Savitribai Phule Pune University
Second Year of Computer Engineering (2015 Course)
210248: Object Oriented Programming Lab

Teaching Scheme:	Credit	Examination Scheme:
PR: 02 Hours/Week	01	TW: 25 Marks PR: 50 Marks

Guidelines for Instructor's Manual

The instructor‘s manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- OOP feature/Concept in brief, algorithm, flowchart, test cases, conclusion/analysis. **Program codes with sample output of all performed assignments are to be submitted as softcopy.**

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Practical Examination

Both internal and external examiners should jointly set problem statements. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement. The supplementary and relevant questions may be asked at the time of evaluation to test the student‘s for advanced learning, understanding of the fundamentals, effective and efficient implementation. So encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising start of the student's academics.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. Encourage students for the use coding standards such as appropriate use of Hungarian notation, proper Indentation and comments. Use of open source software is encouraged. Instructor may also assign one real life application in the form of a mini-project. Based on the concepts learned.

Instructor may also set one assignment or mini-project that is suitable to respective branch beyond the scope of syllabus.
Operating System recommended :- 64-bit Open source Linux or its derivative
Programming tools recommended: - Open Source C++ Programming tool like G++/GCC.
First assignment is compulsory. Set of suggested assignment list is provided in 3 groups- A, B, and C. Instructor is suggested to design assignments list by selecting/designing at least **12** suitable assignments from group A, B, and C- **compulsory assignment, 5** from group A, **4** from group B, **3** from group C.

Suggested List of Laboratory Assignments

Compulsory Assignment

1.	Install, Configure 64 bit Linux Operating Systems, study basic architecture, memory system, and learn basic administration.

Group A

2.	Implement a class Complex which represents the Complex Number data type. Implement the following operations: 1. Constructor (including a default constructor which creates the complex number 0+0i). 2. Overloaded **operator+** to add two complex numbers. 3. Overloaded **operator*** to multiply two complex numbers. 4. Overloaded << and >> to print and read Complex Numbers.
3.	Implement a class Quadratic that represents degree two polynomials i.e., polynomials of type ax^2+bx+c. The class will require three data members corresponding to a, b and c. Implement the following operations: 1. A constructor (including a default constructor which creates the 0 polynomial). 2. Overloaded **operator+** to add two polynomials of degree 2. 3. Overloaded << and >> to print and read polynomials. To do this, you will need to decide what you want your input and output format to look like. 4. A function eval that computes the value of a polynomial for a given value of x. 5. A function that computes the two solutions of the equation $ax^2+bx+c=0$.
4.	Implement a class CppArray which is identical to a one-dimensional C++ array (i.e., the index set is a set of consecutive integers starting at 0) except for the following : 1. It performs range checking. 2. It allows one to be assigned to another array through the use of the assignment operator (e.g. cp1= cp2) 3. It supports a function that returns the size of the array. 4. It allows the reading or printing of array through the use of **cout** and **cin**.
5.	Write a C++ program create a calculator for an arithmetic operator (+, -, *, /). The program should take two operands from user and performs the operation on those two operands depending upon the operator entered by user. Use a switch statement to select the operation. Finally, display the result. Some sample interaction with the program might look like this: *Enter first number, operator, second number: 10 / 3* *Answer = 3.333333* *Do another (y/n)? y* *Enter first number, operator, second number: 12 + 100* *Answer = 112* *Do another (y/n)? n*

6.	Develop an object oriented program in C++ to create a database of student information system containing the following information: Name, Roll number, Class, division, Date of Birth, Blood group, Contact address, telephone number, driving license no. etc Construct the database with suitable member functions for initializing and destroying the data viz constructor, default constructor, Copy constructor, destructor, static member functions, friend class, this pointer, inline code and dynamic memory allocation operators-new and delete.
7.	Create a class template to represent a generic vector. Include following member functions: • To create the vector. • To modify the value of a given element • To multiply by a scalar value • To display the vector in the form (10,20,30,…)
8.	Create a class Rational Number (fractions) with the following capabilities: a) Create a constructor that prevents a 0 denominator in a fraction, reduces or simplifies fractions that are not in reduced form and avoids negative denominators. b) Overload the addition, subtraction, multiplication and division operators for this class. c) Overload the relational and equality operators for this class.
9.	Imagine a publishing company which does marketing for book and audiocassette versions. Create a class 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 a playing time in minutes (type float). Write a program that instantiates the book and tape classes, allows user to enter data and displays the data members. If an exception is caught, replace all the data member values with zero values.
10.	Write a function in C++ to count and display the number of lines not starting with alphabet 'A' present in a text file "STORY.TXT". Example: If the file "STORY.TXT" contains the following lines, The roses are red. A girl is playing there. There is a playground. An aeroplane is in the sky. Numbers are not allowed in the password. The function should display the output as 3.
11.	Write C++ Program with base class convert declares two variables, val1 and val2, which hold the initial and converted values, respectively. It also defines the functions getinit( ) and getconv( ), which return the initial value and the converted value. These elements of convert are fixed and applicable to all derived classes that will inherit convert. However, the function that will actually perform the conversion, compute( ), is a pure virtual function that must be defined by the classes derived from convert. The specific nature of compute( ) will be determined by what type of conversion is taking place.

