Course Description

Database Design

Department of Computer Engineering

Sharif University of Technology

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Site

- sharifdb.github.io

Database Design Home Materials Assignments Problem sets

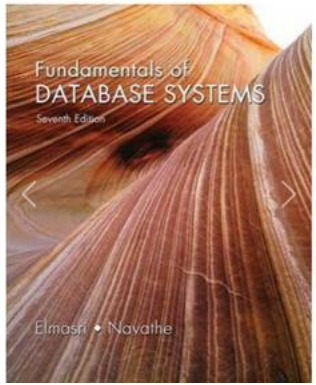
CE384: Database Design

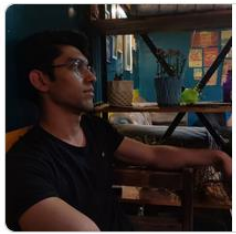
Spring 2024, Group 1; Computer Engineering Department, Sharif University of Technology, Tehran, Tehran Province, Iran

Classes: Sundays and Tuesdays, 16:30-18:00, Class 102

This course delves into the principles of database management, focusing on essential concepts applicable across various domains. Database management is a crucial discipline that explores the organization and manipulation of data within information systems. The course covers fundamental topics such as relational database design, normalization, query languages, and transaction management. Proficiency in database management is vital in fields like software development, business intelligence, data analysis, cybersecurity, and information technology. Given its pervasive relevance, database management is a cornerstone of academic programs, reflecting its significance in contemporary technological landscapes.

Syllabus





Shayan Shabani

Lead TA

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Lead TA

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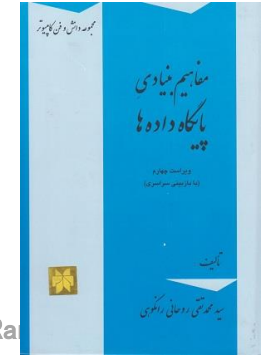
Reach Us!

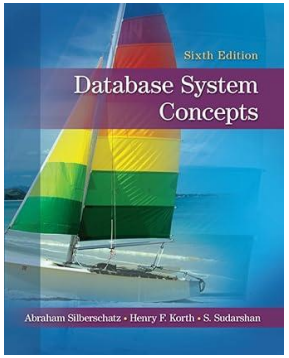
- Office Room: CE803
- Email:
  - Maryam Ramezani: (maryam.ramezani@sharif.edu)
- Course notes, homework and solutions, handouts, and other useful resources are available on the Quera page:
  - https://quera.org/course/16609/
  - Room: (Sunday & Tuesday: 16:30-18:00)
  - class 102
  - https://vc.sharif.edu/ch/rabiee
- Lead TA:
  - Amirmahdi Meighani: (amirmm71382@gmail.com)
  - Shayan Shabani: (shayan.shabani5814@gmail.com)
- Feedback
  - https://forms.gle/7xoQDnva2SHh8AyHA

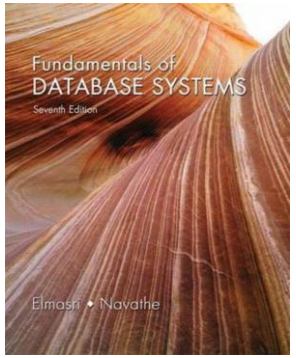
Resources

- Textbooks:
  - S. Sudarshan Abraham Silberschatz Henry Korth. Database System Concepts. McGraw Hill, 2010.
  - C. J. Date. Introduction to Database Systems. Pearson, 2003.
  - Navathe Shamkant Elmasri Ramez. Fundamentals of Database Systems. Financial Times Prentice Hall, 2015.
  - Andrew J. Oppel James R. Groff Paul N. Weinberg. SQL: The Complete Reference. McGraw Hill, 2009.
  - Johannes Gehrke Raghu Ramakrishnan. Database Management Systems. McGraw-Hill, 2002.

+Other textbooks and course materials.







Structure of the Course

- Lectures
  - **Goal: To introduce concepts in designing database, and motivate their use and importance.**
  - **Note: We try to cover useful materials in class, but we recommend you reading more!**
- Assignments
  - **Purpose:** To give you a chance to exercise your mind, and to solidify the concepts introduced to you in class.
  - **Outline:** Four homeworks, and some have practical part.
  - **Importance**: Not important unless you want to learn the material and get a good grade!
- Exams: One Midterm + Final

Lecture Notes

- Lecture slide will be uploaded.
- Many times we will write on board, in real-time, during lecture to prove a theory or answer a question or add some additional explanations. It will be your responsibility to take notes.
- Slides links will be provided on site.

