



Complete Beginner to Advanced

Module 1: C++ Fundamentals

Build a strong foundation by understanding the evolution of C++, its standards, program structure, syntax, and development workflow.

Topics Covered:

- Introduction to Programming Languages
- C++ Overview & Features
- C++ Standards & Implementation
- Writing Your First C++ Program
- Comments and Code Documentation
- Practice Problems

Module 2: Variables & Data Types

Learn how to declare, initialize, and manage variables while understanding different data types and memory concepts.

Topics Covered:

- Variables & Naming Conventions
- Primitive Data Types
- Data Type Ranges
- Scope & Global Variables
- sizeof Operator
- static Variables
- const Keyword
- auto Keyword
- Literals
- Type Conversion
- Practice Problems



Module 3: Input & Output Operations

Master user input, formatted output, buffering techniques, and stream manipulation.

Topics Covered:

- cin & cout
- Input Buffering
- Escape Sequences
- I/O Manipulators
- Floating Point Formatting
- Practice Problems

Module 4: Operators

Understand different operators used for arithmetic, logical operations, comparisons, assignments, and bit manipulation.

Topics Covered:

- Arithmetic Operators
- Relational Operators
- Logical Operators
- Assignment Operators
- Operator Precedence & Associativity
- Bitwise Operators
- Number-based Programming Problems
- Practice Problems

Module 5: Decision Making & Control Flow

Learn to control program execution using conditional statements and solve real-world logical problems.



Topics Covered:

- if-else Statements
- Nested Conditions
- switch Statement
- Ternary Operator
- Even/Odd Problems
- Largest of Three Numbers
- Leap Year
- Calculator Program
- Practice Problems

Module 6: Functions

Understand modular programming using functions and learn best practices for reusable code.

Topics Covered:

- Function Fundamentals
- Function Declaration & Definition
- Function Execution Flow
- Default Arguments
- Inline Functions
- Applications of Functions
- Practice Problems

Module 7: Loops & Pattern Programming

Master iterative programming using loops while solving mathematical and pattern-based coding challenges.

Topics Covered:



- while Loop
- for Loop
- do-while Loop
- break & continue
- Nested Loops
- Pattern Printing
- Fibonacci Series
- GCD & LCM
- Practice Problems

Module 8: References & Memory Concepts

Understand references and parameter passing mechanisms for efficient programming.

Topics Covered:

- References
- Function Parameters
- Range-Based Loops
- Const References
- R-value References
- Practice Problems

Module 9: Arrays & Multi-Dimensional Arrays

Learn array manipulation techniques and solve common array-based programming problems.

Topics Covered:

- Array Fundamentals
- Initialization & Traversal
- Array Operations
- Sorted Array Check



- Sum & Average
- 2D Arrays
- Passing Arrays to Functions
- Practice Problems

Module 10: Pointers & Dynamic Memory

Gain a deep understanding of memory management and pointer-based programming.

Topics Covered:

- Pointer Basics
- Address & Dereference Operators
- Pointer Arithmetic
- Arrays & Pointers
- Function Pointers
- Dynamic Memory Allocation
- nullptr & NULL
- Smart Pointers
- unique_ptr
- shared_ptr
- weak_ptr
- Practice Problems

Module 11: Strings

Work efficiently with both C-style strings and the C++ String class.

Topics Covered:

- C-Style Strings
- std::string
- String Operations



- String Traversal
- String Comparison
- Reading Strings with Spaces
- Binary & Decimal Conversion
- String-based Coding Problems
- Practice Problems

Module 12: Structures & Unions

Learn user-defined data types for organizing complex data efficiently.

Topics Covered:

- Structures
- Structure Arrays & Pointers
- Alignment & Padding
- Unions
- Complex Number Programs
- Practice Problems

Module 13: Object-Oriented Programming

Master object-oriented programming concepts used in modern software development.

Topics Covered:

- OOP Fundamentals
- Classes & Objects
- Constructors & Destructors
- this Pointer
- Access Specifiers
- Inheritance
- Multiple Inheritance
- Virtual Functions



- Friend Functions
- Operator Overloading
- Practice Problems

Module 14: Templates & Standard Template Library (STL)

Learn generic programming techniques and leverage the power of the C++ STL.

Topics Covered:

- Function Templates
- Class Templates
- Introduction to STL
- STL Applications
- Practice Problems

Module 15: Vectors, Iterators & Pairs

Master dynamic containers and commonly used STL utilities.

Topics Covered:

- Vectors
- Vector Operations
- Internal Working of Vectors
- Iterators
- Pairs
- Vector of Pairs
- Sorting Techniques
- Real-world Coding Problems
- Practice Problems



Module 16: Lambda Expressions

Write concise and modern C++ code using lambda expressions.

Topics Covered:

- Lambda Basics
- Capture Lists
- Advanced Lambda Examples
- Practice Problems

Module 17: Exception Handling

Develop robust applications by implementing proper error handling techniques.

Topics Covered:

- Exception Handling Fundamentals
- try, throw & catch
- Stack Unwinding
- User-defined Exceptions
- Practice Problems

Module 18: File Handling

Learn to perform file operations for persistent data storage and retrieval.

Topics Covered:

- File Streams
- Reading Files
- Writing Files
- File Management Best Practices