

## Teaching Guidelines for **C++ Programming**

### PG-DAC September 2023

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**Duration:** 72 hours (32 theory hours + 32 lab hours + 8 revision/practice hours )

**Objective:** To learn object oriented programming using C++

**Prerequisites:** Knowledge of computer fundamentals

**Evaluation:** 100 marks

**Weightage:** CCEE – 40%, Lab exam – 40%, Internals – 20%

#### **Text Book:**

- C++ Primer Plus by Stephen Prata /Pearson

#### **References:**

- Thinking in C++ by Bruce Eckel
- The C++ Programming Language, Bjarne Stroustrup

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(Note: Each Session is of 2 hours)

#### **Sessions 1: Getting Started**

##### **Lecture:**

- Installation and Setup development environment
- The need of C++
- Features of C++
- C++ versus C
- History of C++
- Writing your first C++ program

##### **Lab:**

Write different C++ programs to

- Print Hello World
- Add two numbers/binary numbers/characters
- Calculate compound interest
- Calculate power of a number
- Swap two numbers
- Calculate area of rectangle

#### **Session 2: Beginning with C++**

##### **Lecture:**

- C++Program structure
- Introduction of advanced C++ concepts and feature of C++ 17
- C++ Tokens
- Initialization
- Static Members
- Constant Members
- Expressions

##### **Operators**

- Arithmetic Operator
- Relational Operator

- Logical Operator
- Unary Operator
- Ternary Operator
- Assignment Operator

**Lab:**

- Write a Student class and use it in your program. Store the data of 10 students and display the sorted data according to their roll numbers, dates of birth, and total marks.
- Implement all C++ operators
- Declare members and implement in your programs.

**Session 3: Conditional and Looping Statements**

**Lecture:**

- If, else if, switch
- for loop
- while loop
- do while loop
- Jump statement (break, continue& return keyword)
- Arrays
- Declaration and initialization of an array
- 1-D and 2-D arrays

**Lab:**

- Implement all control structures through your program
- Implement a program which accepts command line arguments from main function.

**Session 4: Functions in C++**

**Lecture**

- Different forms of functions
- Function prototyping
- Call by Reference
- Inline Functions
- Math library functions etc.

**Lab:**

- Implement functions through your program
- Declare function and call it by reference and note the observations
- Implement Inline functions in your program

**Sessions 5 & 6: Memory Management and Pointers**

**Lecture**

- Introduction to memory management in C++
- Pointers in C++
- Arrays using pointers
- Enumeration
- Typedef
- Using New operator
- Class pointer
- this pointer
- Comparison of new over malloc, calloc and realloc, etc.
- Memory freeing using Delete operator

**Lab:**

- Assignments using pointers, arrays of pointers
- Assignments on passing pointers in functions
- Using pointers, write your own functions for the following:
  - o String comparison
  - o String concatenate

- o String copy
- o String length

**Note:** Do not include <string.h> in your program and implement Delete operator in your program.

## Session 7: OOP Concepts

### Lecture

- Discussion on object oriented concepts
- Classes and Objects, Access Specifiers, Overloading, Inheritance, Polymorphism
- Constructors and Destructors
- Namespaces

### Lab:

- Write a student class and use it in your program. Store the data of 10 students and display the sorted data according to their roll numbers, dates of birth, and total marks.

## Session 8: Constructor and Destructor

### Lecture

- Constructors
- Parameterized constructors
- Multiple constructors in class
- Dynamic initialization of objects
- Copy Constructors
- Destructors

### Lab:

- Implement constructor and destructors through your program
- Write a program to implement inner class in C++

## Session 9: Inheritance – extending class

### Lecture

- Types of inheritance
- Single inheritance
- Multiple inheritance
- Multilevel inheritance
- Hierarchical inheritance
- Hybrid inheritance, etc.
- Virtual base class
- Constructors in derived class

### Lab:

- Design a hierarchy of computer printers. Use multiple inheritance in your hierarchy. Also use friend functions and classes in your program.

## Session 10: Polymorphism

### Lecture

- Types of Polymorphism
- Overloading functions
- Overloading Operators
- Friend functions
- Constant functions

### Lab:

- Write Date and Time classes that allow you to add, subtract, read and print simple dates in dd/mm/yyyy and time in hh:mm:ss formats. Use function overloading in your program.
- Assignments to overload =, ==, +, ++, --, <<, >> and [ ]operators.

## Session 11: Virtual Functions and Abstract Class

### Lecture

- Run Time Polymorphism
- Virtual Functions and Pure virtual functions
- dynamic\_cast, static\_cast, const\_cast, reinterpret\_cast
- Interfaces
- Abstract class

### Lab:

- Implement Abstract classes in your program
- Using virtual and pure virtual functions implement hierarchy of computer printers
- Implement diamond problem with real life example

## Session 12: Exception Handling

### Lecture

- Exception Handling Introduction
- Exception handling – throwing, catching, re-throwing an exception
- Specifying exceptions etc.

### Lab:

- Implement exceptions and do proper management through your program
- Implement Custom exception class

## Session 13: Managing Console I/O Operations

### Lecture

- Introduction
- C++ streams
- C++ stream classes
- Unformatted I/O operations
- Formatted I/O operations
- Managing output with manipulators

### Lab:

- Implement console I/O operations through your program.

## Session 14: File Handling in C++

### Lecture

- Definition of file
- File handling in C++
- Doing read, write operation in files

### Lab:

- Assignments on files doing different operations

## Session 15: Templates

### Lecture

- Introduction to Templates
- Function Templates
- Class Templates

### Lab:

- Assignments on templates

## Session 16: STL and RTTI

### Lecture

- Introduction to C++ Standard Library
- Introduction to RTTI (Run-Time Type Information) in C++

**Lab:**

- Assignments on STL Library