270081 - ASW - Web Applications and Services

Coordinating unit: 270 - FIB - Barcelona School of Informatics
Teaching unit: 747 - ESSI - Department of Service and Information System Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan

Teaching staff

Coordinator: - Carles Farre Tost (farre@essi.upc.edu)
Others: - Joaquim Motger De La Encarnacion (jmotger@essi.upc.edu)

Prior skills

1) Learn how to specify a system's functional and nonfunctional requirements in UML.
2) Learn the context in which one can design a system and what the previous and subsequent steps are.
3) Learn the nature of software architecture, and the architectural styles there are (of which layered architecture is one).
4) Principles of object-oriented design
5) Understand the concept of design patterns and know the main design patterns available.
6) Learn the specific UML elements of design.
7) Learn the main characteristics of distributed component systems.

Requirements

- Prerequisite AS

Degree competences to which the subject contributes

Specific:
CES1.1. To develop, maintain and evaluate complex and/or critical software systems and services.
CES1.2. To solve integration problems in function of the strategies, standards and available technologies
CES1.4. To develop, maintain and evaluate distributed services and applications with network support.
CES1.7. To control the quality and design tests in the software production
CES2.2. To design adequate solutions in one or more application domains, using software engineering methods which integrate ethical, social, legal and economical aspects.
CES3.1. To develop multimedia services and applications.
CT2.1. To demonstrate knowledge and capacity to apply the principles, methodologies and life cycles of software engineering.
CT2.3. To design, develop, select and evaluate computer applications, systems and services and, at the same time, ensure its reliability, security and quality in function of ethical principles and the current legislation and normative.
CT2.5. To design and evaluate person-computer interfaces which guarantee the accessibility and usability of computer systems, services and applications.

General:
G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.
270081 - ASW - Web Applications and Services

Teaching methodology

The teaching of the course is structured in theory/problems sessions and laboratory sessions.

Theory/problems sessions: 2 hours per week.
The instructors can present some of the course content using slides or other material available at Atenea. Problems will be aimed to help and test learning. Sometimes, students may be required to have fully or partially solved problems before class, so the possible solutions will be discussed in class. At other times, the problem will be raised and resolved during class, using cooperative learning techniques. There will be also sessions in which students will be required to prepare on their own and present to the class a certain topic.

Laboratory sessions: 2 hours per week.
During the first 5 weeks of the course, and after a brief introduction, the students will be required to complete a certain number of tasks using the computer in accordance with a work plan. Durant the remaining weeks of the course, the students, in groups of 3-4, will design and implement a web project. The lab sessions will be used to work in the project, discuss and fix doubts and problems, plan and manage goals, and present results.

Learning objectives of the subject

1. Acquire a critical and systematic knowledge of the main protocols and web technologies
2. Gain an overview of the wide range of languages, tools and techniques available for application development and web services
3. Evaluate and select the most appropriate architecture and technologies for a given application / web service
4. Design web applications and services
5. Know and use frameworks to implement Web applications and services
6. Implement, deploy and configure Web applications and services using the proposed technologies and techniques
7. Understand and identify the main security risks of Web applications and services as well as the strategies to solve them.
8. Analyze and evaluate Web applications and services according to quality criteria

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 24h</th>
<th>16.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 6h</td>
<td>4.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 30h</td>
<td>20.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 6h</td>
<td>4.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 84h</td>
<td>56.00%</td>
</tr>
</tbody>
</table>
## Introduction

**Degree competences to which the content contributes:**

**Description:**
Differences between web applications and web services. Historical development. Main characteristics of the applications and Web services.

## Protocols, languages and web technologies

**Degree competences to which the content contributes:**

**Description:**
- The core: URIs and HTTP
- On the client: HTML, CSS, JavaScript, DOM, AJAX
- On the server: PHP, Java Servlets, JSPs, ...
- Data exchange formats: XML, JSON
- Web Services: SOAP + WSDL, REST

## Architectures for Web Applications and Services

**Degree competences to which the content contributes:**

**Description:**
Logic Architecture vs. Physical Architecture. Specifics and conditions of web applications and services. Components of a generic web architecture. Patterns of physical architectures.

## Design of Web Applications

**Degree competences to which the content contributes:**

**Description:**
Architecture and design of web applications.

## Design of Web Services

**Degree competences to which the content contributes:**

**Description:**
Architecture and design of web services.

## Security, Usability and Test for Applications and Web Services

**Degree competences to which the content contributes:**
Description:
Topics related to security, usability and test for applications and web services.
### Planning of activities

<table>
<thead>
<tr>
<th>Unit 1: Introduction</th>
<th>Hours: 2h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 0h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 0h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
</tr>
<tr>
<td></td>
<td>Self study: 0h</td>
</tr>
</tbody>
</table>

**Description:**
Participates actively in the theory class, where the objectives and organization of the course will be exposed.

<table>
<thead>
<tr>
<th>Unit 2: Protocols, languages &amp; web technologies</th>
<th>Hours: 8h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 0h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 0h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
</tr>
<tr>
<td></td>
<td>Self study: 6h</td>
</tr>
</tbody>
</table>

**Description:**
Participates actively in the theory class. Autonomously, and in groups of two or three, s/he will begin to look for information on a specific technology to be presented in class.

**Specific objectives:**
1, 2

<table>
<thead>
<tr>
<th>P1: Presentation on Web protocols, languages and technologies (Part 1)</th>
<th>Hours: 8h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study: 6h</td>
</tr>
</tbody>
</table>

**Description:**
Apart from making the presentation before the entire class, students must hand in a file with the slides prepared for this purpose.

