

UNDERGRADUATE PROGRAMME IN ELECTRONICS

EL-7

C++ and Data Structures

Total Periods: 48

Unit-1

(P-20)

C++ Programming Language:

Introduction to Object Oriented Programming, Data Abstraction and Abstract Data Type (ADT), Data Encapsulation and hiding, Class Instantiation, Static and Dynamic Memory Allocation, Inheritance, Polymorphism and Dynamic Binding, Function Overloading, Operator Overloading, Friend Function and Friend Classes, Exception Handling, Template Functions and classes

Unit-2

(P-10)

Data Structures:

Arrays and Linked Lists: Arrays and Pointers, Arrays & Structures, Single, Double, Linear and Circular Linked Lists, Applications of Linked lists

Stacks: Implementing stacks using linked lists, Applications of stacks

Unit-3

(P-9)

Queues: Linked List Implementation of queues, Linear and Circular queues, Circular Buffers, Priority queues
Searching and sorting: Linear search, Binary search, Quick sort, merge sort

Unit-4

(P-9)

Trees: Concept of a tree, Binary tree and its implementation in C++, Classification of binary trees, Applications of binary trees: - Heap trees, Binary Search Trees (BSTs), Traversals and Search operation in BST, Divide and Conquer strategy to implement a BST, Degenerated BST, Height Balancing in trees.

Essential Text:

UNIT I:

1. Chapter 11-24, The Complete Reference C++ by Herbert Schildt (TMH Third Edition), 2008

UNIT II:

1. Chapter 2, 4 - 5, Data Structures Using C and C++ by Y Langsam, M J Avgenstein, A M Tenenbaum (PHI), 2008.

UNIT III:

1. Chapter 6, Data Structures Using C and C++ by Y Langsam, M J Avgenstein, A M Tenenbaum (PHI), 2008.

UNIT IV:

1. Chapter 7, Data Structures Using C and C++ by Y Langsam, M J Avgenstein, A M Tenenbaum (PHI), 2008.

Suggested Books:

1. Programming Principles & Practice Using C++ by Bjarne Stroustrup, Addison Wesley
2. Data Structures, Algorithms and Applications in C++ by Sartaj Sahni (McGraw-Hill)
3. Schaum's Series in Data structures- Lipshutz, TMH

EL-7 Practical: *Programs of C++*

(Any eight)

1. W. A. P to maintain an account of a customer using classes.
2. W. A. P to simulate the results of a class using class student.

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3. W. A. P to maintain a small library of 100 books using class Library.
4. W. A. P to add, subtract, multiply and divide two matrices using operator overloading.
5. W. A. P to implement friend functions and friend classes.
6. W. A. P to implement default, parameterized and copy constructors in the same program.
7. W. A. P to implement multilevel inheritance.
8. W. A. P to implement hierarchical inheritance.
9. W. A. P to implement single level, multilevel, hierarchical and multiple inheritances.
10. W. A. P to implement compile time and run time polymorphism.
11. W. A. P to implement exception handling.
12. W. A. P to implement function templates and class templates.

Programs of Data Structures

(Any five)

1. W. A. P to implement linear and circular linked lists using single and double pointers.
2. W. A. P to implement stacks using arrays and linked lists.
3. W. A. P to implement circular queues using arrays and linked lists.
4. W. A. P to implement polynomial addition and subtraction using linked lists.
5. W. A. P to implement sparse matrices using arrays and linked lists.
6. W. A. P to binary tree using linked lists and perform in order, preorder and post order traversals.
7. W. A. P to implement binary search tree using linked lists. Compare its time complexity over that of linear search.