Data architecture

Academic Year: **(2023 / 2024)**   **Review date: 28-04-2023**

Department assigned to the subject: Computer Science and Engineering Department

Coordinating teacher: MORENO LOPEZ, LOURDES

Type: Compulsory ECTS Credits : 6.0

Year : 4 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)
Files and databases (2 course / 2 semester))
Programming (Course: 1 / Semester: 1)
Data Structures and Algorithms (Course: 1 / Semester: 2)
Computer Structure (Curso: 2 / Cuatrimestre: 1)

SKILLS AND LEARNING OUTCOMES
¿   Identify different data management solutions depending on the data structure
¿   Understand and apply noSQL database technologies to store structured and unstructured data.
¿   Know and apply the principles of database administration (confidentiality, availability and
integrity).

DESCRIPTION OF CONTENTS: PROGRAMME
Introduction
* Data life cycle
* Data governance. Metadata management. Data quality management.
* Structured and unstructured data storage
* Relational and NoSQL databases. ACID and BASE architectures

Relational Database Management
* Database administrator. Functions. Tools. Cloud services
* Security and Confidentiality. Integrity. Recovery
* Monitoring. Optimization

Distributed Databases
- Distributed architectures
- Principles of design
- Distributed query processing

NoSQL databases
* Introduction to NoSQL systems.
* Types of NoSQL systems: Key-value Pair Based, Document-oriented, Column-oriented, and Graphs-based.
* NoSQL Database Management

LEARNING ACTIVITIES AND METHODOLOGY
* Lectures: 1 ECTS. The objective is to present theoretical concepts and techniques for designing and managing storage systems and architectures.
* Practical/Lab sessions: 1 ECTS. The objective is the development of specific instrumental skills, as well as problem-solving skills and application of knowledge.
* Continuous assessment tests (individual work): 1ECTS. The objective is to complete the development of the specific instrumental skills and start the development of the specific attitudinal skills, as well as the transversal skills of problem-solving and application of knowledge.
* Projects (in-group): 2.5 ECTS. The objective is to complete cand integrate the development of all the specific skills related to the resolution and implementation of practical cases where the problem statement, the choice of resolution method, the results obtained, and their interpretation are well documented.
* Tutorials: individualized assistance (individual tutorials) or group (collective tutorials) to students by the teacher.

* Final exam: 0.5 ECTS. The objective is the development of specific cognitive and procedural abilities. It especially reflects the use of master classes.

ASSESSMENT SYSTEM

FINAL EXAM. The overall knowledge, skills, and abilities acquired throughout the entire course will be evaluated. CONTINUOUS ASSESSMENT. Projects, presentations, participation in debates, in-class presentations, exercises, practical cases, and work carried out in the workshops throughout the entire course will be evaluated.

There will be a final exam. Besides, there will be projects on Relational Database Management as well as practices in the Design and Management of NoSQL Databases.

- Continuous assessment. projects (50%)
- Final Exam (50%)

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

BASIC BIBLIOGRAPHY

- Elmasri, Ramez, Navathe, Sham. Fundamentals of database systems, Pearson Addison Wesley., 2017

- M. Tamer Özsu, Patrick Valduriez Principles of Distributed Database Systems, Springer-Verlarg, 2011

- Ramakrishnan, Raghu, Gehrke, Johannes Database management systems, McGraw-Hill, 2003

- Stefano Ceri, Giuseppe Pelagatti Distributed Database. Principles and System, McGraw-Hill, 1988

ADDITIONAL BIBLIOGRAPHY

- Andreas Meier & Michael Kaufmann SQL & NoSQL Databases: Models, Languages, Consistency Options and Architectures for Big Data Management, , Springer, 2019
- Bradshaw, S., Brazil, E., & Chodorow, K. MongoDB: the definitive guide: powerful and scalable data storage. , O'Reilly Media., 2019
- Evren Eryurek, Uri Gilad, Valliappa Lakshmanan, Anita Kibunguchy, Jessi Ashdown Data Governance: The Definitive Guide: People, Processes, and Tools to Operationalize Data Trustworthiness, O'Reilly Media, 2021

- Ian Robinson, Jim Webber, Emil Eifrem Graph Databases. 2nd. edition., O'Reilly Media, 2015

- Rahimi, S. K., & Haug, F. S. Distributed database management systems: A Practical Approach. , John Wiley & Sons, 2010
- Redmond, E. &Wilson Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement, The Pragmatic Bookshelf, 2010
- Sadalage, P. & Fowler. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Education, 2013