

Gujarat University
K. S. School of Business Management and Information Technology
[Five Years' (Full – Time) M.Sc. (CA&IT) Integrated Degree Course]
Second Year M.Sc. (CA&IT) (Semester - III)

Course Name: Computer Oriented Numerical Methods – Practical

Course Code: IDC- IMSCIT-234P

Course Credit: 2

Objective:

The aim of this course to enable students to

- Gain a deep understanding of various numerical techniques used to solve mathematical problems that cannot be solved analytically.
- Learn how to analyze and understand the sources of errors in numerical computations, including truncation and round-off errors.
- Enhance problem-solving skills by applying numerical methods to a variety of mathematical and real-world problems, such as solving linear and nonlinear equations, numerical integration and differentiation, and differential equations.
- Evaluate and compare the efficiency and stability of different numerical algorithms.
- Apply numerical methods to practical problems in engineering, physics, finance, and other fields.

Course Outcomes:

Upon successful completion of this practical course, students will be:

- Gain a solid understanding of various numerical techniques used for solving numerical problems including root finding, interpolation, differentiation and solving systems of linear equations.
- Develop proficiency in the C-programming language, including syntax, data types, control structures, functions, arrays and pointers through the implementation of Numerical algorithms.

Contents:

Unit No.	Course Content	Hours	Credits
1	Introduction to C Programming: Basic Syntax and data type in C, Control structures (if else, loops), Functions and modular programming, Arrays and Pointers Solutions of linear equations: Gauss Elimination, Iterative methods (Jacobi, Gauss-seidel) Roots (of non-linear equations) finding methods: Bisection, Newton-Raphson, Secant	30	1

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2	Interpolation and curve fitting: Linear interpolation, Polynomial interpolation (Lagrange and Newton) Numerical differentiation and Integration: Numerical differentiation formulas, Trapezoidal rule, Simpson's rule Numerical Solution of Ordinary Differential Equations (ODEs) Euler's method, Runge-kutta method (mainly fourth order)	30	1
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Reference Books:

1. Numerical Methods in Engineering and Science, B. S. Grewal
2. Numerical Methods with C++ Programming, PHI New Delhi. by Nita H. Shah
3. Computer Oriented Numerical Methods, 3rd edition, PHI. by V. Rajaraman
4. Numerical Methods with C++ Programming, Prentice Hall India Pvt. Ltd. by RM Somasundaram & RM Chandrasekaran

Assessment Tools: Test, Quiz, Assignment, Presentation etc.

Accomplishments of the student after completing the Course:

After completion of this course Student would be able to

- Implement concepts of C programming to solve mathematical problems.
- Able to develop numerical software applications using C programming including writing modular and reusable code, implementing efficient algorithm and optimizing code for performance