



Marwadi University

Bachelor of Computer Application

Semester III

Subject Code : 05BC0304

Subject Name: Object Oriented Concepts & Programming using C++ (OOCB)
(Lab Practice Experiments)

Learning Objectives:

Understanding the object oriented concepts and doing efficient programming using C++ for computers as well as different hand held devices like mobile phones, networking devices like routers, etc. is the recent need from IT and IT enabled industry. The lab exercise course enables the student to master such skills of object oriented programming using C++ and satisfy the requirements of industry. Aim of the course is to enable students to

1. Clear understanding of difference between procedural and object oriented programming.
2. Understand and learn C++ as a programming language, its various features.
3. Implement Object Oriented Concepts, application development using C++ and usage in real life world

Prerequisites:

1. Knowledge of programming in C language
2. Programming concepts including algorithms, flow chart, and logic building

Practical List: (The list of experiments listed here is tentative based on the theory syllabus. Subject faculty may explore more experiments.)

- (1) Write a program which illustrates the use of scope resolution operator.
- (2) Define a class of employees. It should contain employee number, name, address, and number of dependents for the employee. It should also contain function to insert and display information about employee. Define an array of 20 employees. Now write a simple for loop to read information about the employee. At the end, display all employees with more than two dependents.
- (3) Define a class to represent a bank account. Include the following members :

Data Members	Member Functions
Name of Depositor	To assign initial values
Account Number	To deposit the amount
Type of Account	To withdraw an amount after checking the balance amount in account
	To display name and balance

Write C++ program to handle 10 customers.

- (4) Demonstrate the use of static variables in a class by using it to count the number of objects created in the program



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(5) Create a class **Stud** that has **r_no**, **name**, **marks[5]** as data member and **void getinfo(void)** , **void compute(void)** – to compute total marks and percentages and **void putinfo(void)** - to display data members and total marks and average, as member function. Call compute function from putinfo to display total marks and percentages.

(6) Define a class **employee** with the following data members as private: **Empno**, **ename**, **basic**, **hra**, **da**, **salary** and a private member function Called, **float calculate(void)** - to calculate net salary.

Public member functions as bellow :

Void getinfo(void) – A function to accept values for empno, name, basic, hra, da and invoke calculate() function to calculate net salary.

Void displayinfo(void) – A function to display all the data members on the screen. Write an appropriate main() function for it.

(7) Make a program of adding two complex numbers. Define one class named **complex** with two private data members.

1. **real** – for real part of complex number

2. **image**– for imaginary part of complex number

Define three member functions for complex class

1. **void getnumber(void)** – to get complex number
2. **void putnumber(void)** – to display complex number
3. **void sum(complex,complex)** – to add to complex number

(8) Write appropriate main() function for this program. Make a program using class for creating stack. Define a class called **createstack** with two private data members as **int stack[SIZE]** and **int tos**. Define the SIZE of stack with **#define** statement.

Define three public member functions

- **void init(void)** – to initialize tos as 0.
- **void push(int)** – to push
- the value into the stack.

int pop(void) – to pop the value from the stack. Write an appropriate main () to create two stacks.

(9) Write a program that calculates the value of m raised to power n for both int and double data types. (Use the concept of function overloading)

(10) Write a class to represent a vector. Include member functions to perform the following



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1. To create the vector
 2. To modify the value of a given element
 3. To multiply by a scalar value
 4. To display the vector in the form(10,20,30...)
- (11) Define a class Car. Add data members as Make, Color, Size, and Cost. Write member functions for reading values and printing values of car. Define one more class as CarCollection. CarCollection contains array of cars. CarCollection class should contain member functions as Add, delete, modify and replace. Collection is to be defined as friend of Car class. Use Exception Handling techniques to handle errors.
- (12) Overload all the four arithmetic operators to operate on a vector class and also the overload the * operator to multiply scalar values to the vector class. Overload the >> operator to input a vector and the << operator to display the vector in the form (10,20,.....). Also overload the [] operator to access the individual member of the vector.
Use Dynamic memory allocation to achieve the solution.
Write appropriate constructor and destructor for the class.
- (13) Write a menu driven program that can perform the following functions on strings. (Use overloaded operators where possible). (Do not use predefined string class)
1. Compare two strings for equality (== operator)
 2. Check whether first string is smaller than the second (<= operator)
 3. Copy the string to another
 4. Extract a character from the string (Overload [])
 5. Reverse the string
 6. Concatenate two strings (+ operator)
- (14) Overload subscript operator [] for a array class.
- (15) Overload function call operator () to allow the more common form of double array subscripting. Instead of saying x[row][column] for an array of objects, overload the function call operator to allow the alternate form x(row, column)
- (16) Define a singly linked list class, which is a made up objects of node class. Provide addition, deletion of nodes, with operator overloading.
- (17) Define a matrix class, which allows addition, subtraction, multiplication with another matrix, multiplication with a scalar value, and inverse of a matrix



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(Use operator overloading). Use dynamic constructors and destructors for allocation and de allocation of memory.

- (18) Construct a class distance having member variables int feets and int inches. Design the class to make it possible :
- (i) To convert this class into the basic data type int which will represent the total no. of inches of the class.
 - (ii) To convert a basic data type int to distance class
 - (iii) To convert distance class to length class having member variables int meters and int centimeters

Write a C++ program to test your class.

