



Universitat de Lleida

# DEGREE CURRICULUM

# **ENTERPRISE SOFTWARE**

# **ARCHITECTURES**

Coordination: GARCIA GONZALEZ, ROBERTO

Academic year 2023-24

## Subject's general information

Subject name	ENTERPRISE SOFTWARE ARCHITECTURES			
Code	102029			
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Computer Engineering	4	COMPULSORY	Attendance-based
	Bachelor's Degree in Computer Engineering	4	OPTIONAL	Attendance-based
Course number of credits (ECTS)	9			
Type of activity, credits, and groups	Activity type	PRALAB		TEORIA
	Number of credits	3		6
	Number of groups	1		1
Coordination	GARCIA GONZALEZ, ROBERTO			
Department	COMPUTER ENGINEERING AND DIGITAL DESIGN			
Teaching load distribution between lectures and independent student work	Total load: 225h - Lectures (40%) = 90h - Independent student work (60%) = 135h			
Important information on data processing	Consult <a href="#">this link</a> for more information.			
Language	English			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CHAMORRO PADIAL, JORGE	jorge.chamorro@udl.cat	2	
CONTRERAS PÉREZ, FRANCESC	francesc.contreras@udl.cat	3,6	
GARCIA GONZALEZ, ROBERTO	roberto.garcia@udl.cat	5,2	Contact by e-mail

## Subject's extra information

To properly follow this subject, it is recommended to have consolidated software engineering and Web applications development skills like those presented in the Software Engineering and Web Systems and Technologies courses.

## Learning objectives

- To present Web engineering and its fundamental applications patterns and architectures in the context of an agile methodology and Behaviour Driven Development.
- To have a global vision of the existent technologies to implement enterprise applications using the previous patterns and architectures, especially Java, Javascript and the Web.
- To put into practice the previous concepts and technologies through the development of a Web application project using Java (**Spring**) and TypeScript (**Angular**), following an agile methodology and behaviour driven development (BDD).

## Competences

### Strategic Competences

**CT2.** Mastering a foreign language, especially English.

**CT3.** Training Experience in the use of the new technologies and the information and communication technologies.

### Cross-disciplinary Competences

**EPS11.** Capacity to understand the needs of the user expressed in no technical language.

### Specific Competences

**GII-TI1.** Capacity to understand the environment and needs of an organisation in the field of information and communication technologies.

**GII-TI2.** Capacity to choose, design, deploy, integrate, evaluate, build, manage, explode and keep the hardware, software and network technologies inside the cost and quality requirements.

**GII-TI5.** Capacity to select, deploy, integrate and manage systems of information that satisfy the needs of the organisation, within the cost and quality requirements.

**GII-TI6.** Capacity to conceive systems, applications and services based on network technologies, including Internet, web, e-commerce, multimedia, interactive services and mobile computation.

## Subject contents

1. Agile Web Applications Development Process
  1. Behaviour-Driven Development (BDD) with Cucumber Java
  2. Scrum using GitHub
  3. Teamwork coordination using Version Control
  4. Continuous Integration using GitHub Actions
  5. Automated deployment on the cloud
2. Application Architecture Patterns
  1. Introduction and layered architecture
  2. Patterns in the domain layer
  3. Patterns in the integration layer
  4. Patterns in the presentation layer
  5. Technologies for pattern application
3. Web Application Implementation
  1. Server side: Java (**Spring**)
  2. Client side: TypeScript (**Angular**)

## Methodology

The methodology is based on a Project Based Learning approach where an enterprise software application is developed, focusing on Web-based applications. The course starts with a review of Web development frameworks from an industrial point of view, by analysing existing reports about the state of the art of Web development. Based on these dimensions, Spring is selected for the server side and Angular for the client one.

The first weeks of the course focus on fundamental aspects of software development, including project management ideas and development process concepts. Software architecture, specification, analysis and design are presented from a client/server and Web perspective, guided by enterprise application patterns. These concepts are the starting point for the students' project development.

The students select a common project, under professors' guidance, and complete a first deliverable where they apply these fundamental concepts to specify, analyse and design their project.

The rest of the course focuses on the implementation of the defined project and the required concepts related to Agile software development, Spring or Angular are introduced as needed to complete the development of the project.

