

## SEMESTER-III

### COURSE 6: NUMERICAL METHODS

Theory

Credits: 4

5 hrs/week

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#### Course Outcomes

After successful completion of this course, the student will be able to

1. difference between the operators  $\Delta, \nabla, E$  and the relation between them
2. know about the Newton – Gregory Forward and backward interpolation
3. know the Central Difference operators  $\delta, \mu, \sigma$  and relation between them
4. solve Algebraic and Transcendental equations
5. understand the concept of Curve fitting

#### Course Content

##### Unit – 1

##### The calculus of finite differences

The operators  $\Delta, \nabla, E$  - Fundamental theorem of difference calculus- properties of  $\Delta, \nabla, E$  and problems on them to express any value of the function in terms of the leading terms and the leading differences - relations between E and D - relation between D and  $\Delta$  - problems on one or more missing terms- Factorial notation- problems on separation of symbols- problems on Factorial notation.

##### Unit – 2

##### Interpolation with equal and unequal intervals

Derivations of Newton – Gregory Forward and backward interpolation and problems on them. Divided differences - Newton divided difference formula - Lagrange's and problems on them.

##### Unit – 3

##### Central Difference Interpolation formulae

Central Difference operators  $\delta, \mu, \sigma$  and relation between them - Gauss forward formula for equal intervals - Gauss Backward formula - Stirlings formula - Bessel's formula and problems on the above formulae.

##### Unit – 4

##### Solution of Algebraic and Transcendental equation

Method for finding initial approximate value of the root - Bisection method - to find the solution of given equations by using (i) Regula Falsi method (ii) Iteration method (iii) Newton – Raphson's method and problems on them.

##### Unit – 5

##### Curve Fitting

Least-squares curve fitting procedures - fitting a straight line-nonlinear curve fitting-curve fitting by a sum of exponentials

#### Activities

Seminar/ Quiz/ Assignments/ Applications of Numerical methods to Real life Problem /Problem Solving Sessions.

#### Text Book

Numerical Analysis by G. Shanker Rao, New Age International Publications

#### Reference Books

1. Applied Numerical Analysis by Curtis F. Gerald and Patrick O. Wheatley, Pearson,(2003) 7th Edition
2. Introductory Methods of Numerical Analysis by S.S. Sastry, (6<sup>th</sup> Edition) PHI New Delhi 2012

3. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S .R. K. Iyengar and R. K. Jain, New Age International Publishers (2012), 6th edition.

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