Lab Exercises:

* There are a total of 7 lab exercises to be done by the students. The detailed description of each exercise is given in the following section. These exercises are for a total of 10 marks.
* In each lab exercise, there are three case studies.
  + The instructors are required to discuss eLearn portal case study in the class in its completeness throughout the course.
  + The exercises based on the Email website case study are to be done individually by the students as evaluative component. (In case the section sizes are too large, this can be given as group exercise).
  + The last case study in each lab exercise, which is based on the choice of the students, needs to be administered as an evaluative group exercise.
* All the UML modelling diagrams, unless mentioned otherwise, are to be implemented using StarUML, an open-source tool. [Attached at the end, some useful links for the same]
* All the faculty are requested to arrange for a demo class of the StarUML tool.
* Diagrams drawn using StarUML can be stored as image files and hence facilitate easy submission.

**Lab Exercise 1:**

Learning Objectives:

Student would be able to:

* Understand and determine the requirements for a given system.

Ques 1: Study and analyze few websites/systems belonging to any one of the following domain:

* Online Retail System
* Online Flight Ticket Booking
* Hotel Management System
* Online Movie Ticket Booking
* Online Railway Reservation

You may keep the following points in mind while studying and analyzing the selected systems/websites:

* Various ways in which the system may be used.
* The various types of logins possible.
* The most important feature of the website.
* The most exciting feature of the website that might be its selling point.
* The various drawbacks of the system.

Prepare a detailed description for the same.

[Continued on the next page…]

Ques 2: Write new set of requirements for a similar website/system illustrating all the features that you would like to include in it inspired by the study done by you. Use the template of the *Software Requirements Specification Template* (SRS) given below to describe the requirements:

# Introduction

* 1. Purpose
  2. Document Conventions
  3. Intended Audience and Reading Suggestions
  4. Project Scope
  5. References

# Overall Description

* 1. Product Perspective
  2. Product Features
  3. User Classes and Characteristics
  4. Operating Environment
  5. Design and Implementation Constraints
  6. User Documentation
  7. Assumptions and Dependencies

# System Features

* 1. System Feature 1
  2. System Feature 2 (and so on)

# External Interface Requirements

* 1. User Interfaces
  2. Hardware Interfaces
  3. Software Interfaces
  4. Communications Interfaces

# Other Nonfunctional Requirements

* 1. Performance Requirements
  2. Safety Requirements
  3. Security Requirements
  4. Software Quality Attributes

# Other Requirements

[Source: [www.processimpact.com/process\_assets/srs\_template.doc](http://www.processimpact.com/process_assets/srs_template.doc)]

Ques 3: Categorize the requirements developed by you into *Normal*, *Expected* and *Exciting* Requirements.

**Lab Exercise 2:**

Learning Objectives:

Student would be able to:

* Identify various actors and associated use-cases for a given system.
* Develop use-case diagram and be able to write use case text scenarios.

Ques 1: Draw the high-level Use Case diagram for an email-based website (similar to Gmail or Yahoo mail).

Ques 2: Draw the high-level Use Case diagram for the eLearn portal of BITS. [Faculty are expected to discuss the same in the class]

**[All the diagrams are to be neatly drawn using StarUML]**

Ques 3:

1. For the website for which you have already captured the requirements (in previous question), you are required to draw the high-level Use Case diagram.
2. Also, write down detailed Use-Case text scenarios for atleast two use cases. [Use the template given below for writing the Use-Case text scenarios]

**Template for Use-Case text Scenario**

|  |  |
| --- | --- |
| **Use-case:** |  |
|  | |
| **Primary actor:** |  |
|  | |
| **Goal in context:** |  |
|  | |
| **Preconditions:** |  |
|  | |
| **Trigger:** |  |
|  | |
| **Scenario:** | |
|  | |
|  | |
|  | |
|  | |
|  | |
| **Exceptions:** | |
|  | |
|  | |
|  | |
|  | |
|  | |
|  | |
| **Priority:** |  |
|  | |
| **When available:** |  |
|  | |
| **Frequency of use:** |  |
|  | |
| **Channel to actor:** |  |
|  | |
| **Secondary actors:** |  |
|  | |
| **Channels to secondary actors:** | |
|  | |
|  | |
|  | |
| **Open issues:** | |
|  | |
|  | |
|  | |
|  | |

[Source: R.S. Pressman, “Software Engineering: A Practitioner’s Approach”, 7th Edition, McGraw-Hill, Inc. New York, NY, USA]

**Lab Exercise 3:**

Learning Objectives:

Student would be able to:

* Develop activity diagram and extend the same to swimlane diagram.
* Understand and analyse the product development processes involved.

