CS157a Fall 2018 Sec3 Home Page/Syllabus

Introduction to Database Management Systems

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Office Hours: MW 4:30-5:45pm
Class Meets:
   Sec3 MW 1:30pm-2:45pm in MH223

Prerequisites

To take this class you must have taken: CS146 with a grade of C- or better.

Texts and Links

Required Texts:	Database Systems: The Complete Book. Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom
Online References and Other Links:	Postgres. Maria DB (MySql fork). Sqlite. Oracle. DB2. Neo4j.

Description

Current, classical database systems. Entity-relationship and enhanced entity models. Relational model, algebra, calculus. Current, emerging SQL standard. Embedded, Dynamic SQL. Application perspective on transactions and security. Interactive and programmatic interfaces to database systems. Application programming project using commercial database system.

Section-Specific Description

In more detail for this section: Database management systems (DBMS) provide facilities to organize, to maintain, and to provide access to data. In this course, we will consider how databases are designed and deployed on DBMSs. We will learn about the three schema architecture used for databases, data independence, and client-server architectures. We will describe models for how data should be organized heuristically in a database using entity relationship (ER), extended entity relationship (EER), and UML diagrams. We will learn about what the relational model is and about relational database constraints. Then

we will discuss how to translate EER diagrams into relations which could then be created as tables in a DBMS. We will see techniques to write relational algebra queries and to be able to predict given a database instance what such a query will return. SQL and enough about real world DBMSs will be introduced to allow us to be able to create a database in such a system, insert rows into it, and update these rows. Importing large quantities of data using a bulk loader will be described. Next we will learn how to write simple transactions using JDBC. Finally, we will discuss how to analyse the relations we have might get from ER modeling followed by conversion to the relational model with respect to various normal forms to be able to judge how good they are. In particular, this means given a table decomposition we should by the end of this course be able to say which of the following normal forms it is in: 2NF, 3NF, 4NF, 5NF, or BCNF. We will also learn about the algorithms for testing if a decomposition is in a given normal form and the algorithms which given a set of functional dependencies can do table decomposition into 3NF or BCNF.

Course Learning Outcomes (CLOs)

By the end of this course, a student should be able to:

CLO1 -- Write relational algebra queries and predict given a database instance what such a query will return.

CLO2 -- Write SQL commands to create databases, create tables, insert/update/delete/retrieve rows in a common database management system.

CLO3 -- Use a database management system's bulk loader to populate a database.

CLO4 -- Write simple transactions using JDBC and ODBC, or similar programmer interfaces in other languages.

CLO5 -- Know the algorithms for testing if a decomposition is in a given normal form and the algorithms which given a set of functional dependencies can do table decomposition into 3NF or BCNF

Course Schedule

Below is a tentative time table for when we'll do things this quarter:

Week 1: Aug 20, Aug 22 (First Day)	Start Ch 1, what is a database, history of databases
Week 2: Aug 27, Aug 29	Finish Ch 1
Week 3: Sep 3 (Labor Day), Sep 5	Start Ch 2, Relational Model SQL
Week 4: Sep 10, (HW1 due) Sep 12	Finish Ch 2 Algebraic query languages, relational constraints
Week 5: Sep 17, Sep 19	Start Ch 3 Design of Databases, Functional Dependencies
Week 6: Sep 24, Sep 26 (HW2 due)	Finish Ch 3 Decompositions, 3NF
Week 7: Oct 1, Oct 3 (Midterm 1)	Review
Week 8: Oct 8, Oct 10	Start Ch 4, ER model, Weak Entity Sets
Week 9: Oct 15, Oct 17 (HW3 due)	Finish Ch 4, ER to Relational Mapping, UML and ODL modeling and Mapping

Week 10: Oct 22, Oct 24	Ch 5. Relational Algebra and its extensions, Datalog
Week 11: Oct 29, Oct 31	Ch 6 Writing Queries in SQL
Week 12: Nov 5, Nov 7 (HW4 due)	Ch 7 Constraints and triggers
Week 13: Nov 12 (Campus Closed) , Nov 14	Review
Week 14: Nov 19, (Midterm 2) Nov 21 (Thanksgiving)	Midterm and thanksgiving
Week 15: Nov 26, Nov 28	Ch 8 Views and Indexes, Start Ch 9 SQL in a Server Environment
Week 16: Dec 3, Dec 5 (Hw5 due)	JDBC, Ch 10 Semi-structured databases, XML
Week 17: Dec 10 (Last Day), Dec 12	Review
	The final will be Wednesday, December 12 from 12:15-2:30pm

Grading

HWs and Quizzes	50%
Midterm 1	15%
Midterm 2	15%
Final	20%
Total	100%

Grades will be calculated in the following manner: The person or persons with the highest aggregate score will receive an A+. A score of 55 will be the cut-off for a C-. The region between this high and low score will be divided into eight equal-sized regions. From the top region to the low region, a score falling within a region receives the grade: A, A-, B+, B, B-, C+, C, C-. If the boundary between an A and an A- is 85, then the score 85 counts as an A-. Scores below 55 but above 50 receive the grade D. Those below 50 receive the grade F.

