

IDENTIFICATION

Course code : DAT501
ECTS : 2

DURATION

Lectures : 4
Tutorial classes : 12
Labs : 8
Total : 24

Project :
Personnal work :

ASSESSMENT

Continuous assessments and evaluated practical work.

TEACHING MATERIALS

Slides and guided practical work sheets.

LANGUAGE

English

CONTACT

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UE : UE5-DATA

COURSE : Database Fundamentals : Concepts and Practices

SCOPE OF THE COURSE

OBJECTIVES

The goal of this course is to understand the principles of data management.

- Data and information concepts
- Data modeling
- Database query languages
- Data organization architecture
- Specialized databases
- Database environment management

COMPETENCE AND SKILLS

Designing and querying databases efficiently

PROGRAM

- **Database Perspectives and Impact** Describe the evolution of data storage and retrieval. Understand the advantages of a database approach compared to traditional file processing. Describe the impact of Internet growth on data volume, manipulation, and processing. Outline the history of database models and their evolution.
- **Data and Information Concepts** Describe the role of data, information, and databases in organizations. Compare and use key terms such as : information, data, database, database management system, metadata, and data mining. Illustrate data quality, accuracy, and timeliness, and explain the impact of their absence on organizations. Describe data collection mechanisms and their implications (automated data collection, input forms, sources). Outline fundamental data retention issues, including the need for retention, physical storage, backup, and security.
- **Data Modeling** Design Entity-Relationship diagrams based on appropriate organizational rules for a given scenario. Describe the relationship between a logical model and a physical model. Evaluate the importance of database constraints. Design a physical model for optimal performance, including the impact of normalization and indexing. Compare and contrast the differences and similarities between the relational model and the dimensional data model (OLTP vs. OLAP).
- **Database Query Languages** Create, modify, and query database objects using Structured Query Language (SQL). Perform data filtering and sorting using various clauses, including WHERE, ORDER BY, BETWEEN, LIKE, GROUP BY, and HAVING. Use joins to select data from multiple tables. Use built-in SQL queries. Perform calculations in a query using computed fields and aggregate functions. Create updatable and non-updatable views.
- **Data Organization Architecture** Demonstrate relational operations such as selection, projection, union, intersection, set difference, and natural join using simple examples of provided relations. Contrast and compare relational database concepts with non-relational databases, including object-oriented databases, XML, NewSQL, and NoSQL. Express the relationship between functional dependencies and keys, and provide examples. Evaluate data integrity

and provide examples of entity integrity and referential integrity. Analyze how fragmentation, replication, and data allocation affect database performance.

- **Specialized Databases** Describe the main concepts of object-oriented databases, XML, NewSQL, and NoSQL. Demonstrate an understanding of online analytical processing and data warehouse systems. Describe data mining methods and what these methods can reveal.
- **Database Environment Management** Contrast and compare data administration and database administration. Describe common tasks performed by database administrators. Create and manage database users, roles, and privileges. Consider the concept of database security, backup, and recovery. Evaluate the importance of metadata in a database environment.

BIBLIOGRAPHY

REQUIREMENTS

No prerequisites.