C++
SYLLABUS

Module 1: Introduction to C++

- Basics of C++ and its features
- Difference between C and C++
- Structure of a C++ program
- Setting up environment (Compiler/IDE)
- Input/Output using cin and cout
- Namespaces and using std

Module 2: Data Types & Operators

- Variables and Constants
- Data Types (int, float, char, double)
- Type Casting
- Operators (Arithmetic, Relational, Logical, Assignment)
- Operator Precedence

Module 3: Control Statements

- if, if-else, nested if
- switch-case
- Conditional (ternary) operator
- Decision-making programs

Module 4: Loops

- for loop
- while loop
- do-while loop
- Nested loops
- break and continue

Module 5: Functions

- Function Declaration & Definition
- Types of Functions
- Default Arguments
- Function Overloading
- Inline Functions
- Recursion

Module 6: Arrays & Strings

- One-dimensional Arrays
- Multi-dimensional Arrays
- String handling using string class
- Basic string operations
- Passing arrays to functions

Module 7: Pointers & Memory Management

- Introduction to Pointers
- Pointer Arithmetic
- Pointers with Arrays and Functions
- Dynamic Memory Allocation (new, delete)
- Dangling pointers

Module 8: Object-Oriented Programming (OOP)

- Introduction to OOP concepts
- Classes and Objects
- Access Specifiers (public, private, protected)
- Constructors & Destructors
- Member Functions

Module 9: Advanced OOP Concepts

- Inheritance (Single, Multiple, Multilevel)
- Polymorphism (Compile-time & Run-time)
- Function Overriding
- Virtual Functions
- Abstraction
- Encapsulation

Module 10: Operator Overloading

- Introduction to Operator Overloading
- Unary and Binary Operators
- Overloading using Member Functions
- Practical examples

Module 11: File Handling

- File Streams (ifstream, ofstream, fstream)
- Opening and Closing Files
- Reading and Writing Files
- File modes and operations

Module 12: Exception Handling

- Introduction to Exceptions
- try, catch, throw
- Multiple catch blocks
- Handling runtime errors

Module 13: Standard Template Library (STL)

- Introduction to STL
- Containers (vector, list, map, set)
- Iterators

- Algorithms (sort, search)

Module 14: Templates

- Function Templates
- Class Templates
- Generic Programming concepts

Module 15: Advanced Concepts

- Friend Functions & Classes
- Static Members
- Inline vs Macro
- Namespaces (advanced use)

Module 16: Mini Projects

- Student Management System
- Banking System
- File-based Record System
- Console-based Applications