If you do better than an A- in this class and want me to write you a letter of recommendation, I will generally be willing provided you ask me within two years of taking my course. Be advised that I write better letters if I know you to some degree.

Course Requirements, Homework, Quiz Info, and In-class exercises

This semester we will have five homeworks, weekly quizzes, and weekly in-class exercises.

Every Monday this semester, except the first day of class, the Midterm Review Day, and holidays, there will be a quiz on the previous week's material. The answer to the quiz will either be multiple choice, true-false, or a simple numeric answer that does not require a calculator. Each quiz is worth a maximum of 1pt with no partial credit being given. Out of the total of twelve quizzes this semester, I will keep your ten best

scores.

On Wednesday's, we will spend 15-20 minutes of class on an in-class exercise. You will be asked to post your solution to these exercises to the class discussion board. Doing so is worth 1 "pre-point" towards your grade. A "pre-point" can be used to get one missed point back on a midterm or final, up to half of that test's total score. For example, if you scored 0 on the midterm and have 10 pre-points, you can use your pre-points, so that your midterm score is a 10. On the other hand, if you score 18/20 on the midterm, you can use at most 1 pre-point since half of what you missed (2pts) on the midterm is 1pt.

Links to the current list of homeworks and quizzes can be found on the left hand frame of the class homepage. After an assignment has been returned, a link to its solution (based on the best student solutions) will be placed off the assignment page. Material from assignments may appear on midterms and finals. For homeworks you are encouraged to work in groups of up to three people. **Only one person out of this group needs to submit the homework assignment; however, the members of the group need to be clearly identified in all submitted files.**

Homeworks for this class will be submitted and returned completely electronically. To submit an assignment click on the submit homework link for your section on the left hand side of the homepage and filling out the on-line form. Hardcopies or e-mail versions of your assignments will be rejected and not receive credit. Homeworks will always be due by the start of class on the day their due. Late homeworks will not be accepted and missed quizzes cannot be made up; however, your lowest score amongst the five homeworks and your quiz total will be dropped.

When doing the programming part of an assignment please make sure to adhere to the specification given as closely as possible. Names of files should be as given, etc. Failure to follow the specification may result in your homework not being graded and you receiving a zero for your work.

Classroom Protocol

I will start lecturing close to the official start time for this class modulo getting tangled up in any audio/visual presentation tools I am using. Once I start lecturing, please refrain from talking to each other, answering your cell phone, etc. If something I am talking about is unclear to you, feel free to ask a question about it. Typically, on practice tests days, you will get to work in groups, and in so doing, turn your desks facing each other, etc. Please return your desks back to the way they were at the end of class. This class has an online class discussion board which can be used to post questions relating to the homework and tests. Please keep discussions on this board civil. This board will be moderated. Class and discussion board participation, although not a component of your grade, will be considered if you ask me to write you a letter of recommendation.

Exams

The midterms will be during class time on: Oct 3 and Nov 19.

The final will be: Wednesday, December 12 from 12:15-2:30pm.

All exams are closed book, closed notes and in this classroom. You will be allowed only the test and your pen or pencil on your desk during these exams. The final will cover material from the whole semester although there will be an emphasis on material after the last midterm. No make ups will be given. The final

exam may be scaled to replace a midterm grade if it was missed under provably legitimate circumstances. These exams will test whether or not you have mastered the material both presented in class or assigned as homework during the quarter. My exams usually consist of a series of essay style questions. I try to avoid making tricky problems. The week before each exam I will give out a list of problems representative of the level of difficulty of problems the student will be expected to answer on the exam. Any disputes concerning grades on exams should be directed to me, Professor Pollett.

Regrades

If you believe an error was made in the grading of your program or exam, you may request **in person** a regrade from me, Professor Pollett, during my office hours. **I do not accept e-mail requests for regrades.** A request for a regrade must be made no more than a week after the homework or a midterm is returned. If you cannot find me before the end of the semester and you would like to request a regrade of your final, you may see me **in person** at the start of the immediately following semester.

University Policies and Procedures

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/. Below are some brief comments on some of these policies as they pertain to this class.

Academic Integrity

For this class, you should obviously not cheat on tests. For homeworks, you should not discuss or share code or problem solutions between groups! At a minimum a 0 on the assignment or test will be given. A student caught using resources like Rent-a-coder will receive an F for the course. Faculty members are required to report all infractions to the Office of Student Conduct and Ethical Development.

Accommodations

If you need a classroom accommodation for this class, and have registered with the Accessible Education Center, please come see me earlier rather than later in the semester to give me a heads up on how to be of assistance.