COURSE SYLLABUS

YEAR COURSE OFFERED: 2021
SEMESTER COURSE OFFERED: Fall
DEPARTMENT: Computer Science
COURSE NUMBER: COSC3380
NAME OF COURSE: Database Systems
NAME OF INSTRUCTOR: Carlos Ordonez

The information contained in this class syllabus is subject to change without notice. Students are expected to be aware of any additional course policies presented by the instructor during the course.

Learning Objectives

Students will gain a basic understanding on the theory, principles and systems aspects to design, update and query a relational database, managed by a DBMS. From a theory perspective, there will be an introduction to first order logic, set theory, relational algebra, functional dependencies and normalization. From a programming perspective, students will learn how to create tables, indexes, schemas, as well as developing queries and transactions in SQL. The course will explain the main subsystems of a DBMS, including the file system, storage manager, locking manager, transaction scheduler, query optimizer and recovery manager.

Major Assignments and Exam

This is a course that gives more weight to programming homeworks. Grading is as follows:

- 70%: 2 programming assignments. HW1 (individual) is 30% and HW2 (team of 2 students) has 40% weight. HW1: using only SQL to understand queries and functional dependencies & normalization (i.e. no host language); HW2: designing an ER database model, developing SQL transactions, defining SQL queries, and creating a web application program with JavaScript or Python, sending SQL statements to a DBMS and retrieving results. Each HW will be delivered in 2 phases and then carefully tested by TAs. Phase 1 will receive a preliminary score and it is a requirement to submit Phase 2: Phase 2 will not be accepted without Phase 1 submitted. A score will be assigned based on 10 test cases of varying difficulty and checking source code originality and quality. There will be an opportunity for resubmission with 10%-20% penalty depending on the number and importance of source code fixes.
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- 30%: midterm exam. If classes are face to face the exam will be in-class, closed-book. Otherwise, if the course switches to online mode exam would be open-everything and the weight would be 20%. The exam has 10 questions, short answer.
- Bonus points: Up to 5 points out of 100 (i.e. up to 5%), towards final grade, based on participation (in-class, answering theory and system programming questions).

Required Reading

This is the textbook used in the course:


List of lecture topics

1. Review of set theory and first order logic
2. Relational model: domains, tuples, arity, cardinality
3. Relational algebra and SQL
4. Functional dependencies
5. Normalization up to 3NF and BCNF
6. Database design and software engineering: ER model, flows
7. DBMS subsystems
8. Storage, Indexing, transaction/locking manager, query optimizer
9. Transaction processing: ACID, locking, timestamping, mvcc
10. Query processing: SPJA queries, derived tables/view, optimization, cost
11. Advanced (optional): MVDs, 5NF, UDFs, pivoting, recursive queries, security.
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Synchronous Online Course:

This course is being offered in the Synchronous Online format. Synchronous online class meetings will take place according to the class schedule. There is no face-to-face component to this course. In between synchronous class meetings, there may also be asynchronous activities to complete (e.g., discussion forums and assignments). This course may have a final exam per the University schedule. The exam would be delivered in the synchronous online format, and the specified date and time will be announced during the course. Prior to the exam, descriptive information, such as the number and types of exam questions, resources and collaborations that are allowed and disallowed in the process of completing the exam, and procedures to follow if connectivity or other resource obstacles are encountered during the exam period, may be provided.

Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Undergraduate Excused Absence Policy and Graduate Excused Absence Policy for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability.

Interim Undergraduate Grading Policy

Due to the unique and unprecedented challenges associated with the COVID-19 pandemic, the University of Houston has implemented an Interim Undergraduate Grade Policy for undergraduate grades which applies to all undergraduate students in courses offered in all sessions during fall 2020. Under this policy, students have the option of converting final assigned letter grades to S (Satisfactory, applicable to any letter grade from A to D-) or NCR (No Credit Reported COVID-19, applicable to grades of F) on their transcripts. Please visit FAQs for additional information.

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the Center for Students with Disabilities. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may
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be recorded by the instructor. Students may use instructor’s recordings for their own studying and notetaking. Instructor’s recordings are not authorized to be shared with anyone without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Syllabus Changes

Due to the changing nature of the COVID-19 pandemic, please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible through (specify how students will be notified of changes).

Webcams

Access to a webcam is recommended for students participating remotely in this course, but participation with other devices is acceptable (smartphone).