

## Course guide

### 270081 - ASW - Web Applications and Services

**Last modified:** 30/01/2024

**Unit in charge:** Barcelona School of Informatics  
**Teaching unit:** 747 - ESSI - Department of Service and Information System Engineering.  
**Degree:** BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2010). (Optional subject).  
**Academic year:** 2023    **ECTS Credits:** 6.0    **Languages:** Catalan

#### LECTURER

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**Coordinating lecturer:** CARLES FARRE TOST

**Others:** Primer quadrimestre:  
CARLOTA CATOT BRAGÓS - 11  
CARLES FARRE TOST - 11, 12, 13  
MARC ORIOL HILARI - 13

Segon quadrimestre:  
CARLOTA CATOT BRAGÓS - 13  
CARLES FARRE TOST - 11, 12, 13, 21, 22  
JOAQUIM MOTGER DE LA ENCARNACION - 22  
MARC ORIOL HILARI - 11, 12

#### PRIOR SKILLS

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- 1) Learn how to specify a system's functional and non-functional 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

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- 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.

### Generical:

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.

## 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 4 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

Type	Hours	Percentage
Hours large group	24,0	16.00
Guided activities	6,0	4.00
Hours small group	30,0	20.00
Hours medium group	6,0	4.00



Type	Hours	Percentage
Self study	84,0	56.00

**Total learning time:** 150 h

## CONTENTS

### Introduction

**Description:**

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

### Protocols, languages and web technologies

**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

**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

**Description:**

Architecture and design of web applications.

### Design of Web Services

**Description:**

Architecture and design of web services.

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

**Description:**

Topics related to security, usability and test for applications and web services.

## ACTIVITIES

### Unit 1: Introduction

**Description:**

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

**Full-or-part-time:** 2h

Theory classes: 2h

### Unit 2: Protocols, languages and web technologies

**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

**Related competencies :**

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.

**Full-or-part-time:** 8h

Theory classes: 2h

Self study: 6h

### P1: Presentation on Web protocols, languages and technologies (Part 1)

**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

**Related competencies :**

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.

**Full-or-part-time:** 8h

Guided activities: 2h

Self study: 6h

### P1: Presentation on Web protocols, languages and technologies (Part 2)

**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

**Related competencies :**

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.

**Full-or-part-time:** 2h

Guided activities: 2h

### Unit 3: Architectures for Web Applications and Services

**Description:**

Participate actively in class theory.

**Specific objectives:**

3

**Related competencies :**

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.

**Full-or-part-time:** 4h

Theory classes: 2h

Self study: 2h

### Unit 4: Design of Web Applications

**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

**Related competencies :**

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.

**Full-or-part-time:** 15h

Theory classes: 6h

Self study: 9h



### C1: Control 1

**Description:**

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

**Specific objectives:**

4

**Related competencies :**

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.

**Full-or-part-time:** 8h

Guided activities: 2h

Self study: 6h

### Unit 5: Design of Web Services

**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

**Related competencies :**

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.

**Full-or-part-time:** 15h

Theory classes: 6h

Self study: 9h

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

**Specific objectives:**

7, 8

**Related competencies :**

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.

**Full-or-part-time:** 5h

Guided activities: 2h

Self study: 3h

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

### Specific objectives:

7, 8

### Related competencies :

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.

**Full-or-part-time:** 5h

Guided activities: 2h

Self study: 3h

## C2: Control 2

### Description:

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

### Specific objectives:

4, 7, 8

### Related competencies :

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.

**Full-or-part-time:** 8h

Guided activities: 2h

Self study: 6h

## Laboratory: Introductory sessions to technologies for web applications and services

### 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

### Related competencies :

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.

**Full-or-part-time:** 18h

Laboratory classes: 8h

Self study: 10h

### Laboratory: Project

**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

**Related competencies :**

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.

**Full-or-part-time:** 52h

Laboratory classes: 22h

Self study: 30h

## GRADING 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:

$$NLAB = 30\% \text{IntroLAB} + 70\% \text{Project}$$

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:

$$\text{Numeric G7.3 Grade} = 60\% \text{Project} + 40\% ((P1 + P2) / 2)$$

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

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### Basic:

- Daigneau, R. Service design patterns: fundamental design solutions for SOAP/WSDL and RESTful web services. Addison-Wesley, 2012. ISBN 9780321544209.
- Fox, A.; Patterson, D. Engineering software as a service: an Agile approach using Cloud Computing: first edition 1.1.1. Strawberry Canyon, 2012. ISBN 9780984881246.
- .NET application architecture guide. 2nd ed. Microsoft, 2009. ISBN 9780735627109.
- Shklar, L.; Rosen, R. Web application architecture: principles, protocols, and practices. 2nd ed. John Wiley, 2009. ISBN 9780470518601.

### Complementary:

- Ceri, S. [et al.]. Designing data-intensive web applications. Morgan Kaufmann, 2003. ISBN 1558608435.
- Conallen, J. Building web applications with UML. 2nd ed. Addison-Wesley, 2003. ISBN 0201730383.
- Farré, Carles. Web Applications and Services.
- Farré, Carles. "Desenvolupament d'aplicacions web". Revista de Tecnologia [on line]. núm. 7 (2017), p. 20-29 [Consultation: 26/10/2022]. Available on: <https://doi.org/10.2436/20.2004.01.20>.
- Fowler, M. Patterns of enterprise application architecture. Addison-Wesley, 2003. ISBN 0321127420.
- Kappel, G. [et al.] (eds.). Web engineering: the discipline of systematic development of web applications. John Wiley & Sons, 2006. ISBN 0470015543.

## RESOURCES

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### Hyperlink:

- <http://www.rspa.com/spi/index.html#webe>- <http://www.w3.org/standards/>- <http://www.w3schools.com>