

Object Oriented Programming

Course Objective:

To familiarize students with the C++ programming language and use the language to develop pure object oriented programs.

1.Introduction to Object Oriented Programming(3 hours)

- a.Issues with Procedure Oriented Programming
- b.Basic of Object Oriented Programming (OOP)
- c.Procedure Oriented versus Object Oriented Programming
- d.Concept of Object Oriented Programming
 - i.Object
 - ii.Class
 - iii.Abstraction
 - iv.Encapsulation
 - v.Inheritance
 - vi.Polymorphism
- e.Example of Some Object Oriented Languages
- f.Advantages and Disadvantages of OOP

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2.Introduction to C++(2 hours)

- a.The Need of C++
- b.Features of C++
- c.C++ Versus C
- d.History of C++

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3.C++ Language Constructs(6 hours)

- a.C++ Program Structure
- b.Character Set and Tokens
 - i.Keywords
 - ii.Identifiers
 - iii.Literals
 - iv.Operators and Punctuators
- c.Variable Declaration and Expression
- d.Statements
- e.Data Type
- f.Type Conversion and Promotion Rules
- g.Preprocessor Directives
- h.Namespace
 - i.User Defined Constant
 - j.Input/Output Streams and Manipulators
- k.Dynamic Memory Allocation with new and delete
- l.Condition and Looping
- m.Functions
 - i.Function Syntax
 - ii.Function Overloading
 - iii.Inline Functions
 - iv.Default Argument
 - v.Pass by Reference
 - vi.Return by Reference
- n.Array, Pointer and String
- o.Structure, Union and Enumeration

4. Objects and Classes(6 hours)

- a.C++ Classes
- b.Access Specifiers
- c.Objects and the Member Access
- d.Defining Member Function
- e.Constructor
 - i.Default Constructor
 - ii.Parameterized Constructor
 - iii.Copy Constructor
- f.Destructors
- g.Object as Function Arguments and Return Type
- h.Array of Objects
 - i.Pointer to Objects and Member Access
 - j.Dynamic Memory Allocation for Objects and Object Array
- k.Pointer
 - l.Static Data Member and Static Function
- m.Constant Member Functions and Constant Objects
- n.Friend Function and Friend Classes

5. Operator Overloading(5 hours)

- a.Overloadable Operators
- b.Syntax of Operator Overloading
- c.Rules of Operator Overloading
- d.Unary Operator Overloading
- e.Binary Operator Overloading
- f.Operator Overloading with Member and Non Member Functions
- g.Data Conversion: Basic–User Defined and User Defined–User Defined
- h.Explicit Constructors

6. Inheritance(5 hours)

- a.Base and Derived Class
- b.protected Access Specifier
- c.Derived Class Declaration
- d.Member Function Overriding
- e.Forms of Inheritance: Single, Multiple, Multilevel, Hierarchical, Hybrid, Multipath
- f.Multipath Inheritance and Virtual Base Class
- g.Constructor Invocation in Single and Multiple Inheritances
- h.Destructor in Single and Multiple Inheritances

7. Polymorphism and Dynamic Binding(4 hours)

- a.Need of Virtual Function
- b.Pointer to Derived Class
- c.Definition of Virtual Functions
- d.Array of Pointers to Base Class
- e.Pure Virtual functions and Abstract Class
- f.Virtual Destructor
- g.Reinterpret_cast Operator
- h.Run-Time Type Information
 - i.Dynamic_cast Operator
 - ii.Type_id Operator

8. Stream Computation for Console and File Input/Output(5 hours)
- a.Stream Class Hierarchy for Console Input/Output
 - b.Testing Stream Errors
 - c.Unformatted Input/Output
 - d.Formatted Input/Output with IOS Member functions and Flags
 - e.Formatting with Manipulators
 - f.Stream Operator Overloading
 - g.File Input/output with Streams
 - h.File Stream Class Hierarchy
 - i.Opening and Closing files
 - j.Read/Write from File
 - k.File Access Pointers and their Manipulators
 - l.Sequential and Random Access to File
 - m.Testing Errors during File Operations

9. Templates(5 hours)
- a.Function Template
 - b.Overloading Function Template
 - i.Overloading with Functions
 - ii.Overloading with other Template
 - c.Class Template
 - i.Function Definition of Class Template
 - ii.Non-Template Type Arguments
 - iii.Default Arguments with Class Template
 - d.Derived Class Template
 - e.Introduction to Standard Template Library
 - i.Containers
 - ii.Algorithms
 - iii.Iterators

10. Exception Handling(4 hours)
- a.Error Handling
 - b.Exception Handling Constructs (try, catch, throw)
 - c.Advantage over Conventional Error Handling
 - d.Multiple Exception Handling
 - e.Rethrowing Exception
 - f.Catching All Exceptions
 - g.Exception with Arguments
 - h.Exceptions Specification for Function
 - i.Handling Uncaught and Unexpected Exceptions

Practical:

There will be about 12 lab exercises covering the course. At the end of the course students must complete a programming project on object oriented programming with C++.

References :

1. Robert Lafore, "Object Oriented Programming in C++", 4th Edition 2002, Sams Publication
2. Daya Sagar Baral and Diwakar Baral, "The Secrets of Object Oriented Programming in C++", 1st Edition 2010, Bhundipuran Prakasan
3. Harvey M. Deitel and Paul J. Deitel, "C++ How to Program", 3rd Edition 2001, Pearson Education Inc.
4. D. S. Malik, "C++ Programming", 3rd Edition 2007, Thomson Course Technology
5. Herbert Schildt, "C++: The Complete Reference", 4th Edition 2003, Tata McGraw Hill