1. OVERVIEW

Subject area	Databases
Degree	Bachelor's Degree in Physics
School/Faculty	Architecture, Engineering and Design
Year	Third
ECTS	6 ECTS
Type	Optional
Language(s)	Spanish
Delivery mode	On campus
Semester	1

2. INTRODUCTION

Databases is a compulsory subject in the first year of the Bachelor's Degree in Engineering Mathematics for Data Analysis. It is worth six ECTS credits, like all other compulsory subjects on the degree.

The aim of this subject is for students to learn how to design and implement solutions that require the use of databases. The focus will be on designing, developing and ensuring the quality of the solutions, working individually or in groups and using the most suitable tools in each case.

3. SKILLS AND LEARNING OUTCOMES

Basic skills and general skills (CB and CG, respectively, by their acronym in Spanish):
- CB1: Students have shown their knowledge and understanding of a study area originating from general secondary school education, and are usually at the level where, with the support of more advanced textbooks, they may also demonstrate awareness of the latest developments in their field of study.
- CB2: Students can apply their knowledge to their work or vocation in a professional manner and possess the skills which are usually evident through the forming and defending of opinions and resolving problems within their study area.
- CG3. Knowledge and application of computer technology and tools, mainly databases, algorithm programming and artificial intelligence, to build, analyse and interpret data sources, including data collection, preprocessing, storage, analysis and presentation of results, which support decision-making processes in various fields.

Transversal skills (CT, by the acronym in Spanish):
- CT6: Oral or written communication: Ability to communicate and gather information, ideas, opinions and viewpoints to understand and be able to act, spoken through words or gestures or written through words and/or graphic elements.
- CT9: Interpersonal relationship skills: Ability to maintain positive relationships with other people through assertive verbal and non-verbal communication. This means being able to express or

communicate what you want, think or feel without discomforting, offending or harming the feelings of other people.
- CT13: Problem solving: Ability to resolve an unclear or complex issue or situation which has no established solution and requires skill to reach a conclusion.

Specific skills (CE, by the acronym in Spanish):
- CE2: Understanding of the basic fundamentals, principles and applications of computer systems, software development and databases.
- CE3: Knowledge and efficient application of data type models and algorithms in order to develop solutions to problems.
- CE4: Understanding of the techniques of design, implementation, capture, storage and exploitation of databases and database management systems, both structured and unstructured, monolithic and distributed.

Learning outcomes (RA, by the acronym in Spanish):
- RA1 - To develop algorithmic thinking. Transform a problem into a sequence of actions that can be taken in order to solve the problem.
- RA2 - To design and implement solutions to solve problems of a medium level of difficulty, including the use of databases, data structures and object-orientated programming.
- RA3 - To use database environments for the corresponding data storage.
- RA4 - To learn the value of proper documentation of the created designs to ensure the necessary quality.
- RA5 - To participate in group work, giving opinions, using positive and active listening and empathising with the position of others.

The following table shows how the skills developed in the subject area match up with the intended learning outcomes:

Skills	Learning outcomes
CE2, CE3, CT13, CB2	RA1 - To develop algorithmic thinking. Transform a problem into a sequence of actions that can be taken in order to solve the problem.
CE2, CE3, CE4, CT13, CB2	RA2 - To design and implement solutions to solve problems of a medium level of difficulty, including the use of databases, data structures and object-orientated programming.
CE4, CT13, CB2	RA3 - To use database environments for the corresponding data storage.
CE2, CE4, CT13, CB2	RA4 - To learn the value of proper documentation of the created designs to ensure the necessary quality.
CT6, CT9	RA5 - To participate in group work, giving opinions, using positive and active listening and empathising with the position of others.

4. CONTENTS

The subject is organised into five learning units, which in turn are divided into themes (four or five themes depending on the units):

Unit 1. Foundations of databases

1.1. Purpose, abstraction, models.
1.2. Types of databases. Instances and schemas.
1.3. DDL and DML.
1.4. Database administrator and users.

Unit 2. Conceptual model

2.1. Entities and entity sets.
2.2. Relationships and relationship sets.
2.3. Attributes and keys.
2.4. Entity–Relationship diagram.

Unit 3. Relational model

3.1. Structure of relational databases.
3.2. Converting ER diagrams into tables.
3.3. Tuples and domains.
3.4. Views, sequences and indexes.

Unit 4. Normalisation and physical figures

4.1. Fundamentals and normal forms.
4.2. Normalisation with functional or multi-valued dependencies.
4.3. Subtype mapping and implementation.

Unit 5. SQL language. Database implementation.

6.1. Basic components of an SQL sentence.
6.2. Basic SQL queries.
6.3. Interpretation of queries and operators.
6.4. Set operations.
6.5. Database operation schema.

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:
• Lectures.
• Case studies.
• Collaborative learning.
• Problem-based learning.
• Project-based learning.

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

On campus:

Learning activity	Number of hours
Lectures	50

Individual and/or collaborative practical activities	35
Independent working	40
Tutorials, academic monitoring and assessment	25
TOTAL	**150**

7. ASSESSMENT

The assessment systems, plus their weighting in the final grade for the subject area, are as follows:

On campus:

Assessment system	Weighting
Exams and tests	60%
Individual and collaborative practical activities	25%
Oral defence	5%
Performance observation	10%

On the Virtual Campus, when you open the subject area, you'll find details of your assessable tasks, including the submission dates and assessment procedures for each task.

8. BIBLIOGRAPHY

The reference material for the subject area is as follows:
- Bases de Datos Relacionales, MATILDE CELMA, Ed. PEARSON.
- Entity Modeling: Techniques and application, RONALD G. ROSS