

School of IT and Engineering, ADA University

CSCI 3615 – Database Systems

Spring 2025

Instructor: Jamaladdin Hasanov

How to reach me:

- through email: jhasanov@ada.edu.az.
- Blackboard discussions
- during office hours Mon/Fri 08:00 – 12:00.
 - If office hours don't work for you, we can set up an appointment.

Course synopsis

This course is on the design and implementation of database management systems. Topics include relational model and relational algebra, database normalization, intermediate and advanced SQL, indexing and query optimization techniques, transaction management and concurrency, logging and recovery protocols and distributed databases. Case studies on open-source and commercial database systems are used to illustrate these techniques and trade-offs.

Course Objectives

Upon successful completion of this course, the student should be able to:

- Use relational algebra to express database queries.
- Use SQL to interact with database management systems.
- Design appropriate database tables, using normal forms.
- Use indexing techniques to speed up queries.
- Understand and implement join algorithms.
- Understand optimizer's architecture.
- Understand, compare, and implement the fundamental concurrency control algorithms.
- Implement database recovery algorithms and verify their correctness.
- Interpret and comparatively criticize database system architectures.

Prerequisites: CSCI 2304 – Data Structures and Algorithms.

Software:

- Download PostgreSQL from <https://www.postgresql.org/download/> and install it. Alternatively, use can use it from the Docker container: https://hub.docker.com/_/postgres

Readings:

1. Database System Concepts, 7th ed., Silberschatz, Korth, & Sudarshan.
2. Database management systems. Raghu Ramakrishnan and Johannes Gehrke
3. Fundamentals of database systems. Ramez Elmasri, Shamkant B Navathe
4. Database systems : design, implementation, and management. Carlos Coronel, Steven Morris (Steven A.).
5. Database systems : the complete book. Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom
6. Concise Guide to Databases : a Practical Introduction. Peter Lake and Paul Crowther

Late policy: No person has any slip days. No late assignments will be accepted. In extreme circumstances (e.g., medical emergencies), no penalty will be applied. Please be prepared to provide written documentation (e.g., doctor's note) to academic advisors.

Attendance: Attendance will be checked starting from the 2nd week of the semester. You will be marked late after 5 and absent after 15 minutes. There is NOT a policy allowing “two unexcused absences” as a similar policy was officially discontinued starting Fall Semester 2015.

Homeworks: Students will complete multiple homework assignments during the course. These homeworks are designed to reinforce the lectures and reading materials and must be complete individually.

Exams: There will be two closed note exams during the course (both via Respondus Lockdown browser in Blackboard). The first will be an in-class midterm exam. The second will be a final exam at during the University's final examination period at the end of the semester. The exams will be based on the lecture notes, homeworks and in-class exercises.

Grading scheme

- Assignment – 45%.
- Quizzes – 15% (10-minute short in-class quizzes)
- Midterm – 20%.
- Final – 20%.

Course calendar

Week	Topic
Week 1	Course Intro and Relational Model
Week 2	Relational Algebra / Database Normalization
Week 3	Introduction to PostgreSQL DB, SQL – Introduction
Week 4	SQL – Intermediate level
Week 5	SQL – Advanced Level
Week 6	Storages and Storage structures
Week 7	Hash Tables
	Mid-term exam
Week 8	Tree Indexes
Week 9	Sorting
Week 10	Join Algorithms
Week 11	Query Execution and Optimization
Week 12	Concurrency Control Theory
Week 13	Two-Phase Locking Concurrency Control
Week 14	Recovery

Week 15	Distributed Databases
	Final exam

Although substantially complete, this schedule, as well as the syllabus, is tentative and can be modified as necessary.

WARNING: Academic dishonesty such as inventing false information, cheating, plagiarism and helping other students on the same will not be tolerated. You may not copy from other students or other sources that you find on the web. For further information, refer to the university's [Honor Code](#).