

Numerical Methods

Code	Credit Hours
MATH- 351	3-0

Course Description

The course gives the students sound knowledge to solve non-linear equations numerically. Lengthy and suckle problems of differential, integral calculus and ordinary differential equations are also solved numerically. Curve fitting and interpolation like topics are also included which are very useful for engineers /technologists

Text Book:

1. E. Kreyszing: Advanced Engineering mathematics (10th Ed)
2. Steven C. Chapra, Raymond P. Canale: Numerical methods for Engineers (4th Ed)

Reference Book:

1. Curtis F. Gerald , Patrick O. Wheatley: Applied Numerical Analysis, Addison –Wesley (6th Ed)
2. J. Douglas Faires, Richard Burden: Numerical Methods (9th Ed.)

Prerequisites

A-Level / F.Sc Physics

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Mid Terms	30%
ESE	50%
Total	100%

Teaching Plan

Week No	Topics	Learning Outcomes
1	Mathematical Preliminaries	Round off error and Computer arithmetic, Algorithms and Convergence
2-6	Iterative Methods for the Solutions of Non-Linear Equations (convergence analysis) Interpolation	Bisection Method, Fixed point Method, Newton-Raphson Method, Secant Method & Regula - Falsi Method Introduction, Lagrange Interpolation, Newton's Divided Difference Interpolation, Forward Difference and Backward Difference Interpolations, Introduction to Cubic Spline Interpolation, Clamped cubic spline, Natural spline
7-8	Numerical Differentiation Numerical Integration	Numerical Differentiation Elements of Numerical Integration, Rectangular, Trapezoidal, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Weddle's Rule
9	MID TERM EXAM	
10-12	Numerical Methods in Linear Algebra	LU Factorization, Doolittle's, Crouts's and Cholesky's Methods, Iterative Methods for Systems of Equations, Jacobi's Method, Gauss-Seidel Method, Evaluation of Eigenvalues by Iteration: Power Method.
13-17	Solution of 1st and 2nd Order Ordinary Differential Equations Solution of Higher Order IVPs, Elliptic Partial Differential Equations, and Parabolic PDEs	Introduction, Euler Method, Heun's Method, Runge-Kutta Methods Solution of Higher Order IVPs, Solution of Elliptic Partial Differential Equations, Solution of Parabolic PDEs: Crank-Nicolson Method
18	End Semester Exams	

