# SUBJECT TEACHING GUIDE

## G665 - Development of Information Systems

## Degree in Computer Systems Engineering

### Academic year 2023-2024

| 1. IDENTIFYING DATA | | | | |
|---|---|---|---|---|
| Degree | Degree in Computer Systems Engineering | | Type and Year | Optional. Year 3 |
| Faculty | Faculty of Sciences | | | |
| Discipline | Subject Area: Software Engineering<br>Mention in Software Engineering | | | |
| Course unit title and code | G665 - Development of Information Systems | | | |
| Number of ECTS credits allocated | 6 | Term | Semester based (2) | |
| Web | https://moodle.unican.es/course/view.php?id=12136 | | | |
| 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 | |

| 3.1 LEARNING OUTCOMES |
|---|
| - Design and development of information systems with relational back-end using the database life cycle: conceptual, logical and physical design |
| - Design and management of data warehouses |
| - Development of the persistence layer of an Information System with relational backend |
| - Security in Information Systems with relational backend |

## 4. OBJECTIVES

Specifiy, design and implement relational databases and multidimensional data bases.
Use of data models and CASE tools for conceptual, logical and physical design.
Master the key concepts of relational database technology (physical and logical data independence, transaction concept, indexing and efficiency, etc.)
Acquire the basics of dimensional model and OLAP technology.
Know common patterns for the enterprise application development and, in particular, design and implement the persistence layer.
Define and programme tests for evaluating the robustness of the persistence layer and data base implemented according to requirements.
Master the SQL language (standard SQL2011)
Know the threats and vulnerabilities of information systems and, in particular, in databases and how to mitigate them.

## 6. COURSE ORGANIZATION

| CONTENTS | |
|---|---|
| 1 | Topic 1: Analysis and design of information systems |
| 1.1 | Unit 1: Introduction. Life cycle of information systems. Database design phases : conceptual design, logical design and physical design. Techniques, data models and tools. |
| 1.2 | Unit 2. Conceptual design: Requirements. Entity-relationship. UML. OCL. |
| 1.3 | Unit 3. Logical design: Transformation rules from EER to relational model. Transformation rules from UML to relational model. |
| 1.4 | Unit 4. Physical design. Files. Tables and contraints. Views. Indexes. Transactions and levels of isolation. Query optimization. |
| 2 | Topic 2: Implementation of database applications |
| 2.1 | Unit 5: Enterprise application architecture. Introduction. Patterns. Persistence layer. Persistence frameworks |
| 2.2 | Unit 6. Security in Information systems: Introduction. Threats. Elements to securize. Security in DBMSs. Security in database applications. |
| 2.3 | Unit 7. Testing. Type of tests: database, performance, security, back-up. Design and creation of testing cases. Techniques and tools. |
| 3 | Topic 3: Analysis and design of data warehouses |
| 3.1 | Unit 8: Introduction to data warehousing. OLTP vs OLAP. Architecture and tools. |
| 3.2 | Unit 9: Multidimensional design. Life cycle. Fact and dimension tables. Star and snowflake models. Support for dimensional databases in SQL:2016 |

## 7. ASSESSMENT METHODS AND CRITERIA

| Description | Type | Final Eval. | Reassessn | % |
|---|---|---|---|---|
| Partial written exam: questions and exercises | Written exam | No | Yes | 35,00 |
| Partial written exam: questions and exercises | Written exam | No | Yes | 20,00 |
| Lab exam: SQL | Laboratory evaluation | Yes | Yes | 15,00 |
| Individual project: design and building of a database and its persistence layer | Work | No | Yes | 30,00 |
| Final exam: tests, questions and exercises | Written exam | Yes | Yes | 0,00 |
| TOTAL | | | | 100,00 |

**Observations**

Final mark will be computed as weighted-sum of all learning activities.
Qualification can be increased up to 1 point by performing activities during the semester, as long as the final mark is higher than 4,5.

The evaluation in July will be:
- Written exam: 55%
- Lab exam: 15%
- Individual project: 30%

**Observations for part-time students**

Part time students will be assessed according to:
- Written exam: 55%
- Lab exam: 15%
- Peer project: 30%
Qualification can be increased up to 1 points by performing activities during the semester, as long as the final mark is higher than 4,5

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

**BASIC**

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

Alejandro Vaisman, Esteban Zimányi. Data warehouse systems : design and implementation.
Springer, cop. 2014. ISBN: 978-3-642-54654-9