SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

# Introduction to Database Management Systems Section 06

## CS 157A

Fall 2024 3 Unit(s) 08/21/2024 to 12/09/2024 Modified 08/20/2024

## Contact Information

**Instructor**: Narayan Balasubramanian

**Office Location**: Duncan 280

**Email**: narayan.balasubramanian@sjsu.edu

**Office Hours**: Monday & Wednesday 4:30 pm -5:45 pm

**Class Days/Time**: Monday and Wednesday 3:00pm ~ 4:15pm

**Classroom**: MacQuarrie Hall 222

**Prerequisites**: CS 146 Data Structures and Algorithms (with a grade of "C-" or better); Computer Science, Applied and Computational Math major.

## Course Information

- To introduce students to the purpose of Database systems and databases, as well as common users of such systems.
- To teach students about the relational model and relation algebra.
- To teach students about design theory (such as normalization, etc.) and algorithms that help
- Determine if a given database's tables are organized in a reasonable way. • To teach students about real-world database system usage, architectures and components. Some example systems that might be considered are: Oracle, MySql, Postgres, Access, DB2, and SQL Server.
- To teach students about SQL, the standard language for interacting with a database.
- To teach students how to interact with a database system from a programming language such as Java, JSP, JavaScript, C, PHP, Perl, etc.
- To develop a real world database application

# 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, or Data Science majors only; or instructor consent.

Letter Graded

# Classroom Protocols

You are expected to attend classes. If you cannot attend, it is your responsibility to get a copy of the lecture notes and class announcements from a reliable classmate. The instructor reserves the right to ignore frivolous or inappropriate e-mail inquiries. Students are expected to participate actively to provide improvement to presentations by other classmates.

# 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 Learning Outcomes (CLOs)

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

- Apply theoretical knowledge and practical skills to develop database applications using DBMS and SQL language
- Effectively use the Entity Relationship Diagram for the representation of conceptual schemas.
- Identify functional dependencies and apply normalization algorithms.
- 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.
- Develop data retrieval procedures using Relational Algebra.
- Write simple transactions using JDBC or similar programmer interfaces in other languages.

# Course Materials

Textbook

Database Systems: The Complete Book (2nd edition) by Garcia-Molina, Ullman, and Widom

Textbook web site: http://infolab.stanford.edu/~ullman/dscb.html

# Course Requirements and Assignments

Homework Assignments You are expected to learn all of the material presented in the lectures. Written homework and project reports are also a requirement of the course. Homework and project reports must be turned in on time; late homework and reports will NOT be accepted. Both homework and project assignments are due at the beginning of the class period on the announced due date.

Pop Quizzes There will be Pop quizzes that will test your knowledge on the material covered. These quizzes can only be taken in class and if you miss the quiz, you will be given zero for that quiz.

Midterm and Final Exams Exams will consist of questions and problems aimed at assessing student mastery of course topics. Conceptual questions may be in the form of essay or multiple-choice format. Problems will require the production of (or correction of) SQL code, data models, or similar output. All exams are closed book and note. If you are unable to attend any one of the exams, arrangements may be made only if you have a legitimate reason. You need to inform your instructor ahead of time and have written documentation available. If you are unable to attend the exam due to illness or emergency, you also need to inform your instructor before the exam and bring documentation afterwards to request a make-up exam, or the points for that exam will be allocated to other exams.

Database Design and Implementation Project The course will teach you practical knowledge that you can apply at work. To that end, the project has to be real world and not theoretical. You are allowed to work in groups of 2 for the project. Project code has to be posted in a private git repository.

You are allowed to collaborate on Homeworks. You can learn from and teach your fellow students. Students are however required to turn in their own work.

# Grading Information

• Class Participation: 15% (pop quizzes, pop questions, discussions, etc.)

• HW Assignments: 20% (5 Individual HWs)

• Database term project: 20% (Team with peer evaluations)

• Midterm exam: 20%

• Final exam: 25% (Accumulative/Comprehensive)

Digit number grades will be assigned according to the following policy:

97 ~ 100 ---- A+

93 ~ 96 ---- A

90 ~ 92 ---- A-

87 ~ 89 ---- B+

83 ~ 86 ---- B

80 ~ 82 ---- B-

77 ~ 79 ---- C+

73 ~ 76 ---- C

70 ~ 72 ---- C-

67 ~ 69 ---- D+

63 ~ 66 ---- D

60 ~ 62 ---- D-

0 ~ 59 ---- F

Each assignment, project, and exam will be scored (given points) but not assigned a letter grade. Final individual class letter grades will be assigned based on the class curve. Your final class grade can be adjusted up or down depending on your level and quality of class / project performance

# University Policies

Per University Policy 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) web page. Make sure to visit this page to review and be aware of these university policies and resources.

# Course Schedule

Tentative schedule (Schedule subject to change)

| Week | Date | Topics |
|---|---|---|
| 1 | Aug 26, Aug 28 | Introduction to Database Systems Concepts |
| 2 | Sep 4 | Relatoinal Algebra |

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| 3 | Sep 9, Sep 11 | SQL Programming |
| 4 | Sep 16, Sep 18 | Constraints and Triggers, Transactions, Views, Indexes |
| 5 | Sep 23, Sep 25 | DTD, XML Schema, XPath, XQuery, XSLT |
| 6 | Sep 30, Oct 2 | Entity Relationship Model, UML, ODL |
| 7 | Oct 7, Oct 9 | Authorization |
| 8 | Oct 14, Oct 16 | Recursive SQL |
| 9 | Oct 21, Oct 23 | Mid Term Review, Mid Term |
| 10 | Oct 28, Oct 30 | Object Relational SQL |
| 11 | Nov 4, nov 6 | Information Integration |
| 12 | Nov 13 | Data Mining, OLAP |
| 13 | Nov 18, Nov 20 | No SQL |
| 14 | Nov 25 | Buffer |
| 15 | Dec 2, Dec 4 | Buffer |
| 16 | Dec 9 | Finals Review |
| 17 | Dec 17 | Final Exam 12:15-2:15 |
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