

C, C++ and DSA

Session 1: Introduction to C Language

✓ History of C Language	✓ Type of C Variables, The First C Program
✓ The C Character Set, Data Types & Ranges	✓ Type Declaration, Type Conversion
✓ Constant, Variables and Keywords	✓ Associativity of Operators, Operators

Session 2: The Decision Control Structure

✓ The If Statement	✓ The Nested If-Else Statement
✓ The If-Else Statement	✓ Switch Statement and its various Conditions
✓ Nesting of If Statements	✓ break statement and its examples

Session 3: The Loop Control Structure

✓ Introduction to Loops and its Types	✓ Working with For Loop with Example
✓ Working with While Loop	✓ continue, exit(), goto statements
✓ Working with Do While Loop	✓ Nested of Looping (while, do-while, for)

Session 4: Arrays and Pointers

✓ Introduction to Arrays	✓ Pointers and 1-D, Pointers and 2-D Array
✓ Types of Arrays with Examples	✓ Pointers and 3-D Arrays
✓ Working with 1-D, 2-D and 3-D Arrays	✓ Pointers to an Array, Arrays of Pointers

Session 5 Functions and Pointers

✓ Introduction to Functions	✓ Call by Value and Call by Address
✓ Passing Values between Functions	✓ Recursion, Passing Arrays to Function
✓ Function Declaration and Prototype	✓ Pointer to Function
✓ Function Returning Pointers	✓ Function with Variable Number of Arguments

Session 6: Working with Structure

✓ Why use structure, Declaring a structure	✓ Event Listeners Registration
✓ Accessing Structure Elements	✓ How Structure Elements are Stored
✓ Array of Structures	✓ Additional Features of Structure
✓ Uses of Structure	✓ Enumerated Data Types
✓ Typedef, BitFields	✓ Union and Union of Structures

Session 7: Working with File Input/Output

✓ Data Organization	✓ Counting Characters, Tabs and Space
✓ File Operations (Opening, Reading, Writing)	✓ Writing and Reading to/from Files
✓ File Opening Modes, String I/O in Files	✓ Working with Low Level Disk I/O
✓ Text Files and Binary Files	✓ Working with Files library Functions
✓ Working with Command Line Arguments	✓ Low Level File Interaction

Session 8: The C Preprocessor Directives

✓ Features of C Preprocessor	✓ Macros with Arguments
✓ Macro Expansion	✓ Macros with Functions
✓ File Inclusion	✓ Conditional Compilation
✓ #if and #elif Directives	✓ #undef and #pragma Directives

Session 9: Principles of Object Oriented Programming

✓ Object Oriented Programming Paradigm	✓ Benefits of OOP, Object Oriented Languages
✓ Basic Concepts of OOPS	✓ Application of OOP

Session 10: Beginning with C++

✓ What is C++, Application of C++	✓ More C++ Statements, An Example of Class
✓ A Simple C++ Program	✓ Structure of C++ Program

✓ Creating the Source File	✓ Compiling and Linking
Session 11: Tokens, Expressions and Control Statements	
✓ Tokens, Keywords, Identifiers and Constant	✓ Operators in C++, Scope Resolution Operator
✓ Basic Data Types, User Defined Data Types	✓ Member Dereferencing Operators
✓ Derived Data Types	✓ Memory Management Operators
✓ Declarations of Variables	✓ Manipulators, Type Cast Operators
✓ Dynamic Initialization of Variables	✓ Expression and their Types
✓ Reference Variables	✓ Implicit Conversion, Operator Overloading
✓ Operator Precedence	✓ Control Statements and Looping
Session 12: Functions in C++	
✓ The Main Function, Function Prototyping	✓ Call by Reference, Function Overloading
✓ Return by Reference, Inline Function	✓ Default Arguments, Const Arguments
✓ Friend and Virtual Functions	✓ Math Library Functions
Session 13: Classes and Objects	
✓ Introduction to C++	✓ A C++ Program with Class
✓ Defining Member Functions	✓ Making an Outside Function Inline
✓ Nesting of Member Functions	✓ Arrays within a Class
✓ Private Member Functions	✓ Memory Allocation for Objects
✓ Static Data Members	✓ Arrays of Objects
✓ Static Member Functions	✓ Object as Function Arguments
✓ Friend Functions	✓ Constant Member Functions
✓ Returning Objects	✓ Pointers to Members, Local Classes
Session 14: Constructors and Destructors	
✓ Introduction to Constructors	✓ Parameterized Constructor
✓ Multiple Constructors in Class	✓ Constructors with Default Arguments
✓ Dynamic Initialization of Objects	✓ Copy Constructor
✓ Dynamic Constructor	✓ Constructing Two-Dimensional Arrays
✓ Const Objects	✓ Destructors and its properties
Session 15: Operator Overloading and Type Conversion	
✓ Defining Operator Overloading	✓ Overloading Binary Operators using Friend
✓ Overloading Unary and Binary Operators	✓ Examples of Overloading Operators
✓ Manipulation of Strings using Operators	✓ Rules for Overloading Operators, Type Conversions
Session 16: Inheritance: Extending Classes	
✓ Defining Derived Classes, Single Inheritance	✓ Multiple Inheritance, Hierarchical Inheritance
✓ Making Private Member Inheritance	✓ Hybrid Inheritance, Virtual Base Classes
✓ Multilevel Inheritance	✓ Abstract Classes
✓ Constructors in Derived Classes	✓ Member Classes: Nesting of Classes
Session 17: Pointers, Virtual Functions and Polymorphism	
✓ Pointers, Pointers to Objects, this pointers	✓ Pure Virtual Functions
✓ Pointers to Derived Classes	✓ Virtual Functions
Session 18: Managing Console I/O Operations	
✓ C++ Streams	✓ Unformatted I/O Operations
✓ C++ Stream Classes	✓ Formatted Console I/O Operations
✓ Managing Output with Manipulators	
Session 19: Working with Files	
✓ Classes for File Stream Operations	✓ File Pointers and Their Manipulators
✓ Opening and Closing a File	✓ Sequential Input and Output Operations

