APPLIED NUMERICAL METHODS

Course Code: 13CH2101

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

Course outcomes:

On successful completion of the course, the student should be able to

CO1 : Recognize the best numerical technique to solve the non-linear algebraic equation.

CO2 : Apply the Runge-Kutta methods to solve ordinary differential equation and boundary value problem.

CO3 : Analyze and apply the orthogonal collocation method to solve ordinary differential boundary value problem.

CO4 : Formulate and apply the orthogonal collocation method to solve partial differential equation.

CO5 : Solve any chemical engineering mathematical problem numerically.

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, 1984.

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