



Universitat de Lleida

DEGREE CURRICULUM **SYSTEMS INTEGRATION**

Coordination: GIMENO ILLA, JUAN MANUEL

Academic year 2021-22

Subject's general information

Subject name	SYSTEMS INTEGRATION			
Code	102057			
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		5.4
	Number of groups	1		1
Coordination	GIMENO ILLA, JUAN MANUEL			
Department	COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING			
Teaching load distribution between lectures and independent student work	40% lectures; 60% student work			
Important information on data processing	Consult this link for more information.			
Language	Catalan			
Distribution of credits	Juan Manuel Gimeno Illa (9)			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
GIMENO ILLA, JUAN MANUEL	juanmanuel.gimeno@udl.cat	9	By appointment

Subject's extra information

Knowledge of Java, Data Bases and Web Applications is assumed to properly follow the subject.

Learning objectives

The main objective of this subject is to introduce the functional paradigm for the design of applications

So,

- We will present the Scala programming language, which integrates both object-oriented and functional paradigms
- We will present the main concepts of functional programming
- We will introduce the main libraries in the typelevel ecosystem
- We will analyse the architecture and design of some applications

Competences

Strategic competences of the UdL

- **CT1:** Mastering a foreign language, especially English.
- **CT2:** 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 a no technical language.

Specific competences

- **GII-IS3:** Capacity to give solution to problems of integration taking into account the strategies, standards and available technologies.
- **GII-IS5:** Capacity to identify, evaluate and manage the potential risks that can arise.

Subject contents

1. The Scala 3 programming language
2. Functional Programming Fundamentals
 1. What is Functional Programming?
 2. Data Structures
 3. Error Management
 4. Strict and Lazy Evaluation
 5. State Management
 6. Parallelism and Concurrency
 7. Property Based Testing
 8. Functional Patterns
 1. Monoids

2. Functors and Monads
3. Applicatives and Traversables
4. Functional Effects
3. Typelevel Ecosystem
 1. cats
 2. cats-effect
 3. fs2
 4. http4s
 5. doobie
4. Study of Applications

Methodology

Theory / Laboratory sessions:

- The main theoretical concepts are presented, but always working on practical examples
- We'll use some videos with presentations and tutorials
- We'll practice the concepts presented in theory on
- We'll analyze the code and structure of existing projects
- Live-programming sessions on simplifications of the libraries we'll use

Autonomous work:

- Programming on practice exercises
- Reading of additional materials
- Viewing of additional videos

Development plan

Setmana	Continguts
1	Presentation + Scala 3
2	Functional Programming
3	Data Structures
4	Errors
5	Evaluation Strategies
6	State
7	Parallelism and Concurrency
8	Testing
9	First midterm
10	cats + cats-effect
11	cats-effect + fs2
12	fs2 + http4s
13	http4s + doobie
14	Analysis of Applications
15	

Setmana	Continguts
16	Second midterm
17	Second midterm

Evaluation

- Two midterms, about basic concepts (short answers), 10% of final grade each one
- Four projects using different techniques and libraries: 20% each

Bibliography

- Paul Chiusano, Rúnar Bjarnason, Functional Programming in Scala, Manning (2015)
- Martin Odersky, Lex Spoon, Bill Venners and Frank Sommers, Programming in Scala (Fifth Edition), Artima (2021)
- Debasish Ghosh, Functional and Reactive Domain Modeling, Manning (2017)