Savitribai Phule Pune University
Second Year of Artificial Intelligence and Data Science (2020 Course)
217523: OOP and Computer Graphics Laboratory

Teaching Scheme Practical: 04 Hours/Week	Credit Scheme 02	Examination Scheme and Marks Term Work: 25 Marks Practical: 25Marks

Companion Course: 210243: Object Oriented Programming(OOP),
                210244: Computer Graphics

Course Objectives:
To understand basics of Computer Graphics, apply various methods and techniques for implementing line-circle drawing, projections, animation, shading, illumination and lighting using concepts of Object Oriented Programming.

Course Outcomes:
On completion of the course, learner will be able to–

CO1:   **U**n**derstand** and **apply** the concepts like inheritance, polymorphism, exception handling and generic structures for implementing reusable programming codes.

CO2:   **Analyze** the concept of file and **apply** it while storing and retrieving the data from secondary storages.

CO3:   **Analyze** and **apply** computer graphics algorithms for line-circle drawing, scan conversion   and filling with the help of object oriented programming concepts.

CO4:   **Understand** the concept of windowing and clipping and **apply** various algorithms to fill and clip polygons.

CO5:   **Apply** logic to implement, curves, fractals, animation and gaming programs.

Guidelines for Instructor's Manual

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

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software and Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart, test cases, Test Data Set(if applicable), mathematical model (if applicable), 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 must be avoided. Use of DVD containing students programs maintained by Laboratory In-charge is highly encouraged. For reference one or two journals may be maintained with program prints in the Laboratory.

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as timely completion, performance, innovation, efficient codes, and punctuality.

Guidelines for Practical Examination

Problem statements must be decided by the internal examiner in consultation with the external examiner.   During practical assessment, maximum weightage should be given to satisfactory implementation of the problem statement. Relevant questions may be asked at the time of evaluation to test the student's understanding of the fundamentals, effective and efficient implementation. The questions asked will in no way be the deciding factor for passing the students. This will encourage, transparent evaluation and fair approach, and hence 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 student's academics.

Guidelines for Laboratory Conduction

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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. Use of open source software is encouraged. 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, OPENGL.

Virtual Laboratory:

- http://cse18- iiith.vlabs.ac.in/Introduction.html?domain=Computer%20Scie nce
- http://vlabs.iitb.ac.in/vlabs-dev/labs/cglab/index.php

Part I : Object Oriented Programming

Suggested List of Laboratory Experiments/Assignments
(All assignments are compulsory)

Sr. No.	Group A
1	Implement a class Complex which represents the Complex Number data type. Implement the following 1. Constructor (including a default constructor which creates the complex number 0+0i). 2. Overload operator+ to add two complex numbers. 3. Overload operator* to multiply two complex numbers. 4. Overload operators << and >> to print and read Complex Numbers.
2	Develop a program in C++ to create a database of student's information system containing the following information: Name, Roll number, Class, Division, Date of Birth, Blood group, Contact address, Telephone number, Driving license no. and other. Construct the database with suitable member functions. Make use of constructor, default constructor, copy constructor, destructor, static member functions, friend class, this pointer, inline code and dynamic memory allocation operators-new and delete as well as exception handling.
3	Imagine a publishing company which does marketing for book and audio cassette versions. Create a class publication that stores the title (a string) and price (type float) of publications. 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 class, allows user to enter data and displays the data members. If an exception is caught, replace all the data member values with zero values.
	Group B
4	Write a C++ program that creates an output file, writes information to it, closes the file, open it again as an input file and read the information from the file.
5	Write a function template for selection sort that inputs, sorts and outputs an integer array and a float array.
	Group C
6	Write C++ program using STL for sorting and searching user defined records such as personal records (Name, DOB, Telephone number etc) using vector container. **OR** Write C++ program using STL for sorting and searching user defined records such as Item records (Item code, name, cost, quantity etc) using vector container.
7	Write a program in C++ to use map associative container. The keys will be the names of states and the values will be the populations of the states. When the program runs, the user is prompted to type the name of a state. The program then looks in the map, using the state name as an index and returns the population of the state.

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