

C++ Course Contents

Course Duration: One Month

1. Introduction to C++

- What is C++?
- History and Evolution of C++
- Setting up the development environment (IDE, Compiler)
- First C++ program: "Hello, World!"

2. Basics of C++

- Syntax and Structure of C++ Program
- Variables and Data Types
- Input and Output (cin, cout)
- Operators (Arithmetic, Relational, Logical, Bitwise)

3. Control Structures

- Conditional Statements: if, if-else, switch
- Loops: for, while, do-while
- Break and continue statements

4. Functions

- Defining and Calling Functions
- Function Parameters and Return Types
- Function Overloading
- Inline Functions
- Recursive Functions

5. Arrays and Strings

- One-dimensional and Multi-dimensional Arrays
- Character Arrays and C-Strings

- String Class and String Operations

6. Pointers and Dynamic Memory

- Pointer Basics and Pointer Arithmetic
- Pointers and Arrays
- Dynamic Memory Allocation: new, delete
- Smart Pointers (brief overview)

7. Structures and Unions

- Defining and Using Structures
- Nested Structures
- Unions and Differences from Structures

8. Object-Oriented Programming (OOP) in C++

- Classes and Objects
- Constructors and Destructors
- Access Specifiers: public, private, protected
- Member Functions and Data Members
- Static Members
- Friend Functions and Friend Classes

9. Inheritance

- Types of Inheritance (Single, Multiple, Multilevel, Hierarchical, Hybrid)
- Base and Derived Classes
- Function Overriding and Virtual Functions
- Abstract Classes and Pure Virtual Functions
- Polymorphism (Compile-time and Run-time)

10. Operator Overloading

- Overloading Arithmetic and Relational Operators

- Overloading Assignment Operator
- Overloading Stream Operators (<<, >>)

11. Templates and Generic Programming

- Function Templates
- Class Templates
- Template Specialization

12. Exception Handling

- Basics of Exception Handling
- try, catch, throw
- Custom Exceptions

13. Standard Template Library (STL)

- Introduction to STL
- Containers (vector, list, deque, set, map, etc.)
- Iterators
- Algorithms (sort, find, etc.)
- Function Objects and Lambdas

14. File Handling

- File Streams: ifstream, ofstream, fstream
- Reading and Writing Files
- File Modes and Operations

15. Advanced Topics (Optional)

- Move Semantics and Rvalue References
- Multithreading Basics (std::thread)
- Lambda Expressions
- Namespaces and the Standard Namespace

