



Universitat de Lleida

# DEGREE CURRICULUM **DATABASES**

Coordination: OLIVA SOLE, MARTA

Academic year 2023-24

Subject's general information

<b>Subject name</b>	DATABASES		
<b>Code</b>	102016		
<b>Semester</b>	1st Q(SEMESTER) CONTINUED EVALUATION		
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>
	Bachelor's Degree in Computer Engineering	2	COMPULSORY
	Double bachelor's degree: Degree in Computer Engineering and Degree in Business Administration and Management	3	COMPULSORY
	Master's Degree in Informatics Engineering		COMPLEMENTARY TRAINING
<b>Modality</b>	Attendance-based		
<b>Course number of credits (ECTS)</b>	6		
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRAULA	TEORIA
	<b>Number of credits</b>	3	3
	<b>Number of groups</b>	2	2
<b>Coordination</b>	OLIVA SOLE, MARTA		
<b>Department</b>	COMPUTER ENGINEERING AND DIGITAL DESIGN		
<b>Teaching load distribution between lectures and independent student work</b>	6 ECTS = 25x6 = 150 working hours 40 % -> 60 classroom hours 60 % -> 90 hours of autonomous work of the student		
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.		
<b>Language</b>	Raul Ariño - Catalan Marta Oliva - Catalan		

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
ARIÑO CAGIGÓS, RAÚL	raul.arino@udl.cat	11	
OLIVA SOLE, MARTA	marta.oliva@udl.cat	1	arrange by email

## Subject's extra information

It is based on the knowledge acquired in the courses: Estructures de Dades and Programació 2. Specifically, it is necessary to have assimilated the concepts related to structures for the persistent storage (files).

Course taught in the 1st semester of 2nd year of the program. It is part of the Matter "Anàlisi i Disseny d'Aplicacions" in the module "Formació Comú a la branca d'Informàtica". It introduces students to the Database technology as usual mechanism for the management, handling and storage of information, focusing on the relational model. The knowledge acquired in this course will be applicable in most careers, especially those who are dedicated to developing applications.

## Learning objectives

- Use a relational database manager.
- Understand database technology as the usual mechanism to manage, manipulate and store information.
- Manage a database in a relational manager.
- Understand the functional structure of a Relational Database Management System.
- Design a database according to user needs.
- Build statements to manipulate databases based in the SQL standard.
- Build sentences for accessing databases based in the SQL standard.
- Optimize a database according to user needs.
- Understanding the user needs of information storage.

## Competences

### Cross-disciplinary competences

EPS11. Capacity to understand the needs of the user expressed in a no 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. Introduction

- 1.1. Concepte de Base de Dades
- 1.2. Objectius de les Bases de Dades
- 1.3. Arquitectura d'un Sistema de Bases de Dades
- 1.4. Independència de les dades
- 1.5. L'administrador de bases de dades. Diccionari de dades.
- 1.6. Evolució dels Sistemes de Bases de Dades

### 2. The relational model

- 2.1. Descripció del model
- 2.2. Àlgebra relacional
- 2.3. Càlcul relacional
- 2.4. Un petit exemple

### 3. SQL (DDL,DML)

- 3.1. L'estàndard SQL
- 3.2. Sentències de definició
- 3.3. Sentències de manipulació
- 3.4. Sentències de control
- 3.5. Llenguatge procedural
- 3.6. Optimització de consultes

### 4. Normalization

- 4.1. Anomalies en un esquema de BD.
- 4.2. Primera forma normal (1FN).
- 4.3. Dependències funcionals.
- 4.4. Segona forma normal (2FN).
- 4.5. Tercera forma normal (3FN).
- 4.6. Forma normal Boyce-Codd (FNBC).

### 5. Conceptual and logical design

- 5.1. Introducció.
- 5.2. Classes i atributs.
- 5.3. Interrelacions.
- 5.4. Altres.
- 5.5. Traducció dels diagrames de classes d'UML al model relacional.

### 6. Components of a DBMS

- 6.1. Arquitectura funcional d'un SGBD.
- 6.2. Processador de Vistes
- 6.3. Integritat
- 6.4. Gestor de Concurrència
- 6.5. Gestor de Dades

### 7. Physical design

- 7.1. Introducció.
- 7.2. Factors que influeixen en el disseny físic.
- 7.3. Decisions de disseny físic.
- 7.4. Ajustament de la BD en operació.

