. Solve differential equations using appropriate numerical methods
4. Evaluate derivatives at a point using appropriate numerical methods
5. Solve system of linear equations using appropriate numerical methods
6. Perform error analysis for a given numerical method
7. Prove results for numerical root finding methods
8. Model engineering systems using first and second order differential equations, and solve the equations both analytically and numerically
9. Calculate definite integrals using appropriate numerical methods
10. Code numerical methods in a modern computer language

Course Title: CSE 235 - Numerical Methods with Algorithm

Syllabus: Solution to simultaneous linear equations: tridiagonal systems and Thomas' method, Iteration method of Jacob and Gauss-Seidel; —Non-linear equations: Bisection method, Newton–Raphson method. Matrices: Norm, condition number with interpretation, LU decomposition, QR decomposition, SVD. Interpolation: Newton's forward, backward and divided difference. Cubic spline method, Curve fitting: Least square method for linear and non-linear case, Bezier curves and B-spline curves, Function-approximation by Chebyshev polynomial. IVP: Range-Kutta method, Milne's method; BVP: Finite difference method; CVP: Power method, QR method. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule, Weddle rule, use of cubic spline. [Prerequisite: MAT 121 > MAT 211].

Course Delivery Plane:-

Class No	Topics	Expected Learning Outcome	Assessments (ASSN/ CT/Mid/Final)
01	Introductory Class	✓ Overview of whole course ✓ Importance of this course ✓ Overview of lecture delivery plane	
02	Error Analysis	✓ Perform an error analysis for a given numerical method	

03 to 05	a. Bisection, Iteration and Newton Raphson method to solve algebraic and transcendental equations with algorithm	✓ Prove results for various numerical root finding methods ✓ Perform an error analysis for a given numerical method ✓ Code a numerical method in a modern computer language	2/3 problems related to discussion in the class **** CLASS TEST 01 ****
06 to 08	a. Background of matrix and solving systems of Linear Equations b. Iterative methods (Jacobi & Gauss Seidel)	✓ Solve a linear system of equations using an appropriate numerical method ✓ Able to find solution of linear system ✓ Find the dominant Eigen -values	2/3 problems related to discussion in the class **** ASSIGNMENT ****
09 to 11	a. Interpolation: Newton's Backward Difference Method b. Interpolation: Newton's Forward difference Method. c. Lagrange Interpolation Formula	✓ Approximate a function using an appropriate numerical method ✓ Code a numerical method in a modern computer language ✓ Approximate a function using an appropriate numerical method ✓ Able to use in cryptography ✓ Approximate a function using an	2/3 problems related to discussion in the class **** CLASS TEST 02 ****
************ MID TERM EXAM *****************			
12 to 13	a. Curve fitting: Least square method b. Applications of the methods for linear and non-linear case	✓ Construct a curve or mathematical function that has the best fit to a series of data points.	
14	*********** PRESENTATION ***********		
15 to 19	a. Numerical Differentiation. b. Maximum and minimum value of a tabulated functions c. Numerical solution of ordinary differential equations: Runge-kutta method of 2nd, 4thorder	✓ Able to forecast missing data ✓ Able to find maximum and minimum value of a tabulated functions. ✓ Solve a differential equation using an appropriate numerical method	**** CLASS TEST 03 ****
20 to 22	a. Derivation of General Formula Numerical Integration for Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule and Weddle's rule	✓ Calculate a definite integral using an appropriate numerical method	
************ FINAL EXAM *****************			

Text Book(s):

(1) Numerical Analysis by Burden & Faires **(2)** Introductory Methods of Numerical Analysis, S.S Sastry,