1. Course Title (Course Code)

Software Development Special Experiment (2293)

2. Instructor

Muhammad Wannous, Ph.D.

3. Term

Fall 2 (M2 students only)

4. Outline and Objectives

Applying engineering techniques to software development ensures producing more reliable and robust solutions that better meet the expected performance. This process is commonly referred as Software Engineering (SE). SE can be applied to all types of software systems including embedded systems, desktop applications, and web applications.

This course is problem-driven. It introduces a number of close-to-real-world problems to demonstrate the methods and technologies that could be applied to arrive at a proper solution. Students will be able to use their previous programming experience, but emphasize will be on web-technologies and Cloud Computing environment. The students will:

- Read/parse a requirement document for a specific user.
- Construct a software system that corresponds to the requirement document.
- Be required to use advanced topics such as concurrency and environment limitations.
- Be exposed to multi-modal interfaces Web, mobile, and others types of interface design.

5. Goals (Attainment Targets)

By the end of this course, students will be able to:

(1). Analyze a requirement document.
(2). Categorize requirements
(3). Choose the technologies that best fit the desired solution.
(4). Design a software system to meet the obtained requirements.
(5). Implement and test the software system.

6. Correspondence relationship between Educational goals and Course goals

Educational goals			Course goals
High level ICT skill	Basic academic skills		(1), (3)
	Specialized knowledge and literacy		(3)
Human skill (Tankyu skill)	Ability to continually improve own strengths		(2), (4)
	Ability to discover and resolve the problem in society	Problem setting	(1), (2)
		Hypothesis planning	(3)
		Hypothesis testing	(5)
		Practice	(5)
	Fundamental Competencies for Working Persons	Ability to step forward	(5)
		Ability to think through	(3), (5)
		Ability to work in a team	(1), (2), (3), (4), (5)
Professional ethics			(1), (4)

7. Course Requirements

Programming skill is necessary for completing the practical examples.
A strong base in Cloud Computing will help in completing the exercises easily.

8. Textbooks

For this course, a set of lecture slides, handouts, and reports will be distributed in timely manner through Moodle.

9. Reference Books

There is no specific reference book for this course since it is based on "experiment" but a number of online resources will be prepared when adequate.

10. Evaluation

Goals	Evaluation method & point					
	term-end exam	quiz	report	presentation	deliverable	other
(1)		○				
(2)		○				
(3)		○				
(4)					○	
(5)					○	
Allocation		60			40	

Course Schedule

(Notice) This schedule is a tentative plan; there might be changes, additions, and revisions etc. at the time of delivering the course.

Lesson 1: Software Engineering   (Lecture, Discussion, 90 minutes)

This session includes these topics:
1. Orientation of the course and the syllabus.
2. Software Engineering practices and processes.

Lesson 2: Requirements Engineering [1]   (Lecture, Discussion, 90 minutes)

In this session, we will study/review the principles of Requirements Engineering (RE).
1. Definition of RE.
2. Application of RE.

Lesson 3: Requirements Engineering [2]   (Lecture, Exercise, 90 minutes)

In this session we will:
1. Study the requirement document.
2. Read a sample requirement document and practice writing some functional requirements.

Lesson 4: System Architecture and Design [1]   (Lecture, Discussion, 90 minutes)

This session includes these topics:
1. System architecture and design.
2. Object Oriented design.

Lesson 5: System Architecture and Design [2]   (Lecture, Discussion, 90 minutes)

In this session, we will study about designing for the Cloud environment and the different tools available in the Cloud for managing our web applications.

Lesson 6: Exercise-1 [1]   (Exercise, 90 minutes)

This session includes:
1. Reading a requirement document for a new project (new billing system for Cleanergy®).
2. Writing the functional requirements.
3. Defining the subsystems of interest.

Lesson 7: Exercise-1 [2]   (Exercise, Lab work, 90 minutes)

This session includes:
1. The initial design of the solution system (conventional web application).
2. Defining the subsystems of interest and their relations in the initial design.
3. Defining the actors involved in the solution.

Lesson 8: Exercise-1 [3]   (Lab work, 90 minutes)

In this session we will:
1. Write/analyze the code of the solution system (Cloud based application)
2. Prepare a project on Google App Engine to host the solution system.

