C and C++ Complete Course Outline (Approx. 35-40 Lectures × 45 min)

C Programming Basics (Lectures 1-12)

- Introduction to C, History, Features
- Basic Syntax, Data Types, Variables, Constants
- Operators and Expressions
- Control Flow: if-else, switch, loops (for, while, do-while)
- Functions, Recursion, Modular Programming
- Arrays and Strings
- Pointers, Pointer Arithmetic
- Dynamic Memory Allocation
- Structures and Unions
- File Handling Basics
- Preprocessor Directives and Macros
- Error Handling and Debug Techniques

C++ Basics and OOP Concepts (Lectures 13-22)

- Introduction to C++ Language and Setup
- Classes and Objects, Encapsulation
- Constructors and Destructors
- Operator Overloading
- Inheritance (Single, Multiple, Multilevel, Hierarchical)
- Polymorphism (Compile-Time and Run-Time)
- Abstraction and Interfaces (Abstract Classes)
- Namespaces and Exception Handling
- Function Overloading and Templates

Advanced C++ Concepts (Lectures 23-33)

- Standard Template Library (STL): Vectors, Lists, Sets, Maps, Queues, Stacks
- Iterators and Algorithms
- Smart Pointers and Memory Management
- Multithreading Basics
- Lambda Expressions
- File Streams and I/O
- Move Semantics and Rvalue References
- Design Patterns in C++
- Best Practices and Code Optimization

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Projects, Testing & Debugging (Lectures 34-40)

- Building Mini Projects combining C and C++ concepts
- Debugging Tools and Techniques
- Writing Test Cases and Using Unit Testing Frameworks
- Code Review and Refactoring

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