✓ Detecting end of file, File Modes	✓ Updating a File: Random Access
✓ More about open(), Command Line Args	✓ Error Handling During File Operations
Session 20: Template Programming	
✓ Introduction to Template	✓ Class Templates, Function Templates
✓ Class Templates with Multiple Parameters	✓ Function Templates with Multiple Parameters
✓ Overloading of Templates	✓ Member Function Templates
✓ Non-Type Template Arguments	
Session 21: Exception Handling	
✓ Basic of Exception Handling	✓ Exception Handling Mechanism
✓ Throwing Mechanism	✓ Caching and Rethrowing Exception
Session 22: Manipulating Strings	
✓ Introduction to Strings	✓ Creating Strings Objects
✓ Manipulating String Objects	✓ Relational Operators, String Characteristics
✓ Accessing Characters in Strings	✓ Comparing and Swapping of Strings
Session 23: Introduction to Standard Template Library	
✓ Introduction to STL and its Components	✓ Applications of Container Classes
✓ Containers, Iterators, Algorithms	✓ Function Objects
✓ Working with Namespaces	✓ Introduction to STL Classes
Session 24: Introduction to Data Structures and Algorithms	
✓ Data Structure Introduction & Classification	✓ Algorithm Efficiency
✓ Abstract Data Types and Algorithms	✓ Notation: (Big-O, Omega, Theta)
✓ Time and Space Complexity	✓ Worst-case, Average-case, Best-case
Session 25: Linked Lists	
✓ Introduction to Linked List	✓ Types of Linked List with its operations
✓ Linked List versus Arrays	✓ Application of Linked List
✓ Memory Allocation and De-allocation	✓ Polynomial Representation
Session 26 & 27: Stacks & Queues	
✓ Introduction to Stacks	✓ Introduction to Queues
✓ Array Representation of Stacks	✓ Arrays and List Representation of Queue
✓ Operation on a Stack: Push(), Pop(), Peek()	✓ Types of Queues with Examples
✓ Linked List Representation of Stack	✓ Application of Queues
✓ Push, Pop and Peek operation with List	✓ Circular Queue
✓ Multiple Stacks, Application of Stacks	✓ Dequeue
✓ Evaluation of Arithmetic Expression	✓ Priority Queue
✓ Infix to Postfix Conversion	✓ Multiple Queue
Session 28: Trees	
✓ Introduction to Trees	✓ Operations with Binary Search Tree
✓ Types of Trees, Tree Traversal	✓ Threaded Binary Tree
✓ In-Order, Post-Order, Pre-Order	✓ AVL Trees and its Rotations
✓ Introduction to Binary Search Tree	✓ B and B+ Trees
Session 29: Graphs	
✓ Introduction of Graphs	✓ Adjacency Matrix Representation
✓ Graph Terminology	✓ BFS and DFS Searching Algorithm
✓ Directed Graphs and its Terminology	✓ Shortest Path Algorithms

✓ Representation of Graphs	✓ Minimum Spanning Trees
✓ Prim's and Kruskal's Algorithm	✓ Dijkstra's Algorithm and Application of Graphs

Session 30: Heaps & Searching & Sorting

✓ Introduction to Heaps and its Applications	✓ Bubble Sorting, Selection Sorting
✓ Linear Search and Binary Search	✓ Inserting, Merge, Quick, Heap Sorting
✓ Introduction to Sorting Algorithms	✓ Hash Table, Hash Function, Collisions in Hashing

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