Lesson 9: Exercise-1 [4]   **(Lab work, 90 minutes)**

In this session we will:
1. Deploy our solution system into Google App.
2. Introduce a special web interface to test the solution system.
3. Create a test scenario and test the solution system through the web interface.

Lesson 10: Review of Exercise-1   **(Lecture, Discussion, 90 minutes)**

In this session, we go through the main points we have studied in Exercise-1 in order to confirm what we have learnt and answer any questions.

Lesson 11: Exercise-2 [1]   **(Exercise, 90 minutes)**

This session covers the following topics:
1. Reflecting a change in the requirement document (new feature request) on the requirements.
2. Reflecting the change in the requirements on the design of the system.

Lesson 12: Exercise-2 [1]   **(Exercise, Lab work, 90 minutes)**

In this session, we will start modifying the design of the system according to the new requirement document.

Lesson 13: Exercise-2 [2]   **(Exercise, Lab work, 90 minutes)**

In this session we:
1. Add the new feature required by the customer to the software of the solution system.
2. Deploy our solution system into Google App.
3. Create a test scenario and test the solution system through the web interface.

Lesson 14: Review of Exercise-2   **(Lecture, Discussion, 90 minutes)**

In this session, we go through the main points we have studied in Exercise-2 in order to confirm what we have learnt and answer any questions.

Lesson 15: Advanced topics [1]   **(Lecture, Exercise, 90 minutes)**

In this session we study about:
1. Concurrency in web applications.
2. Analyze a sample code in Java on concurrency.

Lesson 16: Advanced topics [2]   **(Lecture, Lab work, 90 minutes)**

In this session, we test the concurrency feature in our solution system and modify it if necessary.

Lesson 17: Advanced topics [3]   **(Lecture, Exercise, 90 minutes)**

In this session we study about:
1. Web services.
2. Analyze a sample code in Java on web services.

Lesson 18: Advanced topics [4]   **(Lecture, Lab work, 90 minutes)**

In this session, we consider converting the solution system to a web application that supports web services / adding web services to it.

Lesson 19: Advanced topics [5]   **(Lecture, Exercise, 90 minutes)**

In this session we study about:
1. Multi-modal interfaces.
2. Analyze a sample code on multi-modal interface support.

Lesson 20: Advanced topics [6]   **(Lecture, Lab work, 90 minutes)**

In this session, we consider the support of the multi-modal feature in our solution system

Lesson 21: Review of Advanced topics   **(Lecture, Discussion, 90 minutes)**

In this session, we go through the main points we have studied in the Advanced Topics in order to confirm what we have learnt and answer any questions.

Lesson 22: Exercise-3 [1]   **(Exercise, Lab work, 90 minutes)**

In this session, the students are asked to work in groups to introduce more features and reflecting their ideas on the requirements, the system design, and software architecture.

Lesson 23: Exercise-3 [2]   **(Exercise, Discussion, 90 minutes)**

In this session, the different groups will introduce the modified versions of the requirement document and discuss the new functional requirements.

Lesson 24 Exercise-3 [3]   **(Exercise, Discussion, 90 minutes)**

In this session, the different groups will introduce the modified versions of the system design and architecture and discuss the modifications (do they fit the requirements?).

Lesson 25 Exercise-3 [4]   **(Lab work, 90 minutes)**

In this session, the different groups will work on implementing the new designs they introduced.

Lesson 26 Exercise-3 [5]   **(Lab work, 90 minutes)**

In this session, the different groups will deploy their solution system in the Cloud (or any other hosting service that they see suitable).

Lesson 27 Exercise-3 [6]   **(Lab work, 90 minutes)**

In this session, the different groups will demonstrate the new features of their systems and explain about their implementation limitations.

Lesson 28 Exercise-3 [7]   **(Lab work, 90 minutes)**

In this session, the different groups will deploy their solution system in the Cloud (or any other hosting service that they see suitable).

Lesson 29: Review of Exercise-3   **(Lecture, Discussion, 90 minutes)**

In this session, we go through the main points we have studied in Exercise-3 in order to confirm what we have learnt and answer any questions.

Lesson 30: Review of the course   (Discussion, 90 minutes)

In this session, we go through the main points we have studied in this course and answer any questions. In this session, the students should demonstrate their final projects with the latest features included in them.