

EC-205

DATA STRUCTURES THROUGH C++

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**COURSE OBJECTIVES:**

1. To understand Object Oriented Programming features of C++.
2. To understand the concepts encapsulation, inheritance, and polymorphism.
3. To understand the concepts inheritance, Runtime polymorphism and Templates.
4. To understand the concepts of Lists, Stacks and Queue ADT's.
5. To understand Binary trees and ADT's of BST and Various sorting techniques.

**COURSE OUTCOMES:**

**After successful completion of the course, the students are able to**

1. understand about C++ fundamentals and various function modifiers, create and manipulate classes and objects.
2. illustrate use Inheritance and its types and efficiently develop reusable and extensible programs.
3. assess the concept of templates for generic programming.
4. demonstrate programs for various data structures and their applications.
5. compare complexities of different sorting and searching techniques.

**UNIT I***Text Book - 1 (13)*

**An Overview of C++ :** The Origins of C++, What is Object Oriented Programming, some C++ fundamentals, Old-Style Vs Modern C++, Introducing C++ Classes, Function Overloading, Operator Overloading, Inheritance, Constructors and Destructors, The C++ Keywords, The General Form of a C++ Program.

**Classes and Objects :** Classes, Structures and Classes, Unions and Classes are Related, Friend Functions, Friend Classes, Inline Functions, Parameterized Constructors, Static Class Members, When Constructors and Destructors are Executed, Scope Resolution Operator, Nested Classes, Local Classes, Passing and Returning Objects, Object Assignment.

**Arrays, Pointers, References and the Dynamic Allocation :** Arrays of Objects, Pointers, References, Dynamic Allocation Operators, the Placement Forms of new and delete.

**UNIT II***Text Book - 1 (13)*

**Function Overloading, Copy Constructors and Default Arguments :** Function Overloading, Overloading Constructor Functions, Copy Constructors, Finding the Address of an Overloaded Function, Overload Anachronism, Default Arguments, Function Overloading and Ambiguity.

**Operator Overloading :** Creating Member Operator Function, Overloading Using a Friend Function, Overloading new delete, Overloading Special Operators & Comma Operator.

**UNIT III***Text Book - 1 (13)*

**Inheritance :** Base-Class Access Control, Inheritance and protected members, Inheriting Multiple Base Classes, Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes.

**Virtual Functions & Polymorphism :** Virtual Functions, The Virtual Attribute is inherited, Virtual Functions are Hierarchical, Pure Virtual Functions, Using Virtual Functions, Early Vs Late Binding.

**Templates :** Generic Functions, Applying Generic Functions, Generic Classes, Typename and export Keywords, Power of Templates.

**UNIT IV***Text Book - 2 (13)*

**LINKED LISTS** : Abstract Data Types, The List ADT, Linked Lists, Polynomial ADT, Doubly Linked Lists, Circular Linked lists.

**THE STACK and QUEUE ADT** : Stack Model, Implementation of Stacks, Applications: Conversion of infix expression to postfix Expression, postfix evaluation, Queue implementation.

**UNIT V***Text Book - 2 (13)*

**TREES** : Preliminaries, Binary Trees, Binary Tree Traversals, Binary Search Tree.

**SORTING** : Insertion sort, Merge sort, Quick sort, Heap sort.

**LEARNING RESOURCES:****TEXT BOOK(s):**

1. The Complete Reference - C++ by Herbert Schildt, 4/e, Tata McGraw Hill
2. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4/e, Pearson

**REFERENCE BOOK(s):**

1. Object Oriented Programming with C++, E. Balaguruswamy, 4/e, Tata McGraw Hill.
2. An Introduction to Data Structures with Applications, Trembley and Sorenson, 2/e, Tata McGraw Hill, 2001.

**WEB RESOURCES:**

<http://nptel.iitm.ac.in/courses/>