MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A++' Grade University

4.5CE200C00H: Structured Programming and Defensive Techniques

Periods/week Credits	Max. Marks : 200
L : 3 T: 0 P:2 4.0	Continuous Evaluation : 120
Duration of Exam: 3 Hrs	End Semester Examination: 80

Pre-requisite: Fundamentals of Programming Skills

Course Type: Foundation

Course Outcomes: The students will be able to-

4.5CE200C00H.1: Apply advanced features of the C language such to solve complex problems

4.5CE200C00H.2: Design and implement modular and reusable C programs using user-defined functions, structures, and header files.

4.5CE200C00H.3: Develop modular and maintainable code using header files, multi-file programming and macros

4.5CE200C00H.4: Debug, test, and analyze C programs for correctness and efficiency

PART- A

UNIT 1: Datatypes and Control Structures

1.1Primitive, Derived and User-defined Datatypes
1.2Short, Long, Signed, Unsigned, Float ,and Double Datatypes
1.3 Storage classes with their scope, life and memory representations
1.4Revision of Conditional Statements and Control Statements
1.5Logic building for various pattern printing
1.6Advanced problems using loops and nested loops
1.7 Menu-Driven Programs using switch-case

UNIT 2: Functions and Arrays

2.1 Categories of function based on their arguments and return types
2.2 Memory management of C function
2.3 Scope and Lifetime of Variables (Local & Global) in a function
2.4 Memory representation of an array
2.5 Passing an array to function
2.6 Advanced problems on recursive functions and arrays

UNIT 3: Pointer and Dynamic Memory Allocation

3.1Pointer introduction, declaration, and types
3.2 Pointer arithmetic, Pointer to Pointer
3.3Pointers and Arrays, Pointers and Character Strings
3.4 Array of Pointers
3.5 Pointers and Functions
3.6 Pointers and structures
3.7 Dynamic memory allocation: **malloc**(), **calloc**(), **realloc**() & **free**()

PART- B

UNIT 4: File Handling

4.1 Concept of File
4.2 Text and Binary Files
4.3 Opening and Closing Files
4.4 File Input/Output functions
4.5 Formatted Input/Output functions

UNIT 5: Basic Algorithms & Time Complexity

5.1 Introduction to time complexity by substitution method
5.2 Time complexity of linear and binary search
5.3 Bubble Sort and its time complexity
5.4 Selection sort and its time complexity
5.5 Insertion sort and its time complexity

UNIT 6: Advanced Programming skills

6.1 Type Casting
6.2 Preprocessor Directive statements and Macros
6.3 Command line arguments
6.4 Header file creation
6.5 Introduction to the Linux environment
6.6 C programming Skills with Linux editor

List of Programs:

1. Implementation of basic pattern pyramid printing problems
2. Implementation of complex problems using nested loops
3. Implementation of menu-driven programs
4. Implementation of storage classes through examples
5. Implementation of advanced 2D array problems
6. Implementation of recursive function for complex problems
7. Implementation of passing an array to a function
8. Implementation of pointer and its operations
9. Implementation of pointer to function
10. Implementation of pointer with structure
11. Implementation of array of pointers
12. Implementation of dynamic memory allocation using malloc() and free()
13. Implementation of file to read and write text to a file.
14. Program to count number of words and lines in a file.
15. Copy contents of one file to another.
16. Write student data into a binary file and read it back.
17. Program to update specific data in a file (e.g., update marks of a student).
18. Implementation of binary search using recursion
19. Implementation of bubble sort
20. Implementation of insertion sort
21. Implementation of selection sort
22. Implementation of creating a custom header file
23. Implementation of command line argument program
24. Implementation of simple C programs through Linux environment

Note: - Students should work/implement one small project either individually or in a group through Project Based Learning(PBL) scheme.
Few projects are :

1. Student Information system
2. To-do-list
3. Event management system
4. Scientific Calculator
5. Hotel booking system
6. Bank management system
7. School management system
8. Employee management system
9. Tic-Tac-toe game
10. Movie ticket booking system
11. Quiz game
12. Billing systems

Software required/Weblinks:
Turbo C/ Visual Studio (VS) Code
www.tutorialpoint.com
www.nptel.com
www.w3schools.com

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.

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.

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
4.5CE200C00H.1	3	3	3	3	1	-	-	1	1	2	1	3	2	2
4.5CE200C00H.2	3	3	3	3	2	-	-	2	2	2	2	3	3	2
4.5CE200C00H.3	3	3	3	3	2	1	-	2	2	1	1	2	3	2
4.5CE200C00H.4	3	3	2	2	3	-	-	1	2	3	2	3	2	3