

Course Title: Advanced Database Systems

Course Number: CoSc2042

Credit Hours: 3 ECTS: 5 Laboratory: 2hrs

Prerequisite: CoSc2041 Fundamentals of Database Systems

Year II Semester II

Course Objectives

At the end of this course, students will be able to:

- Evaluate a set of query processing strategies and select the optimal strategy.
- Know the basics of transaction management and concurrency control
- Understand database security
- Use different recovery methods when there is a database failure
- Describe the main concepts of the OO model such as object identity, type constructors, encapsulation inheritance, polymorphism, and versioning

Course outline

Chapter 1: Query processing and Optimization

- 1.1 Overview of Data manipulation languages and Data Definition Languages
- 1.2 Translating SQL Queries into Relational Algebra
- 1.3 Overview of Query processing
- 1.4 Using Heuristic in Query Optimization
- 1.5 Semantic Query Optimization

Chapter 2: Transaction Processing Concepts

- 2.1. Transaction Concepts
- 2.2. Properties of Transaction
- 2.3. Schedules
- 2.4. Serializability of Schedules

Chapter 3: Concurrency Control Techniques

- 3.1. Concurrency and related problems
- 3.2. Overview of concurrency control techniques
- 3.3. Locking Techniques for Concurrency Control
- 3.4. Concurrency Control Based ON Timestamp Ordering
- 3.5. Multi-version Concurrency Control Techniques
- 3.6. Validation (Optimistic) Concurrency Control Techniques

Chapter 4: Database Recovery Techniques

- 4.1. Backup and Recovery Concepts
- 4.2. Recovery Concepts Based on Deferred Update
- 4.3. Recovery Concepts Based on Immediate Update
- 4.4. The ARIES Recovery Algorithm
- 4.5. Recovery in Multi database Systems

Chapter 5: Database Security and Authorization

- 5.1. Introduction to DB Security Issues
- 5.2. Discretionary Access Control Based on Granting /Revoking of Privileges
- 5.3. Mandatory Access Control for Multilevel Security
- 5.4. Statistical DB Security

Chapter 6: Concepts for Object-Oriented Databases

- 6.1. Object Definition, Object Identity
- 6.2. Object Structure
- 6.3. Encapsulation of Operations, Methods
- 6.4. Class Hierarchy Definition

Evaluation Technique

➤	Quiz	10%
➤	Mid Exam	25%
➤	Lab Evaluation and Project Work	15%
➤	Final Exam	50%

Text books and References

Textbook

1. Raghu Ramakrishnan, Johannes Gehrke. Database Management Systems, McGraw-Hill; 3rd edition, 2002
2. Elmasri, R., & Navathe, S. *Fundamentals of database systems* (7th Edition) . Pearson. (2017).

References

1. Osama Mustafa, Robert P. Lockard. (2019). Oracle Database Application Security, Apress, Berkeley, CA.
2. C. J. Date. (2019). Database Design and Relational Theory. 2nd Edition. Apress, Berkeley, CA.
3. Anthony Hack. (2019). SQL Computer Programming for Beginners. Independently published