Ques 1:

1. Draw the activity diagram for one of the selected use case scenario for the email-based website that you have already designed in the previous exercise.
2. Modify the above activity diagram into the corresponding swimlane diagram.

Ques 2:

1. Draw the activity diagram for one of the selected use case scenario for the eLearn portal of BITS that you have already designed in the previous exercise.
2. Modify the above activity diagram into the corresponding swimlane diagram.

**[All the diagrams are to be neatly drawn using StarUML]**

Ques 3:

1. For the website for which you have already drawn the high-level Use Case diagram and written Use-Case text scenarios, draw the activity diagrams for all the Use-Case text scenarios.
2. Modify the above activity diagrams into the corresponding swimlane diagrams.
3. Analyze all the work products that you have created so far for your website. Determine what all additional/important information is still required for you to start with the development phase of the website.

**Lab Exercise 4:**

Learning Objectives:

Student would be able to:

* Model the data flow of various systems using Data Flow Diagrams.

Ques 1:

1. Draw the DFD (Level 0) for the email-based website that you have already designed in the previous exercise.
2. Also, design the Level 1 and 2 DFD for the same.

Ques 2:

1. Draw the DFD (Level 0) for the eLearn portal of BITS that you have already designed in the previous exercise.
2. Also, design the Level 1 and 2 DFD for the same.

**[Since StarUML, does not support DFD, one can draw the same using drawing tools available with MSWord]**

Ques 3:

1. For your selected website, draw the DFD (Level 0, 1 and 2).

**Lab Exercise 5:**

Learning Objectives:

Student would be able to:

* Design and develop the class diagram for a system.

Ques 1:

1. Identify the various classes, attributes and operations (along with their visibility) that would exist in the email-based website.
2. Draw the complete class diagram for the same.

Ques 2:

1. Identify the various classes, attributes and operations (along with their visibility) that would exist in the eLearn portal of BITS.
2. Draw the complete class diagram for the same.

**[All the diagrams are to be neatly drawn using StarUML]**

Ques 3:

1. For your selected website, identify the various classes, attributes and operations (along with their visibility) and draw the complete class diagram for the same.

**Lab Exercise 6:**

Learning Objectives:

Student would be able to:

* Design and develop state chart, component and deployment diagrams for a system.

Ques 1:

1. Create a navigation diagram, for your selected website. In case you have chosen to develop a system, you can alternatively draw the state chart diagram for the same.

**[Since StarUML, does not provide support for drawing navigation diagram, one can draw the same using drawing tools available with MSWord]**

1. For your selected website, draw the component and deployment diagrams.

**[All the diagrams are to be neatly drawn using StarUML]**

**Lab Exercise 7:**

Learning Objectives:

Student would be able to:

* Examine a given code and be able to apply various testing techniques to test the same.

Ques 1:

1. Assume that the website/system that you have selected has a search facility. Write the code for linear and binary search algorithms.
2. Draw the control flow graph for both the algorithms and calculate the Cyclomatic Complexity.
3. Identify the basis set of paths and the number of test cases required to test the algorithm.

**[Since StarUML, does not provide support for drawing control flow diagram, one can draw the same using drawing tools available with MSWord]**

**StarUML**

StarUML is an open source project to develop fast, flexible, extensible, featureful, and freely-available UML/MDA platform running on Win32 platform.

* You can download StarUML using the following link:

<https://sourceforge.net/projects/staruml/>

Download version 5.0

* Documentation for StarUML is available at the following link:

<http://staruml.sourceforge.net/docs/user-guide(en)/toc.html>

* Some important links to YouTube videos for StarUML tutorials:
  + For creating UseCase Diagrams:

<https://www.youtube.com/watch?v=2w6D4qQ-iPc>

<https://www.youtube.com/watch?v=DnRSNm41nHQ>

* + For creating Class Diagrams:

<https://www.youtube.com/watch?v=KPLkI5DkWhg>

* + For creating Sequence Diagrams:

<https://www.youtube.com/watch?v=kApq-E2mtn0>