**Specific objectives:**
1, 2

<table>
<thead>
<tr>
<th>P1: Presentation on Web protocols, languages and technologies (Part 2)</th>
<th>Hours: 2h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study: 0h</td>
</tr>
</tbody>
</table>

**Description:**
Apart from making the presentation before the entire class, students must hand in a file with the slides prepared for this purpose.

**Specific objectives:**
1, 2
### Unit 3: Architectures for Web Applications and Services

**Hours:** 4h  
- Theory classes: 2h  
- Practical classes: 0h  
- Laboratory classes: 0h  
- Guided activities: 0h  
- Self study: 2h

**Description:**  
Participate actively in class theory.

**Specific objectives:**  
3

---

### Unit 4: Design of Web Applications

**Hours:** 15h  
- Theory classes: 3h  
- Practical classes: 3h  
- Laboratory classes: 0h  
- Guided activities: 0h  
- Self study: 9h

**Description:**  
Participates actively in the theory class. Autonomously, s/he will study some material related to the subject and do the exercises proposed by the teacher.

**Specific objectives:**  
4

---

### C1: Control 1

**Hours:** 5h  
- Guided activities: 2h  
- Self study: 3h

**Description:**  
The test will assess all the topics covered in the units 1, 2 and 3.

**Specific objectives:**  
4

---

### Review of the control 1

**Hours:** 2h  
- Theory classes: 0h  
- Practical classes: 0h  
- Laboratory classes: 0h  
- Guided activities: 2h  
- Self study: 0h

**Description:**  
Students may ask for explanations or present claims on the assessment following the guidelines established.
### Unit 5: Design of Web Services

**Hours:** 15h  
Theory classes: 3h  
Practical classes: 3h  
Laboratory classes: 0h  
Guided activities: 0h  
Self study: 9h

**Description:**  
Participates actively in the theory class. Autonomously, s/he will study some material related to the subject and do the exercises proposed by the teacher.

**Specific objectives:**  
4

### P2: Presentation on security, usability and test for web applications and services (Part 1)

**Hours:** 5h  
Guided activities: 2h  
Self study: 3h

**Specific objectives:**  
7, 8

### P2: Presentation on security, usability and test for web applications and services (Part 2)

**Hours:** 5h  
Guided activities: 2h  
Self study: 3h

**Specific objectives:**  
7, 8

### C2: Control 2

**Hours:** 6h  
Guided activities: 3h  
Self study: 3h

**Description:**  
The test will assess all the topics covered in the units 5 and 6.

**Specific objectives:**  
4, 7, 8

### Review of the control 2

**Hours:** 2h  
Theory classes: 0h  
Practical classes: 0h  
Laboratory classes: 0h  
Guided activities: 2h  
Self study: 0h
# Laboratory: Introductory sessions to technologies for web applications and services

**Hours:** 23h  
Theory classes: 0h  
Practical classes: 0h  
Laboratory classes: 10h  
Guided activities: 0h  
Self study: 13h

**Description:**  
In pairs, s/he works (installs, configures, programs) in order to achieve a certain number of tasks defined in the statement handed in at the beginning of the session, using the required language, tools and resources. In advance, and autonomously, s/he has introduced her/himself to the use of these technologies.

**Specific objectives:**  
1, 2, 6

## Laboratory: Project

**Hours:** 49h  
Theory classes: 0h  
Practical classes: 0h  
Laboratory classes: 20h  
Guided activities: 2h  
Self study: 27h

**Description:**  
In groups of 3-4, s/he designs and implements the tests and code for a web application, and deploys it on the cloud. Regardless of its functionalities, the application will consist of three parts: "classic" web application, REST API, and responsive mobile interface. Each week s/he comes to the laboratory session to work on the project, indicate the level of achievement of the milestones set for that session, (re)plan the milestones for the next session, present results, and report doubts and problems. At the end of the project, s/he assess the work of his/her project fellows.

**Specific objectives:**  
4, 5, 6, 7, 8
Qualification system

Final Grade = 50% NTP + 50% NLAB

NTP = theory and exercises mark
NLAB = laboratory grade mark

NTP is computed from C1 (Test 1), C2 (Test 2), P1 (Presentation 1) and P2 (Presentation 2) marks applying the following formula:

\[ NTP = 30\% C1 + 30\% C2 + 20\% P1 + 20\% P2 \]

NLAB is computed from IntroLAB (Introductory sessions to web technologies) and Project marks applying the following formula:

\[ NLAB = 35\% \text{IntroLAB} + 65\% \text{Project} \]

Presentations (P1 and P2) and Project involve group work. In these cases, the student will have a personalized note that will be calculated based on the assessment that the teacher will make on the overall quality of the item (presentation or project), the assessment that the teacher will make on the student’s contribution within the group and the assessment that the fellow group members will make on the contribution of the student to the group.

The assessment of the transversal competence assigned to the course (G7.3) is obtained from the following formula:

\[ \text{Numeric G7.3 Grade} = 60\% \text{Project} + 40\% \left( \frac{\text{P1} + \text{P2}}{2} \right) \]

And will have values A, B, C, D according to the following distribution:

G7.3 Grade = A if Numeric G7.3 Grade is in [8.5, 10]
G7.3 Grade = B if Numeric G7.3 Grade is in [7, 8.4]
G7.3 Grade = C if Numeric G7.3 Grade is in [5, 6.9]
G7.3 Grade = D if Numeric G7.3 Grade is less than 5
Bibliography

Basic:

Complementary:

Others resources:

Hyperlink
- http://www.w3schools.com
- http://www.rspa.com/spi/index.html#webe
- http://www.w3.org/standards/
- http://staffweb.cms.gre.ac.uk/~k.mcmanus/web/