Numerical Analysis

Semester: III	Subject Code: BS31604	Lectures: 60

Objectives:

The syllabus aims in equipping the students with,

- An ability to develop the skills of numerical methods and knowledge about convergence of Numerical Methods
- An ability to apply numerical techniques to solve mathematical problems
- An understanding of the wide nature of the subject and applications in different disciplines
- The capacity to represent the given information in the mathematical form using mathematical techniques and draw the relevant conclusion
- An ability to inculcate a positive attitude towards Mathematics and enjoy the triumph of solving interesting problems in different areas of the subject

Unit 1: Errors	2

- Introduction
- Accuracy of Numbers
- Errors
  - Types of Errors
- A General Formula for Error

Unit 2: Algebraic and Transcendental Equations	12

- Introduction
- Location of Roots
- Methods to find the Roots
  - Procedure for Regula- Falsi Method (The method of false positions)
  - Convergence of False Position Method
- Newton-Raphson's Method
  - Procedure for the Newton - Raphson's Method
  - Convergence of Newton-Raphson's Method
- System of linear equations
  - Gauss Seidel method
  - Gauss Jacobi Method

Unit 3: Calculus of Finite Differences	**8**
• Introduction • Forward Difference (Δ) ,Backward Difference (V) and Shift Operator (E) • Central Difference (δ) and Average Operator (μ) • Fundamental Theorem on Difference of Polynomial • Estimation of Error by Difference Table • Technique to Determine the missing Term	

Unit 4: Interpolation with Equal Interval	**6**
• Introduction ➢ Assumptions of interpolation. • Newton - Gregory Formula for Forward Interpolation • Newton - Gregory Formula for Backward Interpolation	

Unit 5: Interpolation with Unequal Interval	**8**
• Introduction. • Lagrange's Interpolation Formulae • Divided Differences • Newton's Divided Difference Formula (Without proof)	

Unit 6: Numerical Differentiation	**4**
• Introduction. • Newton's Forward Differentiation Formulae • Newton's Backward Differentiation Formulae	

Unit 7: Numerical Integration	**8**
• Introduction. • General Quadrature Formula (For Equidistant Arguments) • Trapezoidal Rule • Simpson's 1/3 rd Rule • Simpson's 3/8 th Rule • Euler- Maclaurin's Formula	

***Contact hours – 12 hours**

Reference Books:

1. S. S. Sastry, ***Introductory Methods of Numerical Analysis***, 4th edition, Prentice Hall of India, 1999. Sections : 1.3, 1.4, 2.1, 2.3, 2.5, 3.3, 3.4, 3.6, 3.9, 3.10, 5.1, 5.2, 5.4, 5.4.1–5.4.3, 5.5, 6.4
2. H. C. Saxena, ***Finite Differences and Numerical Analysis***, S. Chand and Company.
3. K.E.Atkinson, ***An introduction to Numerical Analysis***, Wiley Publications.
4. John Mathews, ***Numerical Methods for Mathematics, Science and Engineering,*** 2nd Edition, Prentice Hall India.
5. E. Balgurusamy, ***Numerical Methods***, Tata McGraw Hill Publications. 1999.