CS-15: C++ and Object Oriented Programming

Objectives:

- To provide OOP concepts, Input / Output data management, arrays in C++, functions, classes, objects, pointers and much more.
- Object-Oriented features, which allow the programmer to create objects within the code.

Prerequisites:

- Concepts of OOPs and their implementation.

Unit No.	Topic	Detail
1	**Principles of Object Oriented Programming Tokens, and Control Statements**	• Procedure – oriented programming • Object oriented programming paradigm • Basic concepts of object-oriented Programming • Benefits of object-oriented programming • Application of object-oriented programming • What is C++? • Application of C++ • Input/output operators • Structure of C++ program • Introduction of namespace • Tokens: keywords, identifiers, basic data types, user- defined types, derived data types, symbolic constants, type compatibility, declaration of variables, dynamic initialization of variables, reference variables • Operators in C++: ▪ scope resolution operator, ▪ member referencing operator, ▪ memory management operator, ▪ manipulators • Control structures ▪ Conditional control structure: simple if, if…else , nested if else, switch etc. ▪ Looping control structure: for, while , do…while
	Functions in C++	• The main function • Call by reference

		• Return by reference • Inline function • Default arguments • Const arguments • Functions overloading
2	**Classes and Objects, Constructor and Destructor**	• C structures revisited • Specifying a class • Local Classes • Nested Classes • Defining member functions, nesting of Member functions, private member function, making outside function inline • Arrays within a class • Memory allocation for objects • Static data member • Static member functions • Arrays of objects • Objects as function arguments • Friendly functions • Returning objects • Const member function • Pointer to members
		• Characteristics of constructor • Explicit constructor • Parameterized constructor • Multiple constructor in a class • Constructor with default argument • Copy constructor • Dynamic initialization of objects • Constructing two dimensional array • Dynamic constructor • MIL, Advantage of MIL • Destructors
3	**Operator Overloading and type conversion, Inheritance**	• Concept of operator overloading • Overloading unary and binary operators • Overloading of operators using friend Function • Manipulation of string using operators • Rules for operator overloading • Type conversions • Comparison of different method of conversion • Defining derived classes • Types of inheritance (Single, Multiple, Multi-level, Hierarchical, Hybrid) • Virtual base class & Abstract class

		• Constructors in derived class • Application of Constructor and Destructor in inheritance • Containership, Inheritance V/s Containership
4	**Pointer, Virtual Functions and Polymorphism, RTTI Console I/O Operations**	• Pointer to Object • Pointer to derived class • this Pointer • Rules for virtual function • Virtual function and pure virtual function • Run Time Type Identification (RTTI) • C++ Streams • C++ Stream Classes • Unformatted and formatted I/O operations • Use of Manipulators.

5	**Working with Files, Exception Handling, Introduction to Template STL**	• File Stream Classes
		• Opening and closing a file
		• Error Handling
		• File Modes
		• File Pointers
		• Sequential I/O operations
		• Updating a file (Random access)
		• Command Line Arguments
		• Overview of Exception Handling
		  ◦ Need for Exception Handling
		  ◦ various components of exception handling
		• Introduction to templates
		  ◦ Class templates and Function templates
		  ◦ Member function templates
		  ◦ Overloading of template function
		  ◦ Non-type Template argument
		• Introduction to STL
		  ◦ Overview of iterators, containers

Seminar - 5 Lectures
Expert Talk - 5 Lectures
Test - 5 Lectures

Total Lectures 60 + 15 = 75

Reference Books:

- Complete Reference C++ by Herbert Schildt McGraw Hill Publications
- Computer Science- A Structured approach using C++ by Forouzan, Gilburg, THOMSON
- Object Oriented Programming in C++ - E.Balagurusamy, BPB
- Object Oriented programming in C++ by Robert Lafore, Pearson Education
- Mastering C++ - Venugopal
- The C++ Programming Language by Bjarne Stroustrup, Pearson Education

- Object Oriented Programmin in C++ - Robaret Laphore
- Let us C++ - Yashvant Kanitkar, BPB

Course Outcomes:

- Understand the concept and underlying principles of Object-Oriented Programming.
- Understand implementation issues related to object-oriented techniques.
- Apply the techniques of object-oriented programming to solve real problems
- Analyze, apply and write programs that make appropriate use of object-oriented functionality such as classes, overloading and inheritance
- Implement the file handling techniques for back-end storage problems solutions