



Universitat de Lleida

DEGREE CURRICULUM

# **DATABASES AND SOFTWARE ENGINEERING II**

Coordination: GIMENO ILLA, JUAN MANUEL

Academic year 2023-24

## Subject's general information

Subject name	DATABASES AND SOFTWARE ENGINEERING II			
Code	102019			
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Computer Engineering	3	COMPULSORY	Attendance based
	Double bachelor's degree: Degree in Computer Engineering and Degree in Business Administration and Management	3	COMPULSORY	Attendance-based
	Master's Degree in Informatics Engineering		COMPLEMENTARY TRAINING	Attendance-based
Course number of credits (ECTS)	6			
Type of activity, credits, and groups	Activity type	PRAULA		TEORIA
	Number of credits	3		3
	Number of groups	2		1
Coordination	GIMENO ILLA, JUAN MANUEL			
Department	COMPUTER ENGINEERING AND DIGITAL DESIGN			
Teaching load distribution between lectures and independent student work	20% on-site 20% virtual 60% autonomous work			
Important information on data processing	Consult <a href="#">this link</a> for more information.			
Language	Preferably Catalan (Spanish if any student shows difficulties with Catalan).			

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

To follow this subject properly the previous knowledge acquired in the subjects Data Bases and Software Engineering is assumed and the elements of the Java programming Language presented in Programming 2 and Data Structures.

## Learning objectives

- Understand the data storage needs of the users
- Understand the different technologies which facilitate distributed data management
- Understand the different technologies to integrate existing data sources
- Understand the different NoSQL technologies which facilitate the storage of big volumes of data.
- Define designs which are robust to changes
- Apply basic object oriented design patterns to problems of limited size.

## Competences

### Cross-disciplinary competences

- **EPS11:** Capacity to understand the needs of the user expressed in a non technical language.

### Specific competences

- **GII-CRI2:** Capacity to plan, conceive, deploy and direct projects, services and computer systems in all the fields, leading his set up and his continuous improvement and evaluation his economic and social impact.
- **GII-CRI12:** Knowledge and application of the characteristics, functionalities and structure of the databases, that allow their suitable use, and the design and the analysis and implementation of applications based in them.
- **GII-CRI13:** Knowledge and application of the necessary tools for the storage, processing and access to the Systems of information, including those based in web.
- **GII-CRI16:** Knowledge and application of the principles, methodologies and life cycle of the software engineering.
- **GII-CRI17:** Capacity to design and evaluate person-computer interfaces that guarantee the accessibility and usability of systems, services and computer applications.

## Subject contents

### 1. Database optimization

#### 1.1 Physical organization

#### 1.2 Query processing

## 2. Distributed Databases

2.1 Data distribution and relational model

2.2 NoSQL

2.3 Data integration

## 3. Persistence layer of an application

## 4. Modern Java

## 5. Object-Oriented Design

6.1 Principles

6.2 Patterns

Software / Languages / Libraries

- PostgreSQL
- MongoDB
- Neo4j
- Java OpenJDK
- JUnit 5
- IntelliJ IDEA Community Edition

## Methodology

### Big-size Group: Theory Sessions (3 credits)

- The theory content is presented helped by the materials prepared by the teaching staff
- It also has an applied component because, when possible, we work on concrete examples

### Mid-size Group: Problems / Laboratory Sessions (3 credits)

- The previously proposed exercises, which should have been prepared by the students, are solved
- Pros and cons of the proposed solutions are commented
- There will be two laboratory sessions to show the query language of the NoSQL MongoDB Database

### Autonomous work

- Study of the given materials and solving the proposed exercises
- Homework/exercises and/or programming projects

## Development plan

Setmana	Presencial GG	Presencial GM	No Presencial
1	Presentation. Optimization	Optimization	Study and problem solving
2	Optimization	Optimization	Study and problem solving
3	Distributed DB	Optimization Exercises	Study and problem solving Optimization Exercise (Evaluable Activity)
4	Distributed DB	Distributed DB Exercises	Study and problem solving

Setmana	Presencial GG	Presencial GM	No Presencial
5	Distributed DB	Distributed DB Exercises	Study and problem solving Distributed DB Exercise (Evaluable Activity)
6	Distributed DB	Distributed DB Exercises	Study MongoDB Reference Reading
7	Data layer	Distributed DB Exercises	Study Neo4J Reference Reading
8	Data layer	Data layer Laboratory	Study
9	Evaluation		
10	Modern java	Modern java	Study and problem solving
11	Modern java	Modern java	Study and problem solving
12	OO Design	OO Design Exercises	Study and problem solving
13	OO Design	OO Design Exercises	Study and problem solving Patterns Homework (Evaluable Activity)
14	OO Design	OO Design Exercises	Study and problem solving Patterns Homework (Evaluable Activity)
15	OO Design	Exam Preparation	Study and problem solving Patterns Homework (Evaluable Activity)
16	Evaluation		Study and problem solving
17	Evaluation		Study and problem solving
18	Tutorials		
19	Recovery		Study and problem solving

## Evaluation

### Continuous evaluation

BLOCK	Description	Weight	Minimum grade	Week (approx)	Ind / Group
1	Exercise DB	10%	No	3	group 3
2	Exercise DB	10%	No	6	group 3
3	First midterm	30%	<b>3,0</b>	9 / 20	Individual
4	Exercise Design	10%	No	12	group 3
5	Exercise Design	10%	No	14	group 3
6	Second midterm	30%	<b>3,0</b>	16-18 / 20	Individual

### Alternative evaluation

Two exams, one corresponding to each midterm, with a 50% weight and minimum grade of 3,0

**NOTE:** The evaluation will be done according to the [Regulations for the Assessment and Grading of Student Learning in UDL Bachelor's and Master's Degrees](#) (translation to english, pending)

## Bibliography

### Basic bibliography

- Henrietta Dombrovskaya, Boris Novikov, Anna Bailliekova: PostgreSQL Query Optimization. Apress (2021)
- Héctor García Molina, Jeffrey D. Ullman, Jennifer Widom. Database Systems. The Complete Book (2nd edition). Pearson Prentice Hall (2009)
- Stephen J. Metsker, William C. Wake: Design Patterns in Java, Addison-Wesley (2006)
- Pramod J. Sadalage, Martin Fowler. No SQL Distilled. A Brief Guide to the Emerging World of Polyglot Persistence. AddisonWesleyProfessional (2012)

### Complementary bibliography

- M. Tamer Özsu, Patrick Valduriez. Principles of Distributed Database Systems (4th edition). Springer (2019)
- Ramez Elmasri, Shamkant B. Navathe. Fundamentals of Database Systems (7th edition). Pearson. (2015)
- Eric Gamma, Richard Helm, Ralph Johnson, John Vlissides: Patrones de Diseño, Addison-Wesley (1995)
- Dan Sullivan: NoSQL for Mere Mortals, Addison-Wesley (2015)