

Department of Computer Science and Engineering
Course: CSE 0541 2258 (Numerical Methods Lab)
Assignment

1. Write a program to implement the following numerical methods for root finding of an equation.
 - a. Bisection method
 - b. False position method
 - c. Newton Raphson method
 - d. Secant method
2. Write a program to do the followings- (Solution of System of Linear Equations-SLEs)
 - a. Input: A system of linear equation in Matrix form
 - b. Solve the SLEs using Naïve Gaussian Elimination method and Gaussian Elimination with Partial pivoting.
 - c. Calculate the lower and upper triangular matrix using LU Decomposition method and also find the Inverse Matrix and determinant
3. Write a program to implement the following numerical methods related to ODE-
 - a. Euler's method
 - b. Runge-Kutta 2nd order method
 - i. Heun's method
 - ii. Midpoint method
 - iii. Ralston's method

Note: You can't use the built-in function. You must write the function for each method. Compare the performance of different methods for a specific problem for different step size.
4. Write a program to do the followings- (Numerical Integration)
 - a. Trapezoidal rule
 - i. Single segment
 - ii. Multiple segment
 - b. Simpson's 1/3 rule
 - i. 2 segment
 - ii. Multiple segment

5. Write a program to implement the following numerical methods related to **Interpolation**-
- a. Direct method of interpolation
 - i. Linear
 - ii. Quadratic
 - iii. Cubic
 - b. Lagrange method of interpolation
 - i. Linear
 - ii. Quadratic
 - iii. Cubic
 - c. Newton's Divided Difference method of Interpolation
 - i. Linear
 - ii. Quadratic
 - iii. Cubic
6. Write a program to implement the **linear regression model**.

Notes-

- 1. You can't use the built-in function. You must write the function for each method. Compare the performance of different methods for a specific problem for different order of polynomial.
- 2. You are free to use any language (python preferred).
- 3. The program should be very much user friendly.
- 4. If your program can do just the basic requirements mentioned above, you will get 60% marks. To get more than 80% (A+), you have to use your creativity based on the marking scheme (in terms of organization of your program and also how do you present your output to the user). User friendliness has no boundaries. Try as much as you can.
- 5. Marking Scheme

Understanding (10)	0-10
Coding Quality (10)	0-10
User Friendliness (10)	0-10
Use built-in function? YES (0), NO (10)	0-10
Correct Output (10)	0-10
Total (50)	50