Government PG College, Ambala Cantt

Course File(Session 2023-24)

Name of Assistant Professor: Ms. Neha Rani

Class: B.A./B.Sc. II Year/5th semester

Section: Non Medical & Computer Science

Subject Code and Name: BM-253/Numerical Analysis

SYALLBUS

B.Sc.	B.A.
Theory: 30	Theory: 20
Practical: 20	Practical: 14
No Internal	No Internal

Time: 3 Hours(Theory)

Time: 2 Hours(Practical)

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short-answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each Unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory Question No. 1. All questions will carry equal marks.

UNIT – I

Finite Differences operators and their relations. Finding the missing terms and effect of error in a difference tabular values, Interpolation with equal intervals: Newton's forward and Newton's backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference, Lagrange's Interpolation formulae, Hermite Formula.

UNIT – II

Central Differences: Gauss forward and Gauss's backward interpolation formulae, Sterling, Bessel Formula.

Probability distribution of random variables, Binomial distribution, Poisson's distribution, Normal distribution: Mean, Variance and Fitting.

UNIT – III

Numerical Differentiation: Derivative of a function using interpolation formulae as studied in Sections –I & II.

Eigen Value Problems: Power method, Jacobi's method, Given's method, House- Holder's method, QR method, Lanczos method.

UNIT – IV

Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one-third and three-eighth rule, Chebychev formula, Gauss Quadrature formula.

Numerical solution of ordinary differential equations: Single step methods- Picard's method. Taylor's series method, Euler's method, Runge-Kutta Methods. Multiple step methods; Predictor-corrector method, Modified Euler's method, Milne-Simpson's method.

Part-B(Practical)

Implementation of numerical methods, studied in the theory paper, in 'C' Programming Language.

Books Recommended:

1. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method, Problems and Solutions, New

Age International (P) Ltd., 1996

2. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
3. C.E. Froberg : Introduction to Numerical Analysis (2nd Edition).
4. Melvin J. Maaron : Numerical Analysis-A Practical Approach, Macmillan Publishing Co., Inc., New York
5. R.Y. Rubnistein : Simulation and the Monte Carlo Methods, John Wiley, 1981
6. Computer Oriented Numerical Methods, Practice Hall of India Pvt. Ltd.

COURSE OBJECTIVES

The course objectives outlined are as follows:

1. The course will also develop an understanding of the elements of error analysis for numerical methods and certain proofs.
2. The main objective of this course is to provide students with an introduction to the field of numerical analysis.
3. Derive appropriate numerical methods to solve interpolation based problems.
4. Derive appropriate numerical methods to solve probability based problems.
5. Prove results for various numerical root finding methods.

COURSE OUTCOMES

After the successful completion of the course, students will be able to:

1. understand the theoretical and practical aspects of the use of numerical analysis.
2. proficient in implementing numerical methods for a variety of multidisciplinary applications.
3. establish the limitations, advantages, and disadvantages of numerical analysis.
4. derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
5. understand of common numerical analysis and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.

Lesson Plan

From August 2023 to November 2023

Week No	Scheduled Dates	Topics to be covered
1.	**24-29 July**	Finite Differences operators and their relations
2.	**31-05 August**	Finding the missing terms in a difference tabular values
3.	**7-12 August**	Effect of error in a difference tabular values
4.	**14-19 August**	Interpolation with equal intervals: Newton's forward interpolation formulae
5.	**21-26 August**	Interpolation with equal intervals: Newton's backward interpolation formulae
6.	**28-02 September**	Interpolation with unequal intervals: Newton's divided difference
7.	**4-9 September**	Interpolation with unequal intervals: Lagrange's Interpolation formulae
8.	**11-16 September**	Interpolation with unequal intervals: Hermite Formula
9.	**18-23 September**	Probability distribution of random variables
10.	**25-30 September**	Binomial distribution
11.	**2-7 October**	Poisson's distribution
12.	**9-14 October**	Normal distribution: Mean, Variance and Fitting.
13.	**16-21 October**	Central Differences: Gauss's forward interpolation formulae
14.	**23-28 October**	Central Differences: Gauss's backward interpolation formulae
15.	**30-04 November**	Sterling Formula
16.	**06-09 November**	Bessel Formula
17.	**10-16 November**	**Diwali Vacations**
18.	**17--24 November**	Final Test, Assignments and REVISION of Contents
Exams Starts		