## Methodology

The course is structured in two Class Groups to ensure that the groups are not too large. Each student has to follow the sessions of the group assigned to her/him.

### Face-to-face class sessions (6 credits), which include theoretical content and problems/practices:

- Lecture: classes based on notes and transparencies where the concepts of the subject will be presented.
- Problems: The concepts of the subject will work through a series of exercises to be resolved collaboratively.
- Some exercises are previously proposed by the teachers and the students have to prepare them.
- We analyze the pros and cons of the solutions provided by the students.
- There are lab sessions planned to work with the PostgreSQL database management system.

### Autonomous work (No Presential)

- Study of teaching materials and resolution of proposed problems.
- The homework exercises and practices will be completed outside of class time.

## Development plan

Week	Description	GG Theory Activity	GG Problems Activity	Autonomous Work
1	Presentation Introduccion, relational model	Presentation of the subject T1: Introduccion, T2: relational model	PostgreSQL working environment	Study related teaching materials, resolution of SQL exercises
2	Relational model, SQL	T2: Relational model, T3: SQL	SQL-DDL (DDL y INSERT,DELETE, UPDATE)	Study related teaching materials, resolution of SQL exercises
3	Relational model, SQL	T2: Relational model, (Relational algebra) T3: SQL	SQL-DML (SELECT)	Study related teaching materials, resolution of SQL exercises
4	Normalization	T4: Normalization	SQL-DML (SELECT)	Study related teaching materials, resolution of SQL exercises
5	Normalization	T4: Normalization (exercises)	SQL-DML (SELECT)	Study related teaching materials, resolution of SQL exercises
6	Conceptual and logical design	T5: Conceptual and logical design, Class diagrams	SQL-DDL, SQL-DML (TRANSACTION, LOCK, GRANT REVOKE)	Study related teaching materials, resolution of SQL exercises
7	Conceptual and logical design	T5: Conceptual and logical design, Class diagrams, translation	Advanced SQL / Functions and Triggers	Study related teaching materials, resolution of SQL exercises
8	Conceptual and logical design	Example of a UML case	UML Exercises-Translation	Study related teaching materials, resolution of SQL exercises
9		First partial exam		Prepare the exam
10	Conceptual and logical design	UML	UML, SQL	Study related teaching materials, resolution of conceptual design exercises, using UML class diagrams, and SQL excercises

11	Conceptual and logical design	UML	UML, SQL	Study related teaching materials, resolution of conceptual design exercises, using UML class diagrams, and SQL exercises
12	DBMS Components	T6: DBMS Components, integrity	UML, SQL	Study related teaching materials, resolution of conceptual design exercises, using UML class diagrams, and SQL exercises
13	DBMS Components	T6: Transaction management, concurrency management	UML, SQL	Study related teaching materials, resolution of conceptual design exercises, using UML class diagrams, and SQL exercises
14	DBMS Components	T6: Transaction management, concurrency management	Transaction management, concurrency management exercises	Study related teaching materials, resolution of transaction management and concurrency management exercises
15	Physical Design	T7: Physical design	Transaction management, concurrency management exercises	Study related teaching materials, resolution of transaction management and concurrency management exercises
16				Prepare the exam
17		Second partial exam		Prepare the exam
18				Prepare the exam (if required)
19		Recovery		Prepare the exam (if required)

## Evaluation

Ac.	Evaluation Activities	Weight	Minimum Note	Week	In group	Mandatory	Recoverable
P1	Partial 1	40%	NO	9	NO	SI	SI
P2	Partial 2	40%	NO	16-17	NO	SI	SI
Pr1	SQL Project	10%	NO	6-7	SI (=4)	NO	NO
E1	Design exercise	10%	NO	14	SI (=4)	NO	NO
For class participation and for SQL-DML exercises in PostgreSQL environment delivered, can earn up to a maximum of 0.5 added to the final score. ( EndNote maximum : 10 points)							
<b>EndNote</b> = 0,4*P1 + 0,4*P2 + 0,1*Pr1 + 0,1*E1							

## Bibliography

Garcia-Molina H., Ullman J. D., Widom J. *Database Systems. The Complete Book*. 2nd edition. Pearson Education Inc. 2009.

Date C.J. *An Introduction to Database Systems* (Eighth Edition). Pearson. 2003.

Database Language SQL (1992). Document ISO/IEC 9075:1992. International Organization for Standardization (ISO).

Database Language SQL (1992). Document ANSI/X3 [135-1992](#). American National Standards Institute (ANSI).