24CE582 Computer Applications in Numerical Analysis Lab

Category: Laboratory **0L 0T 3P 1.5C**

***Pre-requisite*: Basics of Numerical Techniques**

Course Description:

The course is designed for Civil Structural Engineering M.Tech first year students, providing essential and applied knowledge of numerical methods relevant to their fields. Understanding the principles of various numerical techniques and their applications in Structural engineering. An overview of Matlab programming to solve non-linear equation, system of linear equations, initial value problems, curve fitting problems and perform numerical integration.

Course Aims and Objectives:

Demonstrate Matlab coding to

1. Find a real root of Non-linear equation using Bisection and Newton-Raphson methods.
2. Fit a curve by Least Square Approximations.
3. Solve system of linear equations using Gauss-Elimination and Gauss-Seidel methods.
4. Integrate numerically using Trapezoidal rule and Simpson's rule.
5. Visualise solution of 1^{st} and 2^{nd} order initial value problems.

Course Outcomes:

At the end of the course, the student will be able to write Matlab code to...

CO 1: Find real root of an algebraic and transcendental equations **[K3]**

CO 2: Fit a curve for given data **[K3]**

CO 3: Solve system of linear equations **[K3]**

CO 4: Calculate definite integrals **[K3]**

CO 5: Evaluate numerical solution of 1^{st} and 2^{nd} order initial value problems **[K3]**

Course Structure:

1. Finding a real root of transcendental equation using Bisection method. **CO 1 [K3]**

2. Estimate a real root of Non-linear equation using Newton-Raphson method **CO 1 [K3]**
3. Linear and exponential curve fitting by Least Square Approximations. **CO 2 [K3]**
4. Quadratic fitting by Least Square Approximations. **CO 2 [K3]**
5. Solve system of linear equations using Gauss-Elimination method. **CO 3 [K3]**
6. Solve system of linear equations using Gauss-Seidel iteration method. **CO 3 [K3]**
7. Integrate numerically using Trapezoidal rule. **CO 4 [K3]**
8. Integrate numerically using Simpson's rules. **CO 4 [K3]**
9. Solution of 1st order IVP by Runge- Kutta method of order four. **CO 5 [K3]**
10. Solution of 2nd order IVP by Finite difference method. **CO 5 [K3]**

Text Book:

1. S. S. Sastry (2012). *Introductory Methods of Numerical Analysis*. (5th Edition). PHI Learning Private Limited.

Web Resources:

1. MathWorks Web page:
   Get Started with MATLAB - MathWorks India
2. NPTL Matlab Programming for Numerical Computation By Prof. Niket Kaisare IIT Madras
   http://nptel.ac.in/courses/103106074/

Mapping of Course Outcomes to Program Outcomes:

(**3** = High; **2** = Medium; **1** = Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	1	1	2	
CO2	2	1	1	2	
CO3	2	1	1	2	
CO4	2	1	1	2	
CO5	2	1	1	2	
CO5	2	1	1	2	