





**Syllabus & Curriculum  
for Certificate Course In  
C++**

## 1. General Description

This course provides an introduction to computer programming concepts using the C++ programming language. The course does not assume knowledge in C Language. The course emphasis is on the object orientated facilities of C++ and how they can be used to create structured, modular and re-usable code.

## 2. General Eligibility

This course is meant for an absolute beginner looking to be a computer programmer. The participant should have general familiarity with their operating system environment and also the ability to create and edit text files and manipulate directories.

While this course does not assume that participants have any programming language experience, some prior exposure to other structural or object-oriented language is beneficial.

## 3. Hardware & Software required for Teaching

### Hardware

- A system with a 400MHz or faster processor with not less than 150 MB disk space is recommended with Windows or Linux OS

### Software

- Any standard C++ compiler suitable for the OS

## 4. Course objectives and content

Upon completion of this course participant will be able to

- ◇ Understand the fundamental Object Oriented Concepts
- ◇ Solve simple and moderately complex problems using C++
- ◇ Understand the implementation of various data structures and algorithms
- ◇ Understand and modify Open Source software written in C and C++

## 5. Suggested reference material

### Books

Let us C, Yashawant P Kanetkar, BPB, NewDelhi

Let us C++, Yashawant P Kanetkar, BPB, NewDelhi

Object Oriented Programming with C++, E. Balaguruswamy, Tata McGrawHill

Waite Group's Object Oriented Programming in C++, Robert Lafore, Galgotia

## 6. Examination /Evaluation scheme

The evaluation will be done based on one theory Examination of 2 hours and practical examination of 3 hours duration.

- a. Theory Examination: The examination will be of 2 hours duration and will contain 100 objective type questions with maximum marks of 100.
- b. Practical Examination: One Practical examination of 3 hours duration will be conducted on the modules described in the curriculum. The maximum marks will be 100.

## 7. Suggested duration for theory, tutorials, case study & practical sessions

MODULE	TOPIC	THEORY (hours)	LAB (hours)
1	Introduction to C++	2	2
2	Object-oriented programming concepts	2	2
3	The Basics of C++	4	6
4	Working with Operators and Expressions	4	6
5	Controlling the Program flow	4	8
6	Using Functions/Procedures	6	12
7	Pointers and Arrays	8	10
8	Binding data and functions	6	10
9	Function and Operator Overloading	6	8
10	Reusing classes	6	6
11	Virtual functions and Polymorphism	6	6
12	Templates, Exception Handling	4	6
<i>Total Duration</i>		58 hours	82 hours
<i>Project</i>		20 hours	
<b>Total</b>		160 hours	

## Detailed Syllabus

### Contents

1. Introduction to C++
2. Object-oriented programming concepts
3. The Basics of C++
4. Working with Operators and Expressions
5. Controlling the Program flow
6. Using Functions/Procedures
7. Pointers and Arrays
8. Binding data and functions
9. Function and Operator Overloading
10. Reusing classes
11. Virtual functions and Polymorphism
12. Templates, Exception Handling

## 1. Introduction to C++

- Starting with C++
- How C++ evolved from C?
- Features of C++
- Procedure-oriented programming
- OOP vs. procedure-oriented programming
- The basic anatomy of a C++ program
- Starting with a simple “Hello World” program
- Compiling, linking and running a C++ program

## 2. Object-Oriented Programming Concepts

- Abstraction
- Inheritance
- Polymorphism
- Data Binding
- Encapsulation
- Classes, subclasses and Objects

## 3. The Basics of C++

- Base Data Types and sizes
- User-defined Data Types
- Variable Declarations, Variable Names
- Dynamic initialization of variables
- Constants and its types
  - Character Constants
  - String Constants
- Standard input and standard output
  - Formatted input – cin
  - Formatted output – cout
  - Use of << and >> operators

## 4. Working with Operators and Expressions

- Operators
  - Arithmetic Operators
  - Relational Operators
  - Assignment Operator
  - Logical Operators
  - Increment and Decrement Operators (++ and --)
  - 'Operate-Assign' Operators (+=, \*=, ...)

- Expressions
  - What are Expressions?
  - Operator Precedence
  - Precedence and Order of Evaluation
  - Conditional Expression
  - Casting and type conversion

## **5. Controlling the Program Flow**

- Decision control
  - if
  - if – else
  - if - else if
- Loop Control
  - while
  - do – while
  - for
  - break
  - continue
- Case Control
  - switch
  - goto

## **6. Using Functions/Procedures**

- Why Functions?
- Anatomy of a Function
- Returning values from functions
- Arguments Passed by Value
- Passing Addresses of Arguments
- Concept of variable scope and scope rules
- Static and automatic variables
- Global variables

## **7. Pointers and Arrays**

- Pointers
  - What is a Pointer?
  - Pointer Initialization
  - Pointer Operators
  - The & Operator
  - Pointer Arithmetic
  - Functions and pointers
- Understanding Arrays
  - Arrays
  - Initializing Arrays
  - Passing Arrays to Functions

- Pointers and Arrays
- Pointer to an Array
- Array of pointers
- Strings
  - String I/O
  - cin and cout member functions
  - Standard C String functions
  - Arrays of Strings

## 8. Binding data and functions

- Concept of a class
- Defining a class
- Creating an object
- Object Scope
- Data Abstraction
- Enforcing Data Encapsulation
- 'this' Pointer
- Dynamic creation of objects
- Constructors and Destructors
  - The Default Constructor
  - The Destructor
  - Parameterized Constructors
  - Copy constructor
- Defining member functions
  - Methods and access modifiers
- Accessing class data and methods
- Friend class and friendly functions
- Returning objects
- Arrays of Objects

## 9. Function and Operator Overloading

- Function Overloading
  - Using overloaded functions
  - Rules for overloading
- Operator overloading and its uses
  - Overloading unary and binary operators
  - Overloading the assignment operator
  - Overloading the << Operator
  - Overloading the increment and decrement operator
- Dealing with strings using operators
- Converting data types
  - Basic to class type
  - Class to basic type
  - Class to another class type

## **10. Reusing classes**

- Inheritance-Base and Derived classes
- Inheritance types
- Scope Resolution operator
- Access Modifiers
- Access and Inheritance
- Constructors and Inheritance
- Multiple & Multilevel Inheritance
- Calling base class constructor
- Overriding base class members

## **11. Virtual functions and Polymorphism**

- Virtual & non-virtual Overriding
- Virtual functions
- Rules for virtual functions
- Pure virtual functions
- Static and Dynamic Binding
- Virtual base classes

## **12. Templates, Exception Handling**

- Templates
- Function templates
- Class templates
- Exception handling



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