EME 902 - Numerical Methods in Chemical Engineering

Credit Hours: 3
Pre-requisites: Nil

Course Objectives

- To teach the students:
  - The type of roots.
  - The successive substitution.
  - The classification of ODEs for application in chemical engineering.

Course Contents

- Introduction to types of roots and their approximation & The Wegstein method
- Method of successive substitution & Method of linear interpolation
- Newton Raphson method & Newton's method for simultaneous non-linear equations
- Eigenvalue method, Matrix and vector operations & Cramer's rule
- Gauss Elimination method & Gauss-Jordan Reduction method
- Gauss-Seidel substitution method, Jacobi method & Symbolic operations
- Backward Finite Difference, Central Finite Difference & Forward Finite Difference
- Difference equations and their solutions & Differentiation by backward
- Finite differences & Differentiation by central finite differences
- Differentiation by forward finite differences & Integration formulas
- Newton-Cotes formulas of integration & Linear ordinary differential equations
- Classification of ordinary differential equations
- Nonlinear ordinary differential equations- initial value problems
- Nonlinear ordinary differential equations- boundary value problems
- Classification of partial differential equations & Initial and boundary conditions
- Solution of partial differential equations using finite differences
- Stability analysis & Introduction to finite element methods.

Course Outcomes

- The students will gain expertise for mathematical evaluation using mathematical modeling
- Will learn, the numerical techniques applied in chemical engineering.

Recommended Reading (including Textbooks and Reference books)

- Advanced Engineering Mathematics, KREYSIZIG (7th Edition)
- Computational & Applied Mathematics for Engineering Analysis, ASCAKMAK