APPLIED NUMERICAL METHODS

Course Code: 15CH2101	**L**	**P**	**C**
	3	**0**	**3**

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 (10-Lectures)

Nonlinear Algebraic Equations: Multivariable Newton-Raphson Technique.

Regression Analysis: Lagrangian Interpolation, Pade approximations

UNIT-II (10-Lectures)

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 (10-Lectures)

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

UNIT-IV (10-Lectures)

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

UNIT-V (10-Lectures)

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.