Numerical Analysis (MTH5301)

List of References:

1. "Numerical Analysis" 9th ed., Richard Burden and Douglas Faires.

2. "Finite Difference Methods for Ordinary and Partial Differential Equations", Randall Leveque, SIAM.

3. "Iterative Methods for Sparse Linear Systems", 2rd ed., Yousef Saad, SIAM.

4. "Spectral Methods in MATLAB", Lloyd Trefethen, SIAM.

Contents to be Covered

(1) Polynomial Approximations: Lagrange Polynomial and Newton's Divided Difference; Chebyshev Points and Chebyshev Polynomial, Cubic Splines, WENO Interpolations.

(2) Numerical Solution of ODE/System of ODEs: General Single-Step First/Second Order ODE Solvers; Explicit/Implicit Runge Kutta Methods; Multi-Step Methods and the Root Condition; Stiff System and Stability Analysis

(3) Iterative Methods for Sparse Linear System: General Residual Correction Schemes; Conjugate Gradient Method and Preconditioner; QR Factorization and Solution of Linear Least Square Problems

(4) Trigonometric Interpolation and Fast Fourier Transformation

(5) Finite Difference and Finite Element Methods for Boundary Value Problems