

## Database Management Systems 2 course

### 1. Introduction

- Database Instances and Database Schemas
- Database analysis life cycle

### 2. Overview of programming languages used for databases

- Object-oriented data model and concepts (classes, inheritance, encapsulation)
- Scripting Languages for Databases
- Overview of data interchange formats (e.g., JSON, XML, CSV)
- Data Access Layers and Frameworks
- Overview of data access layers in software architecture
- Data access frameworks for programming languages (e.g., Hibernate for Java, Entity Framework for .NET)
- Overview of data visualization and analysis
- Visualization languages and tools (e.g., R, MATLAB, Excel)
- Data mining and analysis languages (e.g., Python, R, SQL)

### 3. Database connectivity

- Different types of database connectivity (ODBC, JDBC, ADO.NET, etc.)
- ODBC Connectivity
- JDBC Connectivity
- ADO.NET Connectivity
- Database Connectivity in Web Applications
- Best practices for securing database connectivity

### 4. Functional dependencies

- Definition.
- Formal notation.
- Transitivity.
- Partial dependencies.
- Keys and composite keys.
- Normalization.
- Denormalization.

5. Database Normalization
  - Definition.
  - Goals.
  - Problems without Normalization.
  - Normal forms.
  - 1NF.
  - 2NF.
  - 3NF.
  - Denormalization.
  - Benefits.
  - Limitations.
6. SQL Fundamentals
  - Creating and altering tables
  - Inserting, updating, and deleting data
  - Querying data with SQL
  - Joins and subqueries
  - Indexes
  - Programming with SQL
7. Database Security and Integrity
  - Access control
  - Authentication and authorization
  - Encryption and decryption
  - Backup and recovery
8. Web Development with Databases
  - Dynamic web applications
  - Database-driven web applications
  - Server-side scripting languages
9. NoSQL and NewSQL Databases
  - Overview of NoSQL databases
  - Overview of NewSQL databases
10. Advanced Topics

- Data warehousing
- Online analytical processing (OLAP)
- Business intelligence
- Big data and data analytics
- Distributed databases
- Cloud databases

#### 11. Case Studies and Projects

- Case studies of database applications in various domains
- Project-based learning on database design, implementation, and administration.