MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)
NAAC 'A++' Grade University

4.5CE102C00H: Programming Foundations: Code, Logic & Problem Solving

Periods/week	Credits	Max. Marks: 200
L : 3 T: 0 P: 2	4	Continuous Evaluation: 120
Duration of Exam: 3 Hrs.		End Semester Evaluation: 80

Pre-requisite: Basic knowledge of computers, Logical thinking, and analytical ability to follow step-by-step procedures in problem-solving.
Course Type: Foundation

Course Outcomes: The students will be able to
4.5CE102C00H.1: Understand number systems and basic programming constructs, including variables, data types, operators, and control structures for developing logical solutions.
4.5CE102C00H.2: Formulate algorithms and implement structured programs using conditional and iterative statements.
4.5CE102C00H.3: Develop modular programs using user-defined functions with appropriate parameter passing techniques to enhance code reusability and clarity.
4.5CE102C00H.4: Apply 1-D and 2-D arrays for problem-solving in real-world scenarios, including searching, sorting, matrix operations, and constructing structured programs.

PART- A

UNIT 1: Introduction to Programming and Problem Solving

1.1 Anatomy of Computer System: Memory, CPU, I/O devices
1.2 Concept of OS, Translators (Compiler, Interpreter, Assembler)
1.3 Basics of Programming: High-level vs Low-level Languages
1.4 Problem Solving Approach: Stepwise refinement and problem-solving steps
1.5 Algorithms and Flowcharts: Representation with examples
1.6 Pseudocode: Writing structured logic
1.7 Number Systems: Binary, Octal, Decimal, Hexadecimal conversions

UNIT 2: Programming Fundamentals

2.1 Introduction to C Language: History and importance
2.2 Data Types and Variables: Declaration, Initialization
2.3 Keywords, Constants, and Literals
2.4 Operators and Expressions: Arithmetic, Logical, Relational, Bitwise
2.5 Expression Evaluation: Precedence, Associativity, Type casting
2.6 Input and Output: scanf(), printf(), escape sequences
2.7 Code Documentation and Comments

UNIT 3: Control Structures

3.1 Decision-Making: if, if-else, else-if ladder, nested if
3.2 Switch-case and Ternary Operator
3.3 Loops: while, do-while, for
3.4 Loop Control: break, continue, goto
3.5 Nested Loops: Logic building and pattern printing
3.6 Common Pitfalls in Loops and Conditions

PART- B

UNIT 4: Functions and Modular Programming

4.1 Defining and Declaring Functions
4.2 Calling Functions and Return Values
4.3 Parameter Passing: Call by Value, Call by Reference (introductory)
4.4 Scope and Lifetime of Variables
4.5 Recursion: Concept and Examples
4.6 Introduction to Standard Library Functions

UNIT 5: Arrays

5.1 One-Dimensional Arrays: Declaration, Initialization, Traversal
5.2 Two-Dimensional Arrays: Basics, Matrix Operations
5.3 Multi-Dimensional Arrays: Concept and Syntax
5.4 Array Operations: Searching (Linear, Binary)
5.5 Array-based Problems: Sum, Average, Max, Min
5.6 Passing Arrays to Functions

UNIT 6: Strings and Structures

6.1 Character Arrays and Strings: Declaration, Initialization
6.2 Basic String Operations: Length, Copy, Concatenate, Compare, Reverse
6.3 Array of Strings and String Handling in Functions
6.4 Structures: Declaration, Initialization, Accessing Members
6.5 Arrays of Structures and Nested Structures
6.6 Unions and Differences from Structures
6.7 User-Defined Types: typedef, enum

List of Practical:

Lab 1: Familiarization with programming environment
Lab 2: Simple computational problems using various operators and arithmetic expressions
Lab 3: Problems involving if-then-elseconditional statements
Lab 4: Problems based on Switch statement
Lab 5: Problems based on looping statements
Lab 6: Problems based on Nested Loops and Pattern Printing
Lab 7: Programs incorporating the use of user-defined functions (call by value,call by reference)
Lab 8: 1D Array manipulation-based programs such as traversal and searching
Lab 9: Program based on 2D arrays, such as Matrix Multiplication/Addition/Transpose
Lab 10: Program based on Structures

NOTE: The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Text Books / Reference Books:

1. Byron Gottfried, 2015, Schaum's Outline of Programming with C: 2nd Ed., McGraw-Hill.
2. E. Balaguruswamy, 1998, Programming in ANSI C: 2nd Ed., Tata McGraw-Hill.
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language:, 2nd Ed., PHI.

Software required/Weblinks: Turbo C, www.tutorialpoint.com, www.nptel.com, www.w3schools.com

Distribution of Continuous Evaluation:

Sessional	30 Marks
Assignment (LinkedIn Certifications /class assignments on EMS etc.)	20 Marks
Class Performance (Case Study /Presentation /Book review /Field study /Quiz etc.)	20 Marks
Viva	20 Marks
Mini Project	20 Marks
Lab Record	10 Marks

Evaluation Tools:

Assignments/LinkedIn Certifications etc.
Sessional Examination
Surprise test during lectures/Class Performance.
Viva
Mini Project
Lab Record
End Semester Examination

Instructions for paper setting: The question paper will be divided into 2 parts, with one question in Part A and four questions in Part B. In Part A, the first question will consist of 10 conceptual questions (2 marks each) covering the entire syllabus and all the COs (up to BTL 3). There will be no choice in question 1. In Part B (question numbers 2 to 5 (15 Marks each)), there can be an internal choice between each of the questions covering the same (set) of COs and BTL. All COs will be covered in Part B.

COURSE ARTICULATION MATRIX

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
4.5CE102C00H.1	3	2	2	1	2	-	-	1	-	-	2	2	1	3
4.5CE102C00H.2	3	3	2	2	2	-	-	1	-	-	2	3	2	3

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
4.5CE102C00H.3	3	2	2	2	2	-	-	-	-	-	2	3	2	2
4.5CE102C00H.4	3	3	3	2	3	-	-	-	-	2	2	3	2	2