- (19) Define a class Employees. Also define classes of MaleEmp and FemaleEmp inheriting from that. Define classes Officers, Clerks and peons again inheriting from Employee class. Define an array which contains 10 different types of employees. Define a function ReadDetails() in all above classes. All array elements should be able to be accessed in the same routine irrespective of their type.
- (20) Consider a class network of fig . The class master derives information from both account and admin classes which in turn derived derive information from the class person. Define all the four classes and write a program to create, update and display the information contained in master objects.

Create a base class called shape. Use this class to store two double type values that could be used to compute the area of figures. Derive three specific classes called triangle, rectangle and circle from the base shape. Add to the base class, a member function get_data() to initialize base class data members and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine this function in derived classes to suit their requirements. Using these three classes design a program that will accept dimensions of a triangle or rectangle interactively and store it in one array. After having read all the input display the area of all the figures whose area has been read in the program. Remember the two values given as input will be treated as lengths of two sides in the case of rectangle and as base and height in case of triangle. In case of circle only one value should be accepted which will be taken as the radius and the default value of the next parameter should be 0.

- (21) Write a object oriented program to implement a generic Stack. Incorporate all the possible operation on Stack in the program. Rework stack class so that stack overflows are handled as exceptions.



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(22) ABC publishing company markets both book and audio cassette versions of its work. Create a class called publication that stores the title (a string) and price (type float) of a publication. From this class derive two classes: book, which adds a page count (type int); and tape, which adds playing time in minutes (type float). Write a main program that reads both book and tape information in one array. When the user has finished entering data for all books and tapes, displays the resulting data for all the books and tapes entered. Also count no of book and cassette entries in the array using runtime identification feature of C++.

(23) Write a C++ program that displays a student object read from a file backwards.

(24) Use Time class to provide overloaded. Here the time query is also to be recorded in file. Use C text file to store the query. If a calling function provides expression Time1 - Time2, then operator - function should throw an exception if Time2 is a later time then Time1. Before throwing exception, though, the operator - function should close the file.

Use an Employee Class to write records of employee to a file. Include a menu that will allow the user to select any of the following features

- a. Add a new record.
- b. Modify an existing record.
- c. Retrieve and display an entire record for a given name.
- d. Generate a complete list of all names, addresses and telephone numbers.
- e. End of the computation.

(25) Write a program that returns the size in bytes of a file entered on the command line.

(26) You are the owner of a hardware store and need to keep an inventory that can tell you what different tools you have, how many of each you have in hand, and the cost of each one. Write a program that initializes the random access file "hardware.dat" to one hundred empty records, lets you input data concerning each tool, enable you to list all your tools, and lets you update any information in the file. The tool identification should be the record number. The file must contain following information for each tool

record_no	tool_name	quantity	cost
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(27) A file contains name and phone numbers. Name contains only one word and names and telephone numbers are separated by white spaces. Write a program which will include a menu driven functionality for the above file

- a. Display 2 column output with names left justified and phone numbers right



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justified.

Name	Phone
Ram	56789125
Shyam	34565432
Rahim	23456789
Joseph	67213148

- Determine the telephone number of a person.
- Determine the name if the telephone number is known.
- Update the telephone number.
- Prefix all the telephone numbers by 2.

- (28) Write a program that stores and displays the records of the customer from a file. The following information for account of the customer is to be stored. Account no, account type, name, old balance, new balance, last payment, date of last payment. Also display the current account status by comparing current payment and previous balance. Also calculate the current balance by subtracting the current payment from the previous balance.
- (29) Write a program that swaps each character pair in a text file. For example, if the file contains "1234", then after the program in run, the file will contain "2143".
- (30) Write a program that reads a text file and creates another file that is identical except that sequence of consecutive blank spaces is replaced by single space.
- (31) Use Employee and EmpCollection classes. Employee class contains details about employee and EmpCollection contains collection of employees in form of an array. Provide GetSubordinates friend function which returns an object of EmpCollection class which contains details of subordinates of a manager. The employee object describing manager is to be passed as a parameter. All the information about employees are to be stored in the files EmployeeFile and EmployeeCollectionFile. Next run of the program should read that file and should store final list of Employees and Employee Collections to again the same files.
- (32) Define a class Person. Have data members as name of the person, names of parents of the person, gender, age, and an array containing list of interests. Provide functions FindFather, FindMother, FindUndle and FindAunty functions, all of which returns the object of person class. Provide access using function pointer for all these functions. The program should take all information about persons from a file Person. The answers to all queries should also be stored in separate files.
- (33) Design a manipulator to provide the following output specifications for printing float values



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- a. 15 column width
 - b. Right justified
 - c. 2 digits precision
 - d. Filling unused spaces with +.
 - e. Showing trailing zeros.
- (34)** Create an input manipulator called `skipchar()` that reads and ignores the ten characters from the input stream. Create an output manipulator called `sethex()` that sets output to hexadecimal and turns on the uppercase and showbase flags. Also create an output manipulator called `rest()` that undoes the changes made by `sethex()`. Write a driver program to test the manipulators.
- (35)** Write a C++ program to demonstrate creation of user defined manipulator
- a. unparameterised
 - b. with one parameter
 - c. with two parameters
 - d. with three parameters
- (36)** Write C++ program to test the following
- a. Name spaces in all possible ways
 - b. `Dynamic_cast`, `const_cast`, `reinterpret_cast`
 - c. Run Time Type Identification
 - d. `const` function
 - e. `const` object
 - f. `bool`
 - g. `mutable`
 - h. `explicit`
 - i. pointer to member functions
 - j. Namespace and other new features in C++
- (37)** Write a C++ program to demonstrate use of all the string function provided in inbuilt `String` class of C++.