INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Databases			Field of study	Information Systems		
Bachelor in	Informatics Engineering			School	School of Technology and Management		
Academic Year	2025/2026	Year of study	2	Level	1-2	ECTS credits	6.0
Type	Semestral	Semester	1	Code	9119-850-2101-00-25		

Workload (hours)	162	Contact hours	T	-	TP	60	PL	-	TC	-	S	-	E	-	OT	-	O	-

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s): João Paulo Ribeiro Pereira, Marisa Cristina Torrado Ortega, Tiago Filipe Lino Santos

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Understand the database development process, identifying its main phases, methodologies, and best practices.
2. Distinguish between different data models, as well as the logical and physical implementation approaches of databases.
3. Demonstrate knowledge of the structure, components, and core functionalities of a Database Management System (DBMS).
4. Apply data modeling and normalization techniques to design consistent and efficient relation-al schemas.
5. Use the SQL language, within a MySQL environment, for data definition, manipulation, and querying.
6. Understand the fundamental principles of NoSQL databases and analyze their relevance in the current context.
7. Compare relational and non-relational models, assessing their advantages, limitations, and suitability for different application contexts.
8. Design and implement databases in MongoDB, using CRUD operations and exploring ad-vanced features such as indexing, aggregations, and transactions.

Prerequisites

Not applicable

Course contents

1. Introduction to Database Environments
2. Database Management Systems (DBMS)
3. Data Modeling and Normalization
4. Relational Algebra and SQL (MySQL)
5. NoSQL Databases
6. MongoDB

Course contents (extended version)

1. Introduction to Database Environments
   - Concept of Information System
   - Information in Organizations
   - Information Technologies
   - Information Management
2. Database Management Systems (DBMS)
   - Approach and Advantages
   - DBMS Architecture
   - Types of Users in a DBMS
3. Data Modeling and Normalization
   - Integrity Maintenance
   - Redundancy and Keys
   - E-R Diagram
   - Relational Model
4. Relational Algebra and SQL (MySQL)
   - Concepts and Application of Relational Algebra
   - MySQL Administration Tools
   - DDL Commands
   - DML Commands
   - DCL Commands
   - Procedure, Function and Triggers
5. NoSQL Databases
   - NoSQL Databases
   - Types of NoSQL Databases
   - Document-oriented databases
6. MongoDB
   - JSON and BSON structures
   - Data modeling
   - Creation of collections and documents
   - CRUD operations and aggregation
   - Indexing and transactions

Recommended reading

1. Elmasri, R., & Navathe, S. (2020). Fundamentals of Database Systems. Pearson.
2. Coronel, C., & Morris, S. (2019). Database Systems: Design, Implementation, & Manage-ment. Cengage Learning.
3. Harrison, G. (2015). Next Generation Databases: NoSQL, NewSQL, and Big Data. Apress.
4. Chodorow, K. (2019). MongoDB: The Definitive Guide. O'Reilly Media.

Teaching and learning methods

Mainly affirmative/interrogative (open variant) method in the theoretical lessons. Interrogative and experimental methods in practical lessons (60 hours). Not presential period: individual and group study of the lesson subjects, reading of the bibliography, resolution of practical assignments.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)

Assessment methods

- Final Written Exam - 50% (Minimum Mandatory Grade of 7 (0-20).)
- Practical Work - 50% (Practical assessments solved in the classroom.)

2. Alternative 2 - (Regular, Student Worker) (Supplementary, Special)
   - Final Written Exam - 100%

Language of instruction

1. Portuguese
2. English

Electronic validation

João Paulo Ribeiro Pereira	Tiago Miguel Ferreira Guimaraes Pedrosa	Isabel Maria Lopes	José Carlos Rufino Amaro
14-10-2025	15-10-2025	15-10-2025	01-11-2025