APPLIED NUMERICAL METHODS

Course Code: 13CH2101 **L P C**
4 0 3

PREREQUISITES: The student should have knowledge of linear and non linear algebraic equations, differential equations and interpolation.

Course Educational objectives: This course introduces the student to the following aspects

1. Solving nonlinear algebraic equations by numerical methods
2. Regression analysis
3. Lagrangian interpolation and Pade's approximations
4. Solving Ordinary differential equations-Initial value and boundary value problems by numerical methods
5. Solving differential equations by orthogonal collocation.

Course outcomes: After studying the course the student will be able to

1. Solve nonlinear algebraic equations
2. Solve differential equations
3. Apply the numerical techniques to solve the usual chemical engineering problems

UNIT-I

Nonlinear Algebraic Equations: Multivariable Newton-Raphson Technique.

Regression Analysis: Lagrangian Interpolation, Pade approximations

UNIT-II

Ordinary Differential Equations-Initial Value Problems (ODE-IVPs): Runge-Kutta fourth order method.

Ordinary Differential Equations-Boundary Value Problems (ODE-BVPs): Shooting Techniques.

UNIT-III

Orthogonal Collocation: To solve BVP problems like Tubular reactor with axial diffusion, calculating effectiveness factor for a spherical catalyst particle, fin effectiveness.

UNIT-IV

Orthogonal Collocation on Finite Elements: Tubular reactor with axial diffusion, calculating effectiveness factor for a spherical catalyst particle, fin effectiveness.

UNIT-V

Orthogonal Collocation to solve Partial Differential Equations like tubular reactor with radial diffusion

TEXTBOOK:

1. Gupta S.K, *"Numerical Methods in Engineering"*, 2nd Edition, New Age International Limited, New Delhi, 2010.

REFERENCES:

1. Mark.E.Davis, "*Numerical Methods and Modeling for Chemical Engineers",* 1st Ed, Willey, 84.

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