## Development plan

Week	Description	Face-to-Face Activities	Autonomous Student Work
1	Frameworks and Methodologies	Study Frameworks JVM Servidor Study Frameworks JavaScript Client	Define project idea
2	Frameworks and Methodologies	Introduction Agile Methodologies SRUM-BAN and BDD	Define project using methodology terms
3	Sprint 1	Tutorials presentations Joint project development	Project development
4	Sprint 1	Tutorials presentations Joint project development	Project development

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Week	Description	Face-to-Face Activities	Autonomous Student Work
5	Sprint 1	Tutorials presentations Joint project development	Project development
6	Sprint 1	Enterprise Application Patterns Joint project development	Study patterns application to project
7	Sprint 1	Enterprise Application Patterns Sprint Retrospective	Study patterns application to project
8		Holidays	
9	Sprint 2	Tutorials presentations Joint project development	Project development
10		1st Midterm Exam	Study
11	Sprint 2	Tutorials presentations Joint project development	Project development
12	Sprint 2	Tutorials presentations Joint project development	Project development
13	Sprint 2	Joint project development Sprint Retrospective	Project development
14	Sprint 3	Tutorials presentations Joint project development	Project development
15	Sprint 3	Tutorials presentations Joint project development	Project development
16	Sprint 3	Joint project development Sprint Retrospective	Project development
17-18		2nd Midterm Exam	Study

## Evaluation

Acr.	Evaluation Activity	Rate	Minimum Qualification	Group Activity	Mandatory	Remedia Exam
P1	1st Midterm Exam	20%	NO	NO	NO	NO
P2	2nd Midterm Exam	20%	NO	NO	NO	NO
E1	1st Project Deliverable	20%	NO	2 o 3	NO	NO
E2	2ª Project Deliverable	20%	NO	2 o 3	NO	NO
E3	3ª Project Deliverable	20%	NO	2 o 3	NO	NO
Final Qualification = $0,2 \cdot P1 + 0,2 \cdot P2 + 0,2 \cdot E1 + 0,2 \cdot E2 + 0,2 \cdot E3$						

The evaluation is fundamentally based on the development of a project following an agile methodology following 3 sprints and 3 deliverables:

- Sprints 1, 1st Deliverable: 20% grade

- Sprints 2, 2nd Deliverable: 20% grade
- Sprints 3, 3rd Deliverable: 20% grade

For each sprint (review), the performance in developing the assigned tasks will be evaluated, which will be contextualised for each corresponding deliverable that takes into account also the developed product. The grade will combine the outcomes for each deliverable together with its associated sprints.

The evaluation is complemented by two exams performed individually:

- 1st Midterm Exam: 20% grade, about fundamental aspects of the frameworks and methodologies used so far.
- 2nd Midterm Exam: 20% grade, about the development experience of the project as a whole.

## Alternative Evaluation

Students who have the approval to be evaluated through alternative evaluation (see requirements and procedure in the evaluation regulations) must carry out the following activities.

Acr.	Evaluation Activity	Rate	Minimum Qualification	Group Activity	Mandatory	Remedia Exam
PF	Final Exam	40%	>3	NO	YES	YES
E1	1st Project Deliverable	20%	NO	NO	NO	NO
E2	2ª Project Deliverable	20%	NO	NO	NO	NO
E3	3ª Project Deliverable	20%	NO	NO	NO	NO
Final Qualification = $0,4 \cdot PF + 0,2 \cdot E1 + 0,2 \cdot E2 + 0,2 \cdot E3$						

The evaluation is fundamentally based on the development of a project following an agile methodology following 3 sprints and 3 deliverables:

- Sprints 1, 1st Deliverable: 20% grade
- Sprints 2, 2nd Deliverable: 20% grade
- Sprints 3, 3rd Deliverable: 20% grade

For each sprint (review), the performance in developing the assigned tasks will be evaluated, which will be contextualised for each corresponding deliverable that takes into account also the developed product. The grade will combine the outcomes for each deliverable together with its associated sprints.

The evaluation is complemented by a final exam:

- Final exam: 40% grade, about fundamental aspects of the frameworks and methodologies used so far, plus the development experience of the project as a whole.

## Bibliography

- Fowler, M.; Rice, D. (2003). Patterns of Enterprise Application Architecture. Addison-Wesley.
- Amuthan, G. (2014). Spring MVC: Beginner's guide Birmingham. Packt Publishing.
  - Electronic Version<sup>1</sup>: <https://www.dawsonera.com/abstract/9781783284887>
- Walls, C. (2014). Spring in Action, 4th Edition. Manning.
- McLaughlin, B.; Edelson, J. (2006). Java and XML (3rd edition). O'Reilly.
  - Electronic Version<sup>1</sup>: <http://proquest.safaribooksonline.com/059610149X>

<sup>1</sup> This book is accessible from the Universitat de Lleida network using this link