Object Oriented Programming

Lab Book

Document Revision History

Date	Revision No.	Author	Summary of Changes
18-Dec-2008	0.1D	Veena Deshpande	Creation
22-Dec-2008		CLS team	Review
Jan-2009	1.0	Veena Deshpande	Baselined
8 May 2009	1.1	Veena Deshpande	Updated for including comments related to tool usage for Labs.
20-May-11	1.2	Latha S	Added the OOP exercises

Table of Contents

Getting Started

Overview

This lab book comprises of assignments to be done for OOP. The course is focused towards understanding Object Oriented Concepts. If the participants are not familiar with UML, it is recommended to the trainers to explain the notations of class diagrams and relationship. The participants can use pen and paper to depict the classes.

Setup Checklist for OOP

- None

Instructions

- Specified for each of the individual assignments.

Learning More (Bibliography)

- Thinking in Java/C++ - First chapter
- Head First Object Oriented Analysis and Design
- Applying UML – Advanced Applications by Rob Pooley , Pauline Witcox
- UML User's Guide by Grady Booch, Ivar Jacobson and James Rambaugh

Lab 1. Introduction to Classes and Objects

Goals	Identifying potential objects from a given business scenario Creating classes Distinguish between objects and classes
Time	20-30 minutes

1.1. Given a university scenario

i. There are several courses offered by the university, for example Discrete Mathematics, Database & Information Systems, Islamic History etc
ii. Each course has several sections (for example Discrete Mathematics has Graph Theory ,Information Systems has ORDBMS , OLAP and Distributed systems etc
iii. All the courses have unique course codes and duration with specific pre requisite
iv. A course section is handled by a Professor
v. A professor is assigned a course section based on his experience and his qualification.
vi. Each course is handled in a specific location /room like lecture halls , workshops , seminar rooms etc
vii. Each course begins with a pre test to check if students meet the pre requisite, mid level tests and end semester tests , which can be theoretical, practical or thesis
viii. Marks are collated to calculate the grade.

Identify the objects and classes here.

1.2. One of the team has identified **Discrete Mathematics** as a class. Give suitable justification whether you agree or not agree. Discuss the solution with your instructor and team mates.

Lab 2. Writing down class structure

Goals	• Write classes with properties and functionalities (attribute and behaviors) • Write classes with overloaded constructors
Time	15-20 minutes

1.1. Now that you have identified the classes in previous questions, list down the structure [attributes, behaviors] of all the identified classes and relevant initialization functions.

1.2. Design a Date class. The class should support the following functionalities

i. Store a specific date
ii. Display the date in a certain format – American (mm/dd/yyyy), British (dd/mm/yyyy), Japanese – dd.mm.yyyy)
iii. Extract out parts of date – day , month , year , day of the week , month name etc
iv. Support manipulation of the date like adding and subtracting days and months.
v. Compare two dates and give the difference in no of days

1.3. Define and implement a class matrix having the following functionality.

i. The matrix can store integer values.
ii. The non-parameterize constructor creates a matrix of 10 rows and 10 columns.
iii. The size of a matrix can be defined through a constructor.
iv. The class allows addition of two matrices.
v. There must be readMatrix and printMatrix function in the class.
vi. The readMatrix function can read from standard input or from file.
vii. The printMatrix function can print on standard output or on file

Lab 3. Class Relationship

Goals	• Identify class relationship – Aggregation, Generalization , Association
Time	10-15 minutes

1.1. Meera is designing classes for an online garment shopping application. She has been given the following requirements

i. Registered Customers can only shop
ii. Shop sells a variety of Indian and western garments
iii. Customers can place multiple orders
iv. Each order can have several products
v. Customers make payment via credit card /net banking

Meera has identified the following classes: Customers, Products, Orders. Now she has to identify the class relationships, can you help her?

1.2. Nothing can be more entertaining like a game of cards. Now that most of the card games have become online, design the classes for a Deck of cards, which can be used to design any new card game. Here is a small introduction to all those non card game players

i. Deck means a pack of cards, usually 54 with 2/3 joker cards. These joker cards can be substituted as any card depending on game
ii. Each card has the following symbols and colors
    1. Red – Diamond, Hearts
    2. Black - Spade, Clover or Clubs
iii. Each set has 13 cards starting from numbers 2 – 10 then K (King) , Q (Queen) , J (Jack) and A (Ace)

Lab 4. Abstract classes , Polymorphism

Goals	• Identify concrete and abstract classes • Identify polymorphic methods
Time	5-10 minutes

1.1. Today, mobile phones support different kinds of messages like Text message, audio message, voice messages, multimedia messages etc. All messages have common information like sender details, receiver details, content, size etc, differencing only in rendering. Design the classes along with relationships and overloadable and overridable methods.

Lab 5. Consolidated Exercise

Goals	• Identify class hierarchy • Identify static members
Time	10-15 minutes

1.1. There are two types of employees in our organization: Regular and Contract. Regular employees are on rolls of the organization and are entitled for various allowances and benefits like HRA, Conveyance, Medical reimbursements, LTA and Special allowances, along with basic salary. Regular Employee is also entitled for 10 days of CL and 30 days of PL every year. The contract employees on the other hand are entitled for Basic and Conveyance. Contract Employee is also allotted 1 day of leave every month and no other. As per government rules, PF is 12 % of Basic and is deducted from all employees (employers contribution being 13 %). Tax is deducted from all employees as applicable depending on the gross salary of the employees.

Design the class hierarchy. You may have additional classes also as applicable.