Homework

- Theorical and Practical Questions
- Assignments will be released on midnight of the day the last topic of the homework has been lectured. Students will have almost 2 week to submit answers in the Quera.
- Homework Upload:
  - https://quera.org/course/16609/

Homework Assignments Schedule

Assignment	Release	Submission	Solution Release	
1	1402/12/22	1403/01/14	1403/01/17	3 Weeks
2	1403/01/22	1403/02/12	1403/02/15	3 Weeks
3	1403/02/21	1403/03/04	1403/03/07	2 Weeks
4	1403/03/10	1403/04/06	1403/04/06	4 Weeks

Important: Note that this schedule is tentative and may be affected by unforeseen circumstances.

TA

- TA class:
  - Exams Exclusive classes: In particular, for each of the midterm and the final exam, a TA class will be held so that students can prepare adequately for the exam.
  - SQL and NoSQL workshops: For those students who are not familiar with SQL or NoSQL and their related libraries, approximately four workshop classes will be held to cover SQL, NoSQL, and related libraries like Peewee.
  - Virtual Class:
    https://vc.sharif.edu/ch/rabiee-ta

Date	Title
To be determined	SQL Workshop
1403/02/19	Midterm
To be determined	NoSQL Workshop
1403/03/03	Final

Grading Scheme

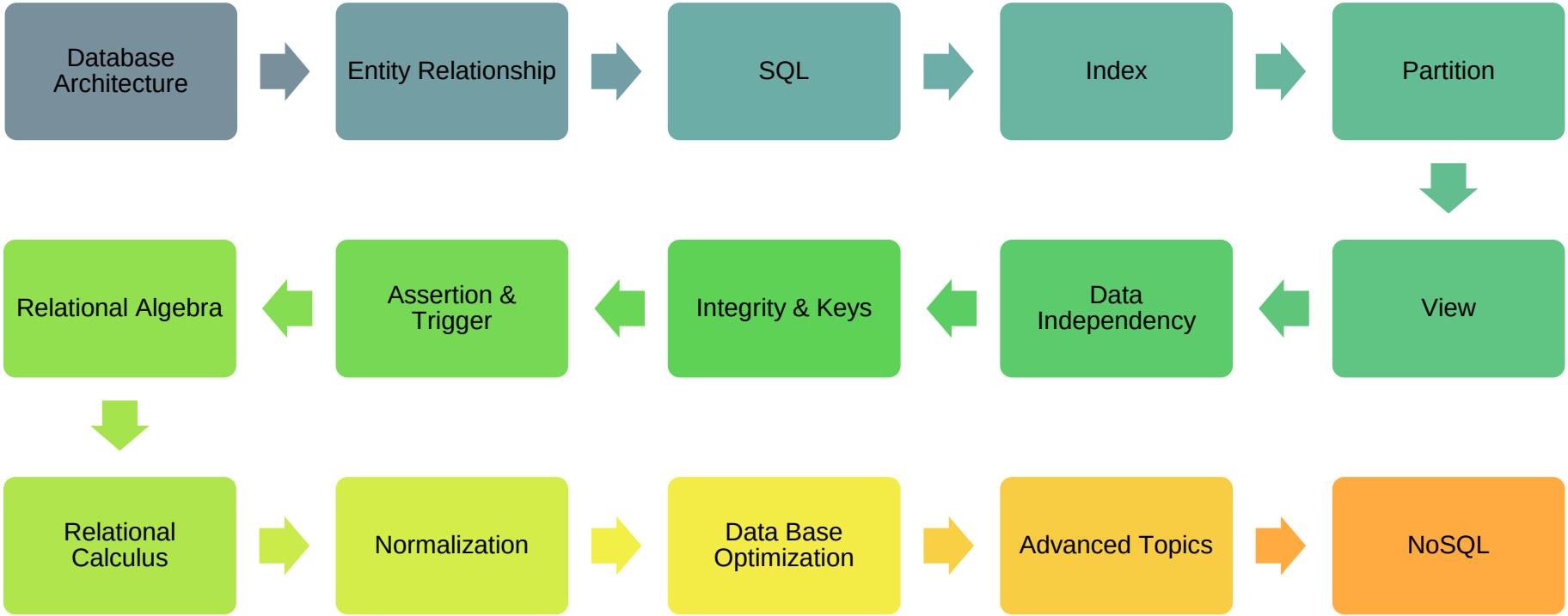
Item	Grade
Homework	35% (7 points)
Midterm Exam	30% (6 points)
Final Exam	40% (8 points) (Comprehensive)
Total	21

- Mid-Term Exam: (1403/02/20 15:30)
- Final Exam: (Comprehensive) (1402/04/03 15:30)

Homework Rules

- Homeworks:
  - Homework Assignments: 7 points, 4 series of theoretical and practical homework assignments.
  - You have a total 5 days of allowed late submission (for both theoretical and code part). 0.5% of the assignment grade will be subtracted for each hour of delay
- For each homework, you can use your late submission up to 2 days.
- Discussing the problems with each other is encouraged. Copying each others assignments or submitting solutions/answers on the web is strictly prohibited. First time, you will receive −100% of grade for the task at hand. If you are caught for a second time, **you will fail the course**.

