



Bhavan's Vivekananda College

of Science, Humanities & Commerce

Sainikpuri, Secunderabad

Autonomous College - Affiliated to Osmania University

Reaccredited with 'A' grade by NAAC

Department of Computer Science

B.Sc. (Computer Science) I year

(w.e.f academic year: 2026-27)

Semester I

Course: Programming in C

Course Code: CS125

Hour: (60 Hrs.) / **Week:** 4PPW

Credits: 4

Course Objectives: The objectives of this course are,

1. To introduce algorithms, flowcharts, and basics of programming with emphasis on logical thinking, ethical practices, and communication skills.
2. To learn the structure and execution of C programs along with documentation, teamwork, and professional practices.
3. To understand data types, variables, operators, and type conversion with awareness of efficient and responsible computing.
4. To apply control statements and input/
5. To develop problem-solving skills using arrays, strings output concepts for solving real-world and environmentally responsible problems, functions, pointers, and modern computational tools in collaborative environments.
6. To learn user-defined data types, dynamic memory allocation, and file handling with focus on innovation, ethics, and sustainable practices.

UNIT I

Programming Fundamentals: Algorithms and Flow charts, Generations of programming languages.

Basics of C Programming: Introduction to C programming language, Structure of a C program, Files used in a C, Compiling and Executing C Programs, C tokens, Keywords, Identifiers, Basic Data types, Variables, Constants, Operators, Operator Precedence and Associativity, Type Conversion and Typecasting in C.

Input and Output: Formatting and Non-Formatting Input/output Statements, Escape sequences and their usage in I/O.

(Book 1: Chapter 1, 2)

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UNIT II

Control Statements : Sequence statements, Selection statements: if, if-else, nested if, switch, conditional operators, Iterative statements: while, do-while and for.

Special control statements: goto, break, continue, return, exit.

Arrays : Introduction, Declaration of Arrays, Accessing the elements of Array, Storing values in Arrays, Two-dimensional arrays .

(Book 1: Chapter 3, 5)

UNIT III

Strings : Introduction, Reading and writing Strings, Operations on strings (String Manipulations Functions), Character functions (ctype.h)

Functions: Introduction, Function Declaration/ Function Prototype, Function Definition, Function Call, Return Statement, Passing Parameters to Functions (call-by-value & call-by-reference). Scope and lifetime of variables, Passing arrays to functions, Recursion, Recursive Functions, inline functions, Storage classes. **Pointers:** Introduction, Declaring Pointer Variables, Pointer Expressions and Pointer Arithmetic, Pointer to Pointer.

(Book 1: Chapter 4,6,7 and Appendix D)

UNIT IV

Dynamic Memory Allocation : malloc, calloc , realloc and free.

User-Defined Data Types: Structures and unions: Definition, initialization, accessing members, arrays of structures, Nested Structures, structures vs. unions, enumeration types (enum)

File handling: Introduction, Types of Files, File operations (using Files in C), Read Data from files (fscanf(), fgets(), fgetc(), fread()), Writing data to files (fprintf(), fputs(), fputc(), fwrite()) , Working with text and binary files.

(Book 1: Chapter 7,8, 9)

Course Outcomes: By the end of the course, the students will be able to,

CS125.CO1: Understand algorithms, flowcharts, and program design.

CS125.CO2: Write basic C programs using data types and operators.

CS125.CO3: Apply input/output functions and type casting.

CS125.CO4: Implement decision-making and looping constructs.

CS125.CO5: Develop programs using arrays, functions, pointers, and DMA.

CS125.CO6: Create programs using structures, unions, and file handling with ethical practices.

Suggested Books

1. Reema Thareja, Programming in C, Oxford University Press, Third Edition , 2023
2. Kernighan, B.W and Ritchie, D.M, The C Programming language, Second Edition, Pearson Education, 2015.

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Reference Books

1. Ashok Kamthane, Programming in C, Pearson Publication, Third Edition, 2024.
2. Yashavant Kanetkar, Let Us C, BPB Publications, Eighteenth Edition, 2020.
3. Herbert Schildt, C: The Complete Reference, McGraw-Hill Education, Fourth Edition, 2000.
4. E. Balagurusamy, Programming in ANSI C, McGraw-Hill Education, Eighth Edition, 2019.

CO-PO Articulation Matrix

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CS125.CO1	3	2	2	1	1	1	1	1	1	1
CS125.CO2	3	2	2	2	1	1	1	1	1	1
CS125.CO3	2	2	2	3	1	1	1	1	1	1
CS125.CO4	2	3	3	2	1	1	1	1	1	1
CS125.CO5	3	3	3	3	1	1	1	2	1	2
CS125.CO6	3	2	3	3	1	1	1	2	1	2

1- Low Correlation 2-Medium Correlation 3-High Correlation

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Semester I

Course: Programming in C Lab

Course Code: CS125P

Hour: (30 Hrs.)/ **Week:** 2PPW

Credits: 1

Course Objectives: The objectives of this course are,

1. Develop programming skills in C using control structures, functions, and data structures for problem-solving.
2. Apply arrays, pointers, strings, recursion, and file handling to build efficient real-world applications..

