Basic principles of databases

Academic Year: (2022 / 2023) **Review date: 03-09-2022**

Department assigned to the subject: Computer Science and Engineering Department

Coordinating teacher: MORATO LARA, JORGE LUIS

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

OBJECTIVES

The aim of this course is that the student understands the role of databases within an information system, know the most important properties that define it, and acquire a methodology for their development and management.

1. Cross/Generic Capabilities
1.a) Analysis and synthesis abilities
1.b) Organize and plan abilities
1.c) Troubleshooting
1.d) Teamwork
1.e) Ability to apply knowledge in practice
2. Specific Capabilities
2.a) Cognitive (Knowledge)
2.a.1) Fundamentals of Databases
2.a.2) Relational data model
2.a.3) SQL Language
2.a.4) Datawarehouses
2.b) Procedural/Instrumental (Know how)
2.b.1) Database Design using conceptual and logical models
2.b.2) Adquiring practical experience in the use of SQL lenguage
2.b.3) Implementing Database Systems using a DBMS
2.b.4) Querying and developing reports
2.c) Attitudinal (To be)
2.c.1) Ability to create designs (creativity)
2.c.2) To discuss and clarify the diverse solutions to a problem

DESCRIPTION OF CONTENTS: PROGRAMME

The descriptors associated with the subject are presented :
Relational Data Model. Relational Databases Management Systems. SQL language: definition and manipulation. Data Warehouse: ROLAP, NoSQL.
Syllabus:

1. Introduction to Databases
1.1. The role of Databases in Information Systems
1.2. Concepts and objectives of Databases (DB)
1.3. Types of Databases
1.4. Database Management Systems (DBMS)
1.5. Methodology for Databases Development

2. Conceptual Model: Entity-relationship model
2.1. Introduction to Entity-Relationship Model
2.2. Static Components of ER Model
2.3. Generalization/Specialization
2.4. n-ary relationships
2.7 Derived attributes

3. Relational Model
This topic explains the Relational Model for Database Design. The model is explained by introducing the basic elements and the inherent and semantics constraints. It also explains the SQL query language by which relational databases can be implemented.
3.1. Introduction and objectives
3.2. Relational Data model structure

3.3. Relational Data model constraints
3.4 Relational graph

4. SQL Language
4.1. Static model. Definition Language
4.2. Dynamic model. Manipulation Language
4.3. Control Language
4.4. Exercises

5. Datawarehouse
5.1. Concept and architecture
5.2. Development methodology
5.2. Multidimensional model. Design
5.3. ETL process(Extract, Transform and Load)
5.4. Implementation: ROLAP (Relational Online Analytical Proccessing)
5.5. Queries

6. NoSQL Databases
6.1. History
6.2. Definition
6.3. Characteristics
6.4. ACID
6.5. Types of NoSQL Databases. Practical cases

LEARNING ACTIVITIES AND METHODOLOGY

- Theoretical classes: 1 ECTS. Aim to achieve the specific cognitive skills of the subject
- Practical Lessons: 1 ECTS. Develop specific instrumental skills and most of the cross capabilities, such as teamwork, to apply knowledge to practice, to plan and organize, and to analyze and synthesize. They are also aim to develop specific attitude skills, such as understanding the design and development of an information system.
- Supervised Academic Activities
a) With the presence of the lecturer: 0.5 ECTS guidance on alternative paths of study through individual or small groups tutored activities. Discussion and joint resolution of problems. Be made at least one collective tutoring session .

b) Without the presence of the lecturer: 1.5 ECTS. Exercises and basic and supplementary readings suggested by the lecturer.
c) Working group: 1.5 ECTS. Consists in the development of an information system proposed in practical classes, through two implementations (relational databases and datawarehouses) and the development of a report.
- Review and Exercises: 0.5 ECTS. They aim to influence and complement in the development of specific cognitive and procedural skills.

ASSESSMENT SYSTEM

Exercises and examinations serve as a training activity and for the evaluation system.
This evaluation system includes the evaluation of academic activities and practical with the following weights.
Theoretic-practical tests: 3 points
Teamwork (practical): 4.5 points
The maximum possible score on the theoretic-practical part can be obtained by carrying out a series of tests and exercises in class (continuous assessment).
The theoretical and practical tests will preferably be carried out in a face-to-face format, in case it is not possible to do it through the teaching platform. The end-of-tem-examination is part of the individual activities mentioned.
Students who do not follow this route, will have the opportunity to access this part of the assessment through a final exam with a value of 80%

% end-of-term-examination:	25
% of continuous assessment (assigments, laboratory, practicals…):	75

BASIC BIBLIOGRAPHY

- Dolores Cuadra, Elena Castro, Ana Iglesias, Paloma Martínez, Javier Calle, César de Pablo, Harith Al-Jumaily y Lourdes Moreno (2007). Desarrollo de Bases de Datos: casos prácticos desde el análisis a la implementación., RA-MA, 2007

- Elmasri R. y Navathe, S. B. (2007). Fundamentos de Sistemas de Bases de Datos., Pearson Addison Wesley.

- W. H. Inmon (2005). Building the Data Warehouse, 3rd Edition., John Wiley & Sons.