

Introduction to Database Management Systems CS 157A

Fall 2026 In Person 3 Unit(s) 08/19/2026 to 12/07/2026 Modified 08/20/2026

Welcome to CS 157A. Databases are a microcosm of computer science, their study covers: languages, theory, operating systems, concurrent programming, user interfaces, optimization, algorithms, artificial intelligence, system design, parallel and distributed systems, statistical techniques, dynamic programming. The concepts here are the foundation for building complex systems and for your career. They carry directly into not just future courses, but also into technical interviews and the rest of your work as an engineer.

Contact Information

Class Hours: TR (T/Th) 4:30 pm - 5:45 pm MacQuirre Hall (MH) 424

Office Hours: W 3:00 pm - 4:30 pm Dudley Moorehead Hall (DH) 282

Course Description and Requisites

Relational data model. Relational algebra. Standard SQL. Design theory. Conceptual data modeling. Integrity constraints and triggers. Views and indexes. Transactions. Distributed data management. Interactive and programmatic interfaces to database systems. Application programming project using a prominent database system.

Prerequisite(s): CS 146 (with a grade of "C-" or better); Computer Science, Applied and Computational Math, Forensic Science: Digital Evidence, Software Engineering, Data Science, or Computer Science and Linguistics majors only; or instructor consent.

Grading: Letter Graded

* Classroom Protocols

Students are expected to adhere to the Student Conduct Code found at the [SJSU Student Conduct website \(http://www.sjsu.edu/studentconduct/\)](http://www.sjsu.edu/studentconduct/). Additionally, students should regularly attend lectures and labs (if applicable), treat instructors and peers with respect, and refrain from the use of cell phones during any classroom activities.

- Regular class attendance is highly recommended and strongly encouraged. Please arrive to class on time so that you benefit fully from the course experience and you do not disturb classmates and the instructor while class is in session.

- Students are responsible for knowing all materials covered in class lectures, readings, assignments, and other course-related work.
- Laptops, tablets, and other devices should only be used for course-related purposes.
- Please turn off your headphones before the class starts.
- All exams must be taken in-person except for extreme emergencies.
- Do not ask for special treatment. The rules for this course apply to everyone equally.
- Cheating will not be tolerable; a ZERO will be given to any cheated assignment/exams, and it will be reported to the Department and the University.
- Do NOT share/post online any course materials, PPT slides, or homework solutions.
- Use of electronic devices during exams is NOT allowed unless stated otherwise.
- You are required to check Canvas for reading/assignments.
- The information on this syllabus is subject to change; changes, if any, will be clearly explained in class, and it is your responsibility to become aware of them.

Academic Integrity & AI Policy

AI-based tools (such as ChatGPT Edu) are permitted only for brainstorming, summarizing, and grammar/syntax checking of assignments. They may not be used for drafting or writing content, code, pseudocode, or proofs. All submissions must be original, human-written work. If AI is used, you must include a "Use of AI" statement explaining its specific role and list the prompts used. You are solely responsible for the technical integrity of your work. Always verify AI output, as it may contain hallucinations. Presenting AI-generated text or code as your own will be treated as a violation of academic integrity.

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Goals

- To ensure understanding of the fundamentals of relational database systems, including data models, database design, and database manipulations
- To teach how to express relational logic using relational algebra
- To teach the data definition, manipulation, and querying aspects of SQL (Structured Query Language).
- To introduce constraints and triggers as an integrity control mechanism in database systems.
- To introduce the concept of database transactions and their ACID properties (Atomicity, Consistency, Isolation, and Durability)
- To teach students how to interact with a database (DB) system such as PostgreSQL from a programming language such as Java

Course Learning Outcomes (CLOs)

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

- Explain basic database concepts, including the structure and operations of the relational data model
- Identify key components of database management systems and their functions at a high level
- Identify functional dependencies and apply normalization algorithms
- Use SQL as a Data Definition Language (DDL) to create and alter databases, tables, views and indexes
- Use SQL as a Data Manipulation Language (DML) for querying and modifying databases
- Define and use constraints and triggers in SQL.
- Describe the concept of transactions
- Build a simple database application in a high-level programming language (e.g., Java) that interacts with a relational database system at the back end (e.g., PostgreSQL).

