

B.Sc. Part – II Computer Science (Optional) (Semester – IV)
Course Code: DSC-D12 Computer Science Paper –VIII
Course Title: Data Structure Using C++
Total Contact Hours: 36 Hrs (45 Lectures of 48 Min.)
Teaching Scheme: Theory – 03 Lect. / Week

Credits: 02

Total Marks: 50

Course Outcomes:

Upon successful completion of this course, students will be able to

1. understand the basic concepts such as Abstract Data Types, Linear and Non-Linear Data structures.
2. choose appropriate data structures to represent data items in real-world problems.
3. analyze the time and space complexities of algorithms.
4. design programs using a variety of data structures such as array, stacks, queues, and linked list.
5. analyze and implement various kinds of searching and sorting techniques.

Unit – 1: Introduction to Data Structures: Stack and Queue

18 Hrs.

1.1 Concept of Abstract Data Types:

- 1.1.1 Definitions, Data types, Data Object, Data structure (D-Data, A-Axioms, O-Operations),
- 1.1.2 Classification (Primitive, Non-Primitive: Array, Files, List: Linear, Non-Linear),
- 1.1.3 Basic Operations (Traversing, Searching, Insertion, Deletion, Sorting, Merging)

1.2 Sorting:

- 1.2.1 Definition
- 1.2.2 Stable-Unstable Sorting
- 1.2.3 Adaptive-Non Adaptive Sorting
- 1.2.4 Order of Sorting (Increasing, Decreasing, Non Increasing, Non Decreasing)

1.3 Sorting Techniques: Bubble sort, Selection sort, Insertion sort, Quick sort

1.4 Searching: Linear and Binary Search

1.5 Stack:

- 1.5.1 Definition
- 1.5.2 Operations (Push, Pop, Peek, Isfull, Isempty),
- 1.5.3 Implementation using array

1.6 Applications of stack: Mathematical Expressions (Well-Parentheses, Notations: Infix, Prefix, Postfix, Conversion from Infix to Postfix and Infix to Prefix)

1.7 Queue –

- 1.7.1 Definition of queue
- 1.7.2 Operations (Enqueue, Dequeue, Peek, Isfull, Isempty)
- 1.7.3 Types of queue (Linear, Circular, Priority)
- 1.7.4 Implementation Linear Queue using array(Compaction)
- 1.7.5 Applications of Queue

Unit – 2: Linked List and Trees

18 Hrs.

2.1 Linked List:

- 2.1.1 Concept of linked list
- 2.1.2 Types Of Linked List (Singly-Doubly, Linear-Circular)
- 2.1.3 Implementation of Linked list

2.1.4 Operations on linear linked list (Insertion, Deletion, Display, Search)

2.1.5 Application

2.1.5.1 Implementation of stack and queue using linked list.

2.2 Trees:

2.2.1 Definition

2.2.2 Terminologies (Root, Child, Parent, Siblings, Descendant, Ancestor, Leaf/External node, Branch node/Internal node, Degree, Edge, Path, Level, Depth, Height of node, Height of tree, Forest)

2.3 Binary Tree:

2.3.1 Definition

2.3.2 Types (Full/Proper/Plane, Complete, Perfect, Skewed, Balanced)

2.4 Binary Search Tree:

2.4.1 Definition

2.4.2 Representation

2.4.3 Operations (Insertion, Deletion, Search, Tree Traversal: Preorder, Inorder, Postorder)

Reference Books

1. Data Structures Using C and C++ by Yedidyah Langsam, Aaron M. Tenenbaum
2. Data Structure using C++ - E Balagurusamy
3. Data Structures Through C++ by Yashavant Kanetkar
4. Data Structure Using C++ by D. S. Malik