

## SUBJECT TEACHING GUIDE

G691 - Advanced Data Bases

Degree in Computer Systems Engineering

Academic year 2022-2023

1. IDENTIFYING DATA					
Degree	Degree in Computer Systems Engineering			Type and Year	Optional. Year 4
Faculty	Faculty of Sciences				
Discipline	Subject Area: Advanced Databases Optional Module				
Course unit title and code	G691 - Advanced Data Bases				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web	<a href="https://moodle.unican.es/course/view.php?id=12158">https://moodle.unican.es/course/view.php?id=12158</a>				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERÍA INFORMÁTICA Y ELECTRÓNICA				
Name of lecturer	MARTA ELENA ZORRILLA PANTALEON				
E-mail	marta.zorrilla@unican.es				
Office	Facultad de Ciencias. Planta: + 1. DESPACHO PROFESOR (1072)				
Other lecturers	ALFONSO DE LA VEGA RUIZ				

### 3.1 LEARNING OUTCOMES

- Know the evolution of data base technologies and their current trends.
- Model driven design: from conceptual design to physical design
- Create and manage active data bases.
- Learn different programatic issues in SQL standard
- Desing and manage temporal data bases and use SQL/OLAP extension
- Know object data base fundamentals.
- Design semi-structured data models and manage them according to SQL/XML and SQL/JSON.
- Learn the basis of NoSQL movement and design data bases under this paradigm.
- Know the basis of specific-domain data base technologies (DB for temporal series, DB in memory, spatial DB so on).

### 4. OBJECTIVES

- Overview of database technologies.
- Design and programming of active databases according to SQL:2016 standard.
- Design and management of temporal databases and use of SQL/OLAP extension.
- Know semi-structured data models according to SQL:2016 standard.
- Know the object data model proposed by ODMG and the object-relational model gathered in SQL:2016 standard.
- Understand the "big data" term and know the features of the most successful NoSQL technologies.
- Assess the most suitable database technology to meet data management requirements.

### 6. COURSE ORGANIZATION

#### CONTENTS

1	Present and future of data base technologies: Evolution in data management. New challenges. Maturity of technologies. Research lines in data bases.
2	Relational data model review. Active data bases: Taxonomy of concepts. Applications of active databases: integrity maintenance, derived data, replication. Design of active databases. Programatic SQL. SQL\ Temporal, SQL\OLAP. Conceptual design with UML and its transformation to relational.
3	Object data bases Object-oriented model. Object Persistence. SQL Standard. ODMG standard. From UML conceptual model to object-relational model. Pros and cons between both paradigms.
4	Semi-structured data. XML and XML Schemas. The XQuery language. XPath expressions. XML, JSON and data bases. SQL/XML and SQL/JSON standard.
5	NoSQL: overview. Concepts. Pros and cons. Taxonomy: key-value, column family, graphs and document-oriented. Criteria design. NewSQL and federated data bases vs NoSQL.
6	Other type of data bases: spatial data bases, GIS, data bases for temporal series, real time data bases, search engines and so on.

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Written exam of the two first units.	Written exam	No	Yes	20,00
Written exam of the rest of units	Written exam	No	Yes	20,00
Project: each student will design and implement a data base in which will use the technologies explained in the semester.	Work	No	Yes	30,00
Students in small groups will describe a BD technology not addressed in the semester. They will write a report and explain its content in the classroom.	Work	No	Yes	10,00
Participation in the classroom, discussion of articles and solving exercises	Others	No	Yes	20,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
<p>The course is passed if the weighted-sum of all assessments is greater than or equal to 5 out of 10. Otherwise, the student will have to carry out the final written exam, which will have a similar structure to the ones performed during the course (continuous evaluation).</p> <p>The learners will be able to do additional activities in order to raise their mark in one point out of ten.</p>				
<b>Observations for part-time students</b>				
<p>Part time students will be assessed according to:</p> <ul style="list-style-type: none"> <li>- written exam: 60 %</li> <li>- individual project: 30%</li> <li>- team project: 10 %</li> </ul> <p>The mark will be computed as the weighted sum of all assesments.</p> <p>The learners will be able to do additional activities in order to raise their mark in one point out of ten.</p>				

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

Elmasri, R., Navathe, S.B., Fundamentals of database systems. 7th edition. Pearson Education, 2017.

Eric Redmond. Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement. 2012