Course content

The course provides a systematic introduction to the fundamental concepts, theories, design methods, and management techniques of database systems. Topics include database fundamentals, the relational model, Structured Query Language (SQL), formal query languages, database logical and physical design, as well as transaction management and fault recovery. This course aims to equip students with theoretical knowledge, practical skills, and insights into the latest developments in database technologies

The following topics are covered in the course:

1. Database Fundamentals: Introduction to database systems, including core concepts, architecture, and applications.
2. Relational Model: Theoretical foundations of relational databases, relational algebra, and relational calculus.
3. Structured Query Language (SQL): Mastery of SQL for creating, reading, updating, and deleting data in relational databases.
4. Database Design: Design methodologies, including E-R modeling, normalization, and schema refinement.
5. Transaction Management: Concepts of atomicity, consistency, isolation, durability (ACID properties), and concurrency control mechanisms.
6. Fault Recovery: Techniques for database recovery from system crashes and data corruption.
7. Performance Optimization: Methods for analyzing and improving database performance based on design and implementation principles.

Course objectives

Knowledge

1. Understand the basic principles, theories, and methodologies of database systems, including the relational model and SQL.
2. Gain a thorough understanding of E-R modeling, schema design, normalization theory, and their role in database development.
3. Learn the principles of transaction management, including concurrency control, fault recovery, and database performance optimization.

Skills

1. Develop proficiency in SQL for performing CRUD (Create, Read, Update, Delete) operations on relational databases.
2. Apply relational database normalization theory to analyze and refine database schemas.
3. Design and implement databases using E-R diagrams and translate them into relational schemas.
4. Analyze and optimize database performance using principles of storage, transactions, and query optimization.

Competencies

1. Apply knowledge of database systems to solve complex problems in database design and management.

2. Evaluate and optimize relational databases to ensure efficiency, scalability, and reliability.
3. Utilize full-cycle design methodologies to develop database systems, considering various factors such as user requirements, scalability, and resource constraints.