Home

Savitribai Phule Pune University, Pune
Second Year Artificial Intelligence & Machine Learning (2020 Course)
218547 : Object Oriented Programming Laboratory

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical (PR) : 04 hrs/week	02	PR: 25 Marks TW: 25 Marks

Prerequisites: Student should have knowledge of programming language.

Course Objectives:
1. Apply concepts of object-oriented paradigm.
2. Design and implement models for real life problems by using object-oriented programming.
3. Develop object-oriented programming skills.

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

CO1: Differentiate various programming paradigms.
CO2: Identify classes, objects, methods, and handle object creation, initialization, and destruction
to model real-world problems.
CO3: Identify relationship among objects using inheritance and polymorphism.
CO4: Handle different types of exceptions and perform generic programming.
CO5: Use file handling for real world application.
CO6: Apply appropriate design patterns to provide object-oriented solutions.

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's Lab Journal

1. The laboratory assignments are to be submitted by student in the form of journal.
2. 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.
3. Program codes with sample output of all performed assignments are to be submitted as hardcopy.
4. 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.
5. Use of DVD containing students programs maintained by lab In-charge is highly encouraged.
6. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Lab /TW Assessment

1. Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student.
2. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage.
3. 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.

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 without changing its complexity level and distribute among batches of students. Encourage students for the use of industry coding standards such as appropriate use of Hungarian notation, Indentation and comments. Use of open source software is encouraged. Set of suggested assignment list is provided, instructors may take different case studies with similar complexity level. Operating System recommended :- 64-bit Open source Linux or its derivative
Programming tools recommended: - JAVA IDE

List of Assignments

1.Classes and object -- CO1 and CO2

Design a class 'Complex 'with data members for real and imaginary part. Provide default and Parameterized constructors. Write a program to perform arithmetic operations of two complex numbers.

2. Polymorphism -- CO3

Identify commonalities and differences between Publication, Book and Magazine classes. Title, Price, Copies are common instance variables and saleCopy is common method. The differences are, Bookclass has author and orderCopies(). Magazine Class has methods orderQty, Current issue, receiveissue().Write a program to find how many copies of the given books are ordered and display total sale of publication.

3.Inheritance -- CO3

Design and develop inheritance for a given case study, identify objects and relationships and implement inheritance wherever applicable. Employee class hasEmp_name, Emp_id, Address, Mail_id, and Mobile_noas members. Inherit the classes: Programmer, Team Lead, Assistant Project Manager and Project Manager from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.

4.Dynamic Binding -- CO3

Design a base class shape with two double type values and member functions to input the data and compute_area() for calculating area of shape. Derive two classes: triangle and rectangle. Make compute_area() as abstract function and redefine this function in the derived class to suit their requirements. Write a program that accepts dimensions of triangle/rectangle and display calculated area. Implement dynamic binding for given case study.

5.Interface -- CO1, CO3

Design and develop a context for given case study and implement an interface for Vehicles Consider the example of vehicles like bicycle, car and bike. All Vehicles have common functionalities such as Gear Change, Speed up and apply breaks. Make an interface and put all these common functionalities. Bicycle, Bike, Car classes should be implemented for all these functionalities in their own class in their own way.

6.Exception handling -- CO4

Implement a program to handle Arithmetic exception, Array Index Out of Bounds. The user enters two numbers Num1 and Num2. The division of Num1 and Num2 is displayed. If Num1 and Num2 are not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception. Display the exception.

7.Template -- CO4

Implement a generic program using any collection class to count the number of elements in a collection that have a specific property such as even numbers, odd number, prime number and palindromes.

8.File Handling -- CO5

Implement a program for maintaining a database of student records using Files.
Student has Student_id,name, Roll_no, Class, marks and address. Display the data for few students.

1. Create Database
2. Display Database
3. Delete Records
4. Update Record

5. Search Record

9.Case Study -- CO2, CO5

Using concepts of Object-Oriented programming develop solution for any one application

1) Banking system having following operations :
1. Create an account 2. Deposit money 3. Withdraw money 4. Honor daily withdrawal limit
5. Check the balance 6. Display Account information.

2) Inventory management system having following operations :
1. List of all products 2. Display individual product information 3. Purchase 4. Shipping
5. Balance stock6. Loss and Profit calculation.

10. Factory Design Pattern -- CO6

Implement Factory design pattern for the given context. Consider Car building process, which requires many steps from allocating accessories to final makeup. These steps should be written as methods and should be called while creating an instance of a specific car type. Hatchback, Sedan, SUV could be the subclasses of Car class. Car class and its subclasses, CarFactory and Test Factory Pattern should be implemented.

11. Strategy Design Pattern -- CO6

Implement and apply Strategy Design pattern for simple Shopping Cart where three payment strategies are used such as Credit Card, PayPal, Bit Coin. Create an interface for strategy pattern and give concrete implementation for payment.

Text Books:

1. E. Balagurusamy, “Programming with Java – A Primer”, Tata – McGraw-Hill Publication, 4th Edition, 2019
2. Kathy Sierra, “OCA /OCP Java SE 7 Programmer I & II Study Guide”(Exams 1Z0-803 & IZ-804) Oracle Press (2017)
3. Steven Holzner et al. “Java 2 Programming”, Black Book, Dreamtech Press, 2009

Reference Books:

1. H.M. Deitel, P.J. Deitel, “Java - How to Program”, PHI Publication, 6th Edition, 2005
2. Bruce Eckel, “Thinking in Java”, PHI Publication
3. Poo, Danny, Kiong, Derek, Ashok, Swarnalatha,“ Object-Oriented Programming and Java”, ISBN 978-1-84628-963-7
4. Erich Gamma,Richard Helm ,Ralph Johnson,JohnVlissides, “Design Patterns ,Elements of Reusable Object- Oriented Software” ISBN-13: 978-0201633610
5. RohitJoshi, “Java Design patterns, Reusable solutions to common problems” Java Code Geeks