

B.Sc. DEGREE PROGRAMME
MATHEMATICS (CORE COURSE)
FIFTH SEMESTER
MM5B08 : NUMERICAL METHODS

5 hours/week

4 credits

30 weightage

Text :

S.S. Sastry : Introductory Methods of Numerical Analysis, Fourth Edition, PHI.

Module I : Solution of Algebraic and Transcendental Equation (23 hrs)

- 2.1 Introduction
- 2.2 Bisection Method
- 2.3 Method of false position
- 2.4 Iteration method
- 2.5 Newton-Raphson Method
- 2.6 Ramanujan's method
- 2.7 The Secant Method

Finite Differences

- 3.1 Introduction
 - 3.3.1 Forward differences
 - 3.3.2 Backward differences
 - 3.3.3 Central differences
 - 3.3.4 Symbolic relations and separation of symbols
- 3.5 Differences of a polynomial

Module II : Interpolation (23 hrs)

- 3.6 Newton's formulae for interpolation
- 3.7 Central difference interpolation formulae
 - 3.7.1 Gauss' Central Difference Formulae
- 3.9 Interpolation with unevenly spaced points
 - 3.9.1 Langrange's interpolation formula
- 3.10 Divided differences and their properties
 - 3.10.1 Newton's General interpolation formula
- 3.11 Inverse interpolation

Numerical Differentiation and Integration

- 5.1 Introduction
- 5.2 Numerical differentiation (using Newton's forward and backward formulae)
- 5.4 Numerical Integration
 - 5.4.1 Trapezoidal Rule
 - 5.4.2 Simpson's 1/3-Rule
 - 5.4.3 Simpson's 3/8-Rule

Module III : Matrices and Linear Systems of equations (22 hrs)

- 6.3 Solution of Linear Systems – Direct Methods
 - 6.3.2 Gauss elimination
 - 6.3.3 Gauss-Jordan Method
 - 6.3.4 Modification of Gauss method to compute the inverse
 - 6.3.6 LU Decomposition
 - 6.3.7 LU Decomposition from Gauss elimination
- 6.4 Solution of Linear Systems – Iterative methods
- 6.5 The eigen value problem
 - 6.5.1 Eigen values of Symmetric Tridiagonal matrix

Module IV : Numerical Solutions of Ordinary Differential Equations (22 hrs)

- 7.1 Introduction
- 7.2 Solution by Taylor's series
- 7.3 Picard's method of successive approximations
- 7.4 Euler's method
 - 7.4.2 Modified Euler's Method
- 7.5 Runge-Kutta method
- 7.6 Predictor-Corrector Methods
 - 7.6.1 Adams-Moulton Method
 - 7.6.2 Milne's method

References

1. S. Sankara Rao : Numerical Methods of Scientists and Engineer, 3rd ed., PHI.
2. F.B. Hidebrand : Introduction to Numerical Analysis, TMH.
3. J.B. Scarborough : Numerical Mathematical Analysis, Oxford and IBH.