Course Materials

We will use material from several books and websites:

- Database Systems: The Complete Book (2nd edition) by Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Widom Textbook web site: <http://infolab.stanford.edu/~ullman/dscb.html> (<http://infolab.stanford.edu/~ullman/dscb.html>) Note: You can use the examples and homework on this website for practice.
- A First Course in Database Systems by Jeffrey D. Ullman, and Jennifer Widom
- Database Management System by Raghu Ramakrishnan, and Johannes Gehrke

Technology Requirements

Students will need access to a laptop with reliable internet connectivity throughout the course. The laptop should run macOS, Windows, or a version of UNIX/Linux and allow you to install the required software.

The course will use:

- Canvas for course materials, announcements, and assignments
- Java for programming assignments
- An Integrated Development Environment (IDE) for writing and running code
- PostgreSQL for database and Entity-Relationship (ER) Modeling

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 \(http://www.sjsu.edu/senate/docs/S12-3.pdf\)](http://www.sjsu.edu/senate/docs/S12-3.pdf).

Assignments:

- No late assignments will be accepted without advance arrangement with the instructor. However, everyone has two passes to waive the penalty for
 - two submissions that are turned in within 24 hours after the due date, or
 - one submission that is turned in within 48 hours after the due date.
- All homework must clearly indicate each student's name, course, and assignment number.
- Students are allowed (and actively encouraged) to form study groups.
- You may discuss solutions, but you MUST write up the answers independently.
- If you use a website or reference book, you must cite it.
- If there are multiple similar submissions not exhibiting independent thought, or with words obviously lifted from a book or website, ALL such submissions will receive scores of 0.

LockDown Browser + Webcam Requirement:

This course requires the use of LockDown Browser and a webcam for online quizzes. The webcam can be the built-in type or one that plugs in via a USB cable. Watch [this \(https://web.respondus.com/lockdownbrowser-student-video/\)](https://web.respondus.com/lockdownbrowser-student-video/) brief video to get a basic understanding of LockDown Browser and the webcam feature. Download and install the LockDown Browser from [here \(https://download.respondus.com/lockdown/download.php?id=967937270\)](https://download.respondus.com/lockdown/download.php?id=967937270).

Project (Programming and Presentation):

A programming project of your choice related to the course in groups of two or three students. At the end of the semester, you will present the project in the class. Never use any code you find on the web unless you have permission from the instructor.

Midterm and Final Examinations:

- There will be two midterm examinations and a cumulative final exam. Exams may NOT be taken before or after the scheduled time for any reason. All students need to attend synchronously.
- No make-up exams for anyone except for a medical emergency with official medical proof.
- Use of electronic devices during exams is NOT allowed unless stated otherwise.
- The exams could include quizzes (closed book) and/or a written test (open book).
- The exams will remain with the instructor.

Course Prerequisites

You must provide documentation showing that you have satisfied the course prerequisites. Please submit proof of the required prerequisites by the end of first week. If you do not provide the required documentation by the deadline, you may be dropped from the course if other students are waiting for a seat. In any case, students who have not demonstrated that they have satisfied the prerequisites by the drop date will be dropped from the course.

Please note that I will not issue an add code without first verifying that the prerequisites have been satisfied. The required prerequisites are:

CS 146 (with a grade of "C-" or better); Computer Science, Applied and Computational Math, Forensic Science: Digital Evidence, Software Engineering, Data Science, or Computer Science and Linguistics majors only; or instructor consent.

✓ Grading Information

Assessment Policy

Attainment of the learning objectives will be assessed via several components distributed across the semester. The following breakdown outlines the relative weight of each component toward the final course grade.

- **Assignments (20% of Final Grade):** 4 programming and data-modeling deliverables (5% each).
- **Quizzes (10% of Final Grade):** 2 short in-class diagnostic checkpoints (5% each).
- **Mid-Term Exams (30% of Final Grade):** 2 exams testing theoretical and practical milestones (15% each).
- **Final Group Project (20% of Final Grade):** A comprehensive database application built in teams of 2–3.
- **Finals (20% of Final Grade):** 1 exam testing theoretical and practical milestones

Your course grade will be determined by your final weighted average:

A plus = 97% or higher

A = 93% to 97%

A minus = 90% to 93%

B plus = 87% to 90%

B = 83% to 87%

B minus = 80% to 83%

C plus = 77% to 80%

C = 73% to 77%

C minus = 70% to 73%

D plus = 67% to 70%

D = 63% to 67%

D minus = 60% to 63%

F = 0% to 60%

Boundary cases count as the higher of the two grades. I reserve the right to make the cut-offs above more generous. My general tendency is to be somewhat strict when assigning numeric scores, and more lax when translating those scores into letter grades.