Lab Experiments:

1. Write a C program to input numbers and find the largest of two or three numbers using if statements and the conditional (ternary) operator (? :). Display the largest number.
2. Write a C program that takes an integer input and outputs the reversed number.
3. Write a C program to print all prime numbers between 2 and a given number n.
4. Write a C program to find the roots of a quadratic equation $x^2 + bx + c = 0$.
5. Write a C program to print a triangle pattern of stars (*), where the number of lines is given by the user.
6. Write a C program to demonstrate formatted and non-formatted I/O with escape sequences.
7. Write a C program to find the largest and smallest elements in an array of n numbers.
8. Write a C program to multiply two matrices of 3x3.
9. Write a C program to find the Greatest Common Divisor (GCD) of two numbers using both iteration and recursion.
10. Write a C program that demonstrates various Character functions from the <ctype.h> library
11. Write a C program that demonstrates various string functions from the <string.h> library.
12. Write a C program that reads only alphabets from user input using scanf
13. Write a C program to demonstrate the use of different storage classes (auto, register, static, extern).
14. Write a C program to demonstrate the concepts of call-by-value and call-by-reference.

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15. Demonstrate a C program on following types of pointers:
 - a) Pointers and Strings
 - b) Pointers and Arrays
 - c) Array of Pointers
 - d) Pointer to Pointer
16. Write a C program to demonstrate
 - a) Structure
 - b) Union
 - c) enum data type.
17. Write a C program that opens a file and counts the total number of characters in it.
18. Write a C program that copies content from an existing text file to a new file.
19. Write a C program that selects a random record from a file using fseek(), ftell(), and rewind().
20. Menu-Driven Programs - Design menu-driven programs for the following applications:
 - Student Management System
 - Hospital/Medical Management System
 - Banking System (Simple ATM Menu)
 - Employee Management System
 - Hotel Room Booking System
 - Complaint Management System
 - Inventory/Shop Management System

Each program should include basic operations such as add, update, delete, search, and display records.

Course Outcomes: By the end of the course, the students will be able to,

CS125P.CO1: Write, debug, and execute C programs using control structures, functions, and data structures with good practices and teamwork.

CS125P.CO2: Apply C concepts like file handling, recursion, and memory management to develop efficient and responsible solutions.

CO-PO Articulation Matrix

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CS125P.CO1	3	3	2	3	2	1	1	2	3	2
CS125P.CO2	3	3	3	3	2	1	1	2	2	2

1- Low Correlation 2-Medium Correlation 3-High Correlation

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Semester II

Course: Data Structures using C

Course Code: CS225

Hour: (60 Hrs.)/ **Week:** 4PPW

Credits: 4

Course Objectives: The objectives of this course are,

1. To discuss the linear data structures and their applications.
2. To Understand Queues and Linked list.
3. To understand and implement trees with efficient traversal, searching, and optimization techniques.
4. Demonstrate graph traversals and apply algorithms like BFS, DFS algorithms.
5. Analyze and implement advanced searching and sorting techniques.
6. To introduce hashing and overflow handling, to optimize data organization and retrieval

UNIT I

Introduction to Data structures: Definition, Types of Data structures.

Arrays: Arrays – ADT, Ordered Lists, Sparse Matrices, Representation of arrays.

Stacks: Stack ADT, Stacks using Arrays, Stacks using Dynamic Arrays, Evaluation of Expressions – Evaluating Postfix Expression, Infix to Postfix Expression, Checking Well-formed Parenthesis (Parenthesized Expression), Reversing a List.

(Book 1: Chapter 2, 3; Book 2: Chapter 7)

UNIT II

Queues : Queues ADT, Operations, Circular Queues, Applications-Job Scheduling.

LinkedLists : Singly Linked Lists and Chains, Linked Stacks and Queues, Polynomials, Operations for Circularly Linked Lists, Equivalence Classes, Doubly Linked Lists.

(Book 1: Chapter 3, 4, 8)

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UNIT III

Trees : Introduction, Binary Trees, Binary Tree Traversals, Heaps, Binary Search Trees(BST): Definition, Searching an element, Insertion into a BST, and Deletion from a BST, Determining the height of BST, Determining the number of nodes, Efficient Binary Search Trees.

Graphs : Graph Abstract Data Type, Elementary Graph operations, Graph Traversal Techniques - DFS and BFS, Minimum Cost Spanning Trees - Prim's and Kruskal's Algorithms.

(Book 1: Chapter 5, 6, 10; Book 2: Chapter 10)

UNIT IV

Searching and Sorting: Sequential Search, Binary Search. Bubble sort, Selection sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, List and Table Sorts.

