C & C++ Programming

Course Duration

- **Total Duration:** 60–80 Hours
- **Theory:** 40%
- **Practical:** 60%

Prerequisites

- Basic Computer Fundamentals
- Logical Thinking
- No prior programming experience required

Part A: C Programming

Module 1: Introduction to Programming & C (6 Hours)

- What is Programming?
- History and Features of C
- Applications of C
- Structure of a C Program
- Compilation Process (Source → Object → Executable)
- Keywords, Identifiers, Constants, Variables
- Data Types and Type Modifiers

Module 2: Operators and Expressions (6 Hours)

- Arithmetic Operators
- Relational Operators
- Logical Operators
- Assignment Operators
- Increment / Decrement Operators
- Bitwise Operators
- Operator Precedence and Associativity
- Type Conversion (Implicit & Explicit)

Module 3: Control Statements (8 Hours)

- Decision Making
  - if, if-else, nested if
  - switch-case
- Looping Statements
  - for loop
  - while loop
  - do-while loop
- break, continue, goto

Module 4: Functions and Storage Classes (6 Hours)

- Functions (User-defined & Library)
- Function Declaration, Definition, Calling
- Call by Value & Call by Reference
- Recursion
- Storage Classes
    - auto, static, register, extern

Module 5: Arrays and Strings (8 Hours)

- One-Dimensional Arrays
- Two-Dimensional Arrays
- Multi-Dimensional Arrays
- Character Arrays (Strings)
- String Handling Functions

Module 6: Pointers (8 Hours)

- Introduction to Pointers
- Pointer Arithmetic
- Pointers and Arrays
- Pointers and Functions
- Pointers to Pointers
- Dynamic Memory Allocation
    - malloc(), calloc(), realloc(), free()

Module 7: Structures, Unions & Enums (6 Hours)

- Structures
- Nested Structures
- Array of Structures
- Unions
- Enumerations (enum)
- typedef

Module 8: File Handling in C (6 Hours)

- File Concepts
- File Modes
- File Functions
    - fopen(), fclose()
    - fprintf(), fscanf()
    - fgetc(), fputc()
    - fread(), fwrite()
- Command Line Arguments

Part B: C++ Programming

Module 9: Introduction to C++ & OOP Concepts (6 Hours)

- Difference between C and C++
- Features of C++
- Basic Syntax
- Tokens and Data Types
- Input / Output using cin, cout
- Introduction to OOP
    - Object
    - Class
    - Encapsulation
    - Abstraction
    - Inheritance
    - Polymorphism

Module 10: Classes and Objects (8 Hours)

- Defining a Class
- Creating Objects
- Access Specifiers
- Constructors and Destructors
- Inline Functions
- Static Data Members and Functions
- Scope Resolution Operator

Module 11: Inheritance and Polymorphism (8 Hours)

- Types of Inheritance
    - Single
    - Multiple
    - Multilevel
    - Hierarchical
    - Hybrid
- Function Overloading
- Operator Overloading
- Virtual Functions
- Runtime Polymorphism

Module 12: Templates and Exception Handling (6 Hours)

- Function Templates
- Class Templates
- Exception Handling
    - try
    - catch
    - throw
- Standard Exceptions

Module 13: File Handling in C++ (6 Hours)

- File Streams
  - ifstream
  - ofstream
  - fstream
- Opening and Closing Files
- Reading and Writing Objects
- Binary Files

Module 14: Standard Template Library (STL) (6 Hours)

- Introduction to STL
- Containers
  - vector
  - list
  - map
  - set
- Iterators
- Algorithms
  - sort
  - search
  - find

Module 15: Mini Projects & Practice (8 Hours)

Project Ideas:

- Student Management System
- Library Management System
- Bank Account System
- File-based Inventory System
- Menu-Driven Applications

Learning Outcomes

After completing the course, students will be able to:

- Write efficient programs in C and C++
- Understand memory management
- Apply Object-Oriented Programming concepts
- Develop real-world applications
- Prepare for technical interviews and competitive exams