Course Roadmap



What Is a DBMS?

- A *Database* is a very large, integrated collection of data.
- Models real-world *enterprise.*
  - Entities (e.g., students, courses)
  - Relationships (e.g., John is taking ECE459)
- A *Database Management System (DBMS)* is a software package designed to store and manage databases.

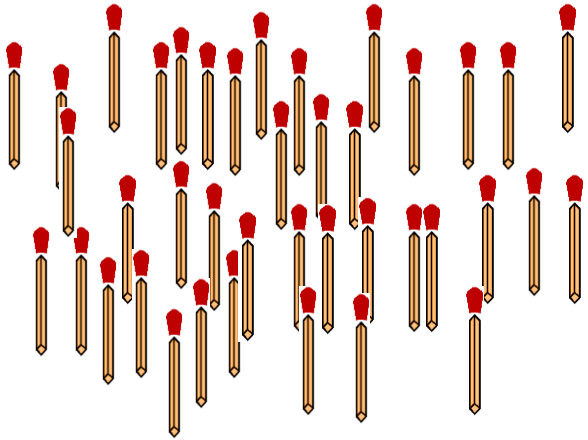
Files vs. DBMS

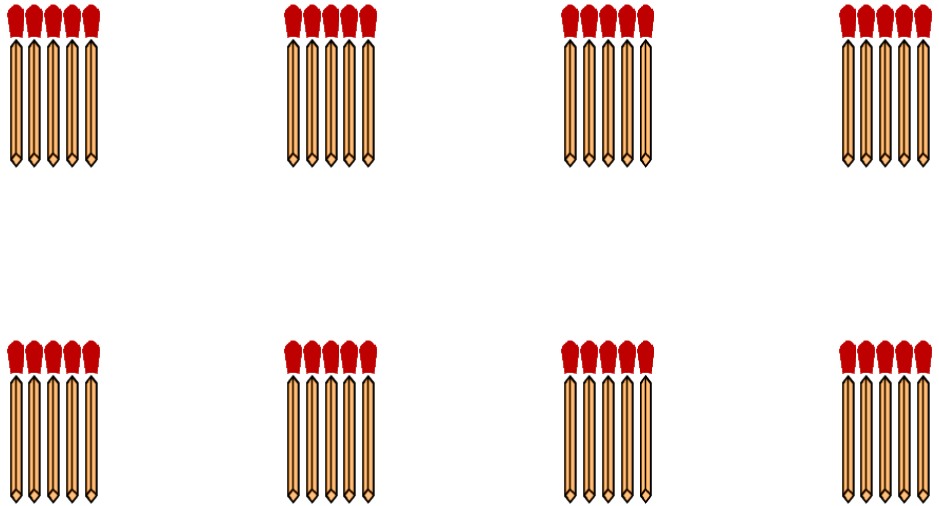
- Application must stage large datasets between main memory and secondary storage (e.g., buffering, page-oriented access, 32-bit addressing, etc.)
- Special code for different queries
- Must protect data from inconsistency due to multiple concurrent users
- Crash recovery
- Security and access control

Why Use a DBMS?

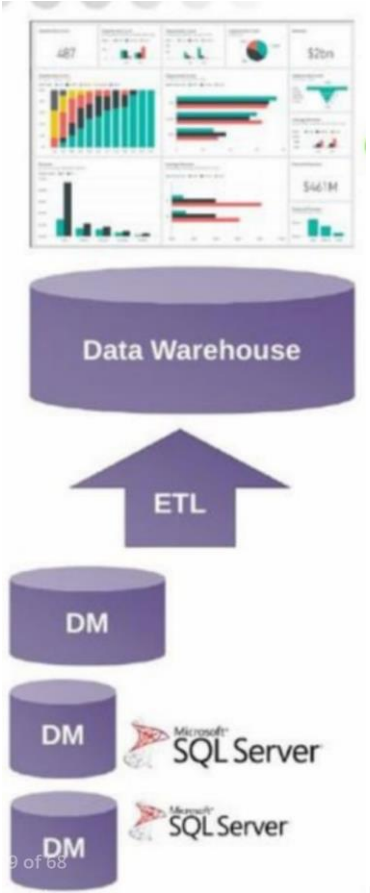
- Data independence (abstract view of data) and efficient access.
- Reduced application development time.
- Data integrity (enforce constraints) and security.
- Uniform (central) data administration.
- Concurrent access, recovery from crashes.

Database to Data warehouse





Data Warehouse



Data Lake, Data Warehouse, Data Mart