Hashing : Static Hashing, Hash Tables - Hashing Functions, Overflow Handling, Theoretical Evaluation of Overflow Techniques.

(Book 1: Chapter 7, 8; Book 2: Chapter 14)

Course Outcomes: By the end of the course, the students will be able to,

CS225.CO1: Understand and implement fundamental data structures such as arrays and stacks for efficient data manipulation and expression evaluation.

CS225.CO2: Apply linked list and queue data structures to design efficient data storage and processing solutions.

CS225.CO3: Analyze and implement tree structures, including binary trees and binary search trees, for efficient traversal operations.

CS225.CO4: Analyze and implement graph structures and traversal techniques such as BFS and DFS.

CS225.CO5: Develop, implement, and optimize searching and sorting algorithms to improve data organization and retrieval efficiency.

CS225.CO6: Implement hashing techniques and analyze their effectiveness in optimizing data retrieval.

Suggested Books

1. Horowitz E, Sahni Sand Susan Anderson-Freed, Fundamentals of Data structures in C, 2nd Edition, Universities Press, 2008.
2. Reema Thareja, Data Structures using C, Second Edition, Oxford University press, 2023.


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Reference Books

1. Kushwaha D.SandMisra A.K, Data structures A Programming Approach with C, Second Edition, PHI, 2014.
2. Chandan Banerjee and AtanuDas, "Data Structures and Algorithms in C and PYTHON", University Press, 2023.
3. Yedidyah Langsam, Moshe J.Augenstein, Aaron M.Tenenbaum, Data Structures Using C and C++, Second Edition, PHI, 2009.

CO-PO Articulation Matrix

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CS225.CO1	3	3	1	2	2	1	1	1	1	2
CS225.CO2	3	3	1	2	2	1	1	1	2	2
CS225.CO3	3	3	1	2	2	1	1	1	2	2
CS225.CO4	3	3	2	2	2	1	1	2	2	2
CS225.CO5	3	3	1	2	2	1	1	2	1	2
CS225.CO6	3	3	1	2	2	1	1	2	1	2

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Semester II

Course: Data Structures using C Lab

Hour: (30 Hrs.) / **Week:** 2PPW

Course Code: CS225P

Credits: 1

Course Objectives: The objectives of this course are,

1. To implement C Programs for Linear Data structures and Non Linear Data Structures.
2. To implement C Programs for Searching and Sorting Techniques.

Lab Experiments:

1. Implementation of Stacks using Arrays.
2. Implementation of Queues using Arrays.
3. Implementation of Circular Queue.
4. Implementation of Infix to Postfix Conversion, Postfix Expression Evaluation.
5. Implementation of Reversing a String.
6. Implementation of Singly Linked List.
7. Implementation of Doubly Linked List.
8. Implementation of Circular Linked List.
9. Implementation of Stacks using Linked Lists.
10. Implementation of Queues using Linked Lists.
11. Implementation of Linear Search Algorithm.
12. Implementation of Binary Search Algorithm.
13. Implementation of Operations on Binary Tree.
14. Implementation of Binary Search Tree.
15. Implementation of AVL Trees.
16. Implementation of Traversal on Graphs.
17. Implementation of Bubble Sort.
18. Implementation of Selection Sort.
19. Implementation of Insertion Sort.
20. Implementation of Merge Sort.
21. Implementation of Quick Sort.

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Case Studies:

22. A music streaming chatbot maintains a playlist of songs. Initially, the playlist contains the following songs: ["Song A", "Song B", "Song C", "Song D"]
- The system needs to perform the following operations:
 - Add a new song at the beginning
 - Delete a song from the middle
 - Display all songs
 - Explain how the playlist is implemented using an Array.
 - Perform the following operations using arrays:
 - Insert "Song X" at the beginning
 - Delete "Song C"
 - Explain the limitations of arrays in this scenario.
 - Now implement the same playlist using a Linked List.
 - Show how insertion and deletion are performed efficiently.
 - Compare Array vs. Linked List for playlist management.
23. An AI system represents followers of a user on Instagram in a hierarchical tree:
- Root = Main user
 - Children = Direct followers
 - Sub-children = Followers of followers
- Draw a tree representing this hierarchy.
 - Define:
 - Root
 - Parent
 - Child
 - Leaf nodes
 - Explain how this tree helps in suggesting new connections.


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Course Outcomes: By the end of the course, the students will be able to,

CS225P.CO1: Implement and apply fundamental data structures including linear structures (arrays, linked lists, stacks, and queues) and non-linear structures (trees and graphs) for solving computational problems.

CS225P.CO2: Design and implement efficient searching and sorting algorithms to analyze, organize, and retrieve data effectively for problem solving.

CO-PO Articulation Matrix

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CS225P.CO1	3	3	1	3	2	1	1	2	2	2
CS225P.CO2	3	3	1	3	2	1	1	2	1	2

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