

San José State University
Computer Science Department CS 157-A 02, Introduction to Database Management Systems, Spring 2024

Course and Contact Information

Instructor: Sanket Kulkarni
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Office Hours: M W 11:00 AM – 12:00 PM
(<https://sjsu.zoom.us/j/87808536147>)
Class Days/Time: T R 10:30 AM – 11:45 AM
Classroom:
Prerequisites: CS 146 Data Structures and Algorithms with grade C- or better.

Course Description

Current, classical database systems. Entity-relationship and enhanced entity models. Relational model, algebra, calculus. Current, emerging SQL standard. Dynamic SQL. Application perspective on transactions and security. Interactive and programmatic interfaces to database systems. Application programming project using a commercial database system. Prerequisite: CS 146 (with a grade of "C-" or better); Computer Science, Applied and Computational Math, or Software Engineering majors only; or instructor consent.

Canvas Course Site

Course materials such as syllabus, textbook, assignments, questions of the week and exams can be found on the [Canvas Learning Management System course website](http://sjsu.instructure.com) at <http://sjsu.instructure.com>. You are responsible for regularly checking with Canvas to learn of any updates.

Course Goals

1. To introduce students to the purpose of Database systems and databases, as well as common users of such systems.
2. To teach students about the relational model and relation algebra.
3. To teach students about SQL, the standard language for interacting with a database.
4. To teach students about design theory and algorithms that help determine if a given database's tables are organized in a reasonable way.
5. To teach students about real-world database system usage, architectures and components. Some example systems that might be considered are: MySQL, Postgres, and SQLite.
6. To teach students about SQL, the standard language for interacting with a database.
7. To teach students how to interact with a database system from a programming language such as Java and Python.
8. Building APIs for web applications using RDBMS Concepts

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

- Write relational algebra queries and predict given a database instance what such a query will return.
- Design a database by creating an Entity/Relationship Diagram for a given problem.
- Being able to identify functional dependencies, check and perform a decomposition in a given normal form.
- Use Data Definition Language to define database schemas.
- Construct data retrieval procedures using the Data Manipulation Language (schema, index, normalization, view, trigger, constraints). Write SQL commands to create databases, create tables, insert/update/delete/retrieve rows in a common database management system. To teach students about SQL, the standard language for interacting with a database.
- Implement simple database applications and write transactions using desired language.

Required Texts/Readings

Textbook

Database System Concepts (6th edition) by Silberschatz, Korth, and Sudarshan.

Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer D. Widom, "Database Systems: The Complete Book".

Course Requirements and Assignments

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 at <http://www.sjsu.edu/senate/docs/S12-3.pdf>.

NOTE that University policy F69-24, “Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.

Grading Information

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|---------------------|-----|
| Homework | 20% |
| Quiz | 10% |
| Midterm 1 | 15% |
| Project | 30% |
| Final Exam | 20% |
| Class Participation | 05% |

Determination of Grades

| Percentage | Grade |
|--------------|-------|
| 97+ | A+ |
| 92-96 | A |
| 90-91 | A- |
| 88-89 | B+ |
| 82-87 | B |
| 80-81 | B- |
| 78-79 | C+ |
| 72-77 | C |
| 70-71 | C- |
| 60-69 | D |
| 59 and below | F |

No make-up Midterms/ Final Exam and no late assignments will be accepted.

Note that “All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades.” See [University Policy F13-1 at http://www.sjsu.edu/senate/docs/F13-1.pdf](http://www.sjsu.edu/senate/docs/F13-1.pdf) for more details.

Classroom Protocol

1. Students are expected to participate in all lectures. Attendance is crucial to do well on quiz, assignments, and exams.
2. Lectures will not be recorded.
3. Always start your email subject with “CS157A Spring 2024” to get my attention.

4. Cheating will result in ZERO score on assignment and exam, and will be reported to the department and university.
5. Students are prohibited from recording class activities (including class lectures, office hours, advising sessions, etc.), distributing class recordings, or posting class recordings. Materials created by the instructor for the course (syllabi, lectures and lecture notes, presentations, etc.) are copyrighted by the instructor.

University Policies

Per [University Policy S16-9](http://www.sjsu.edu/senate/docs/S16-9.pdf) (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant information to all courses, such as academic integrity, accommodations, dropping and adding, consent for recording of class, etc. is available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>.

CS 157A / 02 Introduction to Database Management Systems, Spring 2024, Course Schedule

This detailed outline is subject to change based on the needs of the class. Updates will be notified in the class and Canvas will be kept up to date.

Course Schedule

| Week | Date | Topics, Readings, Assignments, Deadlines |
|------|-------|--|
| 1 | 1/25 | Introduction to the course |
| 2 | 1/30 | Relational Database model and ACID properties |
| 2 | 2/1 | Different types of Keys |
| 3 | 2/6 | Intro to Relational Algebra I |
| 3 | 2/8 | ER Models and ER Constraints |
| 4 | 2/13 | ER Diagrams and Quiz 1 |
| 4 | 2/15 | Mapping ER Model to Relations & Intro to SQL (Homework 1) |
| 5 | 2/20 | SQL database |
| 5 | 2/22 | Database definition language, Single table queries I (Quiz 2) |
| 6 | 2/27 | Single table queries II, Simple Joins (Homework 1 due) |
| 6 | 2/29 | Natural Joins , Outer Joins (Homework 2) |
| 7 | 3/05 | Null Values and Integrity Constraints , Quiz 3 , Midterm 1 review |
| 7 | 3/7 | MIDTERM 1 |
| 8 | 3/12 | Programmatic Interfaces I (API) and Project 1 assignment (Homework 2 due) |
| 8 | 3/14 | Programmatic Interfaces II (API) |
| 9 | 3/19 | Programmatic Interfaces III (API) |
| 9 | 3/21 | Advanced Queries : Aggregations and Nested Queries (Homework 3) |
| 10 | 3/26 | Views, Database mods |
| 10 | 3/28 | Relational Algebra II, Quiz 4 |
| 11 | 04/01 | Spring Recess |
| 12 | 04/09 | Triggers and Misc. (Homework 3 due) |

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| 12 | 4/11 | Intro to Database Normalization and Functional Dependencies |
| 13 | 4/16 | Intro to BCNF (Homework 4) |
| 13 | 4/18 | Intro to Third Normal Form and Project Discussion |
| 14 | 4/23 | Intro to distributed data stores , Quiz 5 |
| 14 | 4/25 | Database Server Connectivity in java or python (Homework 4 due) |
| 15 | 4/30 | Database Authorization (Headers/ auth tokens) (Homework 5) |
| 15 | 5/02 | NoSQL and Quiz 6 |
| 16 | 5/07 | OLAP, Final Exam Review |
| Final Exam | 5/14 | 9.45am - 12pm (Tentative) (Homework 5 due) |