The syllabus, details and dates of each of the above assessments will be posted in Canvas.

Make-up exams and quizzes will be granted only for extenuating circumstances. Contact the instructor as soon as possible during the semester if you have such a circumstance. Absence from examinations and quizzes without prior approval will result in a score of 0.

AI Use Policy

The concepts in this course form the foundation for a lifelong CS career, and mastering them requires direct engagement with the material. AI tools are permitted as a study aid: for self-quizzing, alternative explanations of concepts, and generation of additional practice problems. AI use is not permitted on any component of the assessed coursework tied to the learning objectives. To enforce this consistently, most assessment in this course takes place in class under uniform conditions.

Homework is not proctored, but AI use on homework is discouraged. Homework serves as the mechanism by which concepts are internalized: working through an algorithm, encountering difficulty, and resolving it independently is what builds the understanding required for quizzes, exams, and later professional application. Completing homework with AI assistance produces a completed assignment without producing the corresponding learning, and that gap typically surfaces during in-class assessment.

University Policies

Per [University Policy S16-9 \(PDF\)](http://www.sjsu.edu/senate/docs/S16-9.pdf) (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on the [Syllabus Information](https://www.sjsu.edu/curriculum/courses/syllabus-info.php) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

Here's an overview of the course, organized by lecture. The schedule is tentative and may evolve as the course progresses; any changes will be communicated in advance.

Session	Week	Class Date	Addition Info	Tentative Topics
1	1	8/20/2026		Course Introduction, Prerequisites Check
2	2	8/25/2026		Database Architecture & Data Independence
3	2	8/27/2026		The Entity-Relationship (ER) Model Basics
4	3	9/1/2026		Advanced ER Modeling & Constraints
5	3	9/3/2026		The Relational Model & Schema Mapping
6	4	9/8/2026	Assignment #1 Released	Practical Modeling Workshop & Case Review
7	4	9/10/2026		Formal Query Languages: Relational Algebra I
8	5	9/15/2026	Last add/drop day	Relational Algebra II: Joins & Complex Operations
9	5	9/17/2026	Quiz #1 : In-class	Introduction to Structured Query Language (SQL)

10	6	9/22/2026	Assignment #1 Due	Intermediate SQL: Aggregations & Grouping
11	6	9/24/2026	Assignment #2. Released	Advanced SQL: Subqueries & Joins
12	7	9/29/2026		Views, Triggers, & Database Access Control
13	7	10/1/2026	Mid Term #1 : In-class	Mid Term #1
14	8	10/6/2026	Assignment #2 Due	Functional Dependencies (FDs) & Axioms
15	8	10/13/2026		Schema Normalization: 1NF, 2NF & 3NF
16	9	10/15/2026	Assignment #3 Released	Introduction to Transaction Foundation
17	9	10/20/2026		Database Engines: Recovery, Processing & Tuning
18	10	10/22/2026	Assignment #3 Due	NoSQL Architecture & Key-Value Stores
19	10	10/27/2026		Document-Oriented Databases (XML & JSON Stores)
20	11	10/29/2026	Assignment #4 Released	Graph Databases & Distributed Architectures
21	11	11/3/2026	Group Project: Students form groups of 2–3 and submit application problem domains.	Hands-On DB Engineering with PostgreSQL Tools
22	12	11/5/2026	Assignment #4 Due	Schema Modification, Round-Trip Engineering & Connecting Java to PostgreSQL
23	12	11/10/2026	Mid Term #2	Mid Term #2
24	13	11/12/2026		Building the Java Application Interface
25	13	11/17/2026		Transaction Control & Optimization
26	14	11/19/2026		Project Presentation - 1
27	14	11/24/2026		Project Presentation - 2
28	15	11/26/2026	No Class - Thanksgiving Holiday	
29	15	12/1/2026		Finals Review #1
30	16	12/3/2026	Last instruction day	Finals Review #2
31	16	12/8/2026	Study/ Conference day	TBD
32			Finals	Check Date and Time Here (https://www.sjsu.edu/classes/final-exam-schedule/fall2026.php (https://www.sjsu.edu/classes/final-exam-schedule/fall))