

**UNIVERSITY OF MADRAS**  
**BACHELOR OF COMPUTER APPLICATIONS (BCA)**  
**DEGREE PROGRAMME**  
**SYLLABUS WITH EFFECT FROM 2023-2024**

**Year: I**

**Semester: II**

<b>Object Oriented Programming using C++ Practical</b> Common for B.C.A. , B.Sc.-SA		<b>120C21</b>
<b>Credits 5</b>	<b>Lecture Hours:5 per week</b>	
<p>Learning Objectives: (for teachers: what they have to do in the class/lab/field)</p> <ul style="list-style-type: none"> <li>• Design classes for the given problems.</li> <li>• Write programs in C++.</li> <li>• Code, debug and execute a C++ program to solve the given problems using an IDE.</li> </ul>		
<p>Course Outcomes: (for students: To know what they are going to learn)</p> <p>CO1: Design and create classes. Implement Stream I/O as appropriate.</p> <p>CO2: Design appropriate data members and member functions.</p> <p>CO3: Implement functions, friend functions, static members, constructors and compile-time polymorphism.</p> <p>CO4: Implement inheritance, run-time polymorphism and destructors.</p> <p>CO5: Implement templates and exceptions. Use STL class library. Implement File I/O.</p>		

**List of Programs**

1. Write a class to represent a complex number which has member functions to do the following
  - a. Set and show the value of the complex number
  - b. Add, subtract and multiply two complex numbers
  - c. Multiplying the complex number with a scalar value
2. Write a Point class that represents a 2-d point in a plane. Write member functions to
  - a. Set and show the value of a point
  - b. Find the distance between two points
  - c. Check whether two points are equal or not
3. Design and implement a class that represents a Harmonic Progression (HP).  
 Implement functions to do the following:
  - a. Generate the HP up to a specified number of terms
  - b. Calculate the sum of the HP to n terms and to infinity
  - c. Generate the nth term of the HP
  - d. Generate the corresponding Arithmetic Progression. (Design and implement a class that encapsulates an AP, and allow the HP class to use its facilities by implementing friend functions.)
4. Design and implement a class to represent a Solid object.
  - a. Apart from data members to represent dimensions, use a data member to specify the type of solid.
  - b. Use functions to calculate volume and surface area for different solids.
5. Design a class representing time in hh:mm:ss. Write functions to
  - a. Set and show the time
  - b. Find the difference between two time objects
  - c. Adding a given duration to a time
  - d. Conversion of the time object to seconds

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6. Design a 3x3 matrix class and demonstrate the following:
  - a. Addition and multiplication of two matrices using operator overloading
  - b. Maintaining a count of the number of matrix object created
7. Design a class called cString to represent a string data type. Create a data member in the class to represent a string using an array of size 100. Write the following functionality as member functions:
  - a. Copy Constructor
  - b. Concatenate two strings
  - c. Find the length of the string
  - d. Reversing a string
  - e. Comparing two strings
8. Design a class called cString to represent a string data type. Create a data member in the class to represent a string whose size is dynamically allocated. Write the following as member functions:
  - a. Copy Constructor
  - b. Destructor
  - c. Concatenate two strings
  - d. Find the length of the string
  - e. Reversing a string
  - f. Comparing two strings
9. Create a class to represent a 2-d shape and derive classes to represent a triangle, rectangle and circle. Write a program using run-time polymorphism to compute the area of the figures.
10. Define a class template representing a single-dimensional array. Implement a function to sort the array elements. Include a mechanism to detect and throw an exception for array-bound violations.
11. Demonstrate the use of the vector STL container.
12. Implement a telephone directory using files

Learning Resources: