

CS 440 – Databases

Spring 2021 – Syllabus

Instructor

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Class Hours

MWF, 10:00AM – 10:50AM. KC-267

Office Hours

TTh, 8:00 AM–3:00 PM, ONLINE ONLY. Office hours will be via Slack and Zoom

Catalog Data

Presents database concepts and architectures. Topics include basic file structures, data dictionaries, data models, languages for data definition and queries, and transaction management for data security, concurrency control, and reliability. There will be hands-on experience with database and query systems.

Objectives

Students will have a broad understanding of the theory and practice of databases. Students will become familiar data dictionaries, data modeling, data definition structures, indexes, queries, and transactional systems. Students will have an in-depth understanding of SQL, and hands-on experience with database definition and programmatic database operations. Students will also have an understanding of the issues that affect database performance.

Prerequisites

CS 215, Math 222

Textbook

Jeffrey D. Ullman and Jennifer Widom, A First Course in Database Systems, 3ed. Pearson Prentice Hall. ISBN 0-13-600637-X

Daily and Weekly Requirements

Assigned daily reading and weekly homework assignments.

Exams and Evaluations

There will be 3 1-hour exams and a comprehensive final exam. The final grade will be based on the following weights:

60 %	Three hour Exams
25 %	Final Exam
15 %	Homework and Machine Problems

Attendance, Missed Exams, Late Homework and Machine Problems

Homework and machine problems are due at the beginning of class (10 AM) on the date specified unless otherwise specified. Any assignments handed in after lecture has started are considered late. The following late penalties will be applied:

One day late	10%
Two days late	10% + 20% = 30%
Three days late	10% + 20% + 30% = 60%
Four days late	Do the math...

For the purposes of counting days, days are 24 hours and weekends count as 1 day.

Valid excuses for missing exams and handing assignments in late include illness, family emergencies, religious observances, official UE events, etc. They do not include work conflicts, studying for other classes, staying home an extra day over the weekend, or {dog, virus, space aliens}{ate, wiped out, abducted}{my homework, my computer, me}(in any combination).

The instructor will rely on your integrity on getting work excused. If you have a valid excuse, put it in writing, sign your name to it, and give it to the instructor. For religious observances and UE events, you must inform the instructor that you will be absent **before** the absence occurs, otherwise it will be considered an unexcused absence.

Excused work must be made up within two class meetings. Late work will not be allowed. Exceptions will be made for serious or prolonged illness, or other serious problems. Please note that it is your responsibility to take care of missed or late work.

Honor Code

All students are expected to adhere to the University's Honor Code regarding giving and receiving authorized aid.

Homework exercises are for you to gain experience and practice. You may collaborate with your classmates, but each student should submit a solution in his/her own words that reflect his/her understanding of the solution. You will eventually be required to demonstrate your knowledge of the material on the exams, so it is better that you attempt the problems on your own.

Topics

Here are the topics that will be covered in this class:

- Relational Model
- SQL Schemas
- Relational Algebra
- Database Constraints
- Database Design

- Functional Dependencies
- Decomposition
- 3NF - MVDs
- High-Level Database Models
- Design Principles
- Weak Entities and Translating E/R Diagrams
- Bag Semantics and Extended AQLs
- Multirelation queries
- SQL
- Database Modifications
- Constraints
- Constraints and Triggers
- Views and Indexes
- Indexes and efficiency
- Programming Database Systems
- Security
- Object-Relational Mapping
- NoSQL

Schedule

Week	Date	Monday	Wednesday	Friday
1	[2021-01-18 Mon.]		Introduction Ch. 1	Relational Model Ch. 2.1 - 2.3
2	[2021-01-25 Mon.]	Relational Schema Ch. 2.3	Relational Algebra Ch. 2.4	More Relational Algebra Ch. 2.4
3	[2021-02-01 Mon.]	Database Constraints Ch. 2.5	Database Design Ch. 3.1	Reasoning about FDs Ch. 3.2
4	[2021-02-08 Mon.]	BCNF Ch 3.3	FD Preservation Ch 3.4	3NF Ch 3.5
5	[2021-02-15 Mon.]	MVDs, 4NF Ch. 3.6	E/R Modeling Ch. 4	Design Principles Weak Entities
6	[2021-02-22 Mon.]	Review	Exam 1	Translating E/R Ch. 4
7	[2021-03-01 Mon.]	Bag Semantics Extended AQL 5.1-5.2	SQL Ch. 6	More SQL Ch. 6
8	[2021-03-08 Mon.]	Aggregation Ch. 6	Database Modification Ch. 6	Transactions Ch. 6.6
9	[2021-03-15 Mon.]	NO CLASS WELLNESS DAY	Constraints Ch. 7.1-7.4	Triggers Ch. 7.5
10	[2021-03-22 Mon.]	Review	Exam 2	Trigger and Views Ch. 8
11	[2021-03-29 Mon.]	View and Indexes	Indexes and Efficiency	NO CLASS GOOD FRIDAY
12	[2021-04-05 Mon.]	Indexes and Efficiency	Programming Databases	JDBC
13	[2021-04-12 Mon.]	Security Ch. 10.1	Recursion Ch. 10.2	Object-Relational Mapping
14	[2021-04-19 Mon.]	Spatial Indexes	NoSQL	Review
15	[2021-04-26 Mon.]	Exam 3	Review	