12.	A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message –Required copies not in stock" is displayed. Design a system using a class called books with suitable member functions and Constructors. Use new operator in constructors to allocate memory space required. Implement C++ program for the system.
13.	Create employee bio-data using following classes i) Personal record ii))Professional record iii) Academic record Assume appropriate data members and member function to accept required data & print bio-data. Create bio-data using multiple inheritance using C++.
	Group B
14.	Crete User defined exception to check the following conditions and throw the exception if the criterion does not meet. a. User has age between 18 and 55 b. User stays has income between Rs. 50,000 – Rs. 1,00,000 per month c. User stays in Pune/ Mumbai/ Bangalore / Chennai d. User has 4-wheeler Accept age, Income, City, Vehicle from the user and check for the conditions mentioned above. If any of the condition not met then throw the exception.
15.	Write a menu driven program that will create a data file containing the list of telephone numbers in the following form John 23456 Ahmed 9876 …….. …… Use a class object to store each set of data, access the file created and implement the following tasks I. Determine the telephone number of specified person II. Determine the name if telephone number is known III. Update the telephone number, whenever there is a change.
16.	Write a C++ program that creates an output file, writes information to it, closes the file and open it again as an input file and read the information from the file.
17.	Write a C++ program using command line arguments to search for a word in a file and replace it with the specified word. The usage of the program is shown below. *$ change <old word> <new word> <file name>*
18.	Write a function template selection Sort. Write a program that inputs, sorts and outputs an integer array and a float array.

19.	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 on hand and the cost of each one. Write a program that initializes the random-access file hardware.dat to 100 empty records, lets you input the data concerning each tool, enables you to list all your tools, lets you delete a record for a tool that you no longer have and lets you update any information in the file. The tool identification number should be the record number. Use the following information to start your file:

Record #	Tool name	Quantity	Cost
3	Electric sander	7	57.98
17	Hammer	76	11.99
24	Jig saw	21	11.00
39	Lawn mower	3	79.50
56	Power saw	18	99.99

	Group C
20.	Write C++ program using STL for implementation of Singly, doubly and circular linked list.
21.	Write C++ program using STL for implementation of stack & queue using SLL
22.	Write C++ program using STL to add binary numbers (assume one bit as one number); use STL stack.
23.	Write C++ program using STL for Dqueue (Double ended queue)
24.	Write C++ program using STL for Sorting and searching with user-defined records such as Person Record (Name, birth date, telephone no), item record (item code, item name, quantity and cost)
	Mini-projects
25.	Design and develop the Tic-Tac-Toe Game using C++
26.	Develop a Supermarket Billing System using C++. The key features of this application are listed below : • **Bill Report**: It shows the bill report of all the items added in supermarket billing system. • **Add, Remove or Edit items**: With this feature one can add, remove and modify item details. In add items, one can add information or details such as item no., item name, manufacturing date, price, quantity, tax percent, and many more. • **Show item details**: This feature allows users to see the items and the corresponding details given for the item while adding the item. Use file to store the data.
27.	Design an E-mail Verifier which accepts the email address from the user. Depending upon the input given by user display appropriate results. Use the following concepts in the Project – Constructor, Destructor, new, delete, exceptional handling, string handling functions, etc.
28.	Design and Develop Library Management system using OOP Concepts.
29.	Write a C++ program to implement a small database mini project to understand persistent objects and operations on sequential files (ex- library information, inventory systems, automated banking system, reservation systems etc.) For example, write a program to create a database for reservation system using information such as Name, sex, age, starting place of journey and destination. Program should have following facilities a) To display entire passenger list b) To display particular record c) To update record d) To delete and sort record. Use Exception Handling for data verification