B.Sc. Part – II Computer Science (Optional) (Semester – III)
Course Code: DSC-C12 Computer Science Paper –VI
Course Title: Object Oriented Programming Using C++
Total Contact Hours: 36 Hrs (45 Lectures of 48 Min.)
Teaching Scheme: Theory – 03 Lect. / Week

Credits: 02 **Total Marks: 50**

Course Outcomes:

Upon successful completion of this course, students will be able to

1. understand the principles of web design.
2. understand how C++ improves C with object oriented features
3. learn syntax and semantics of C++ programming language
4. learn how to write inline functions for efficiency and performance.
5. learn how to overload functions and operators in C++.
6. learn how to design C++ classes for code reuse.
7. learn how inheritance promotes code reuse in C++.
8. learn how inheritance and virtual functions implement dynamic binding with polymorphism.

Unit – 1: Introduction to C++ **12 Hrs.**

1.1 Object oriented programming Concepts: Object, class, Encapsulation, Abstraction, Polymorphism, Inheritance
1.2 Procedure Oriented programming versus Object oriented programming
1.3 Basic C++ program:
  1.3.1 Header file, using namespace std, main(), input:>> extraction using cin and output: << insertion using cout operator
  1.3.2 C++ Tokens:
    1.3.2.1 Keywords - bool, class, delete, namespace, friend
    1.3.2.2 Identifiers, Constants, Strings
1.4 Structure of C++ Program
1.5 Benefits of C++ over C Language
1.6 C++ Data Types:
  1.6.1 Built-in / Fundamental: void, char, int, float, double
  1.6.2 User defined- struct, union, enum, class
  1.6.3 Derived- array, function, pointer, reference

1.7 Variable:
  1.7.1 Definition, Declaration, Initialisation
  1.7.2 Dynamic Initialisation and reference variables
1.8 Operators in C++:
  1.8.1 DMA operators: new, delete
  1.8.2 Scope resolution operator::
  1.8.3 Manipulators: setw, endl, setprecision
1.9 Function:
  1.9.1 Function Call: by value, by pointer, by reference, return by reference
  1.9.2 Default arguments, const arguments
  1.9.3 Inline function
  1.9.4 Function overloading

Unit – 2: Object Oriented Programming **24 Hrs.**

2.1 Class:
- 2.1.1 Difference between struct and class
- 2.1.2 Class specification: class declaration, class definition, adding data membersand member functions
- 2.1.3 Access modifiers/ visibility labels – private, public, protected members
- 2.1.4 Member function definition - inside the class and outside the class
- 2.1.5 Object definition and memory allocation of object
- 2.1.6 Use of this pointer
- 2.1.7 Static members - data members and member function
- 2.1.8 Scope of a variable - local, local to class, global

2.2 Friend function and friend class:
- 2.2.1 Characteristics of friend function, Declaration and Definition of friend function
- 2.2.2 Use of friend class

2.3 Constructor and Destructor:
- 2.3.1 Constructor - Definition, Characteristics, features
- 2.3.2 Types - Default, parameterized, copy
- 2.3.3 Destructor- Definition, Need of destructor

2.4 Operator overloading:
- 2.4.1 Concept, Rules
- 2.4.2 Definition of operator function:
  - 2.4.2.1 Using member function to overload unary and binary operators
    Example: unary operator --, ++ and Binary-Arithmetic Operator
  - 2.4.2.2 Using friend function to overload unary and binary operators
    Example: unary operator --, ++ and Binary-Arithmetic Operator

2.5 Inheritance:
- 2.5.1 Concept, Definition
- 2.5.2 Types: single, multilevel, multiple, hierarchical, hybrid
- 2.5.3 Defining derived class
- 2.5.4 Introducing protected members, visibility of derived members
- 2.5.5 Diamond problem with hybrid inheritance -virtual inheritance and virtual base class

2.6 Polymorphism:
- 2.6.1 Concept, Definition
- 2.6.2 Types: Compile time/early binding/static binding and run time/ late binding / dynamic binding
- 2.6.3 Pointer to object
- 2.6.4 Virtual and pure virtual functions -abstract class, rules for virtual functions

Reference Books

1. Object - Oriented Programming in C++ by Rajesh K. Shukla - Wiley India Pvt. Ltd
2. Object Oriented Programming Using C++ by Poonam Ponde
3. Object-Oriented Programming with C++ by E Balagurusamy - McGraw Hill India
4. Mastering C++ by K. R. Venugopal - McGraw Hill Higher Education
5. C++ Programming by D. Ravichandran
6. A Tour of C++ (2nd Edition) - Bjarne Stroustrup.
7. The C++ Programming Language (4th Edition) - Bjarne Stroustrup.