



Paper – 5: COMPUTATIONAL METHODS AND PROGRAMMING

Offered to : M.Sc.(PHYSICS)	Course Code : 22PH2D1
Course Type : DSE	Course : Computational methods and programming
Year of Introduction : 2004	Year of offering : 2023
Year of Revision : 2022	Percentage of Revision : Nil
Semester : II	Credits : 4
Hours Taught: 60 hrs. per Semester	Max.Time: 3 Hours

Course Description

Computational Methods brings to light the numerous uses of numerical methods in engineering. It clearly explains the application of these methods mathematically and practically, emphasizing programming aspects when appropriate.

Course Objectives:

1. To understand the fundamentals of C- language.
2. To improve the Programming skills.
3. To understand the importance and applications of Arrays.
4. To understand various numerical methods used in computation and C- programming.
5. To solve simple problems pertaining to Physics using these methods.

Course Outcomes: At the end of this course, students should be able to:

CO1: Understand the concepts of fundamentals of data types and operators.

CO2: Understand the concepts of I/O statements and control statements.

CO3: Understand the concepts of Arrays.

CO4: Solve the mathematical as well as numerical computations problems by different methods.

CO5: Understand the importance of errors and accuracy of the numerical calculations and its practical implementation in the measurements.

CO - PO MATRIX								
	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
22PH2D1	CO1	H					L	M
	CO2	H					L	M
	CO3	H					L	M
	CO4	H	M				L	M
	CO5		H	M			L	M

Syllabus		
Unit	Learning Units	Lecture Hours
I	<p>Fundamentals and Operators</p> <p>Fundamentals of C Language: C character set-Identifiers and Keywords- Constants- Variables- Data types-Declarations of variables – Declaration of storage class - Defining symbolic constants –Assignment statement.</p> <p>Operators: Arithmetic operators-Relational Operators-Logic Operators- Assignment operators- Increment and decrement operators –Conditional operators.</p>	12
II	<p>Expressions, I/O and Control Statements</p> <p>Expressions and I/O Statements: Arithmetic expressions –Precedence of arithmetic operators- Type converters in expressions –Mathematical (Library) functions –Data input and output-The getchar and putchar functions –Scanf – Printf-Simple programs.</p> <p>Control statements: If-Else statements –Switch statements-The operators –GO TO – While, Do-While, FOR statements-BREAK and CONTINUE statements.</p>	12
III	<p>Arrays and User Defined Functions</p> <p>Arrays: One dimensional and two dimensional arrays –Initialization –Type declaration - Inputting and outputting of data for arrays –Programs of matrices addition, subtraction and Multiplication</p> <p>User Defined Functions: The form of C functions –Return values and their types – Calling a function – Category of functions. Nesting of functions. Recursion. ANSI C functions-Function declaration.</p>	12
IV	<p>Linear, Nonlinear and Simultaneous Equations</p> <p>Linear and Nonlinear Equations: Solution of Algebra and transcendental equations- Bisection, False position and Newton-Raphson methods-Basic principles-Formulae- algorithms</p> <p>Simultaneous Equations: Solutions of simultaneous linear equations - Gauss elimination and Gauss Seidel iterative methods-Basic principles-Formulae- Algorithms</p>	12
V	<p>Interpolations, Numerical Differentiation and Integration</p> <p>Interpolations: Concept of linear interpolation-Finite differences-Newton's and</p>	12

	Lagrange's interpolation formulae-principles and Algorithms Numerical Differentiation and Integration: Numerical differentiation- algorithm for evaluation of first order derivatives using formulae based on Taylor's series-Numerical integration- Trapezoidal and Simpson's 1/3rule-Formulae-Algorithms	
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Text and Reference Books:

1. S.S. SASTRY, Introductory methods of Numerical Analysis (PHI).
2. E. BALAGURUSAMY, Numerical Methods (McGrawHill).
3. BYRON S. GOTTFRIED , Programming with (Schaum'sOutlines).
4. E. BALAGURUSAMY, Programming in ANSI C (TataMcGraw-Hill).