UTRGV COURSE SYLLABUS

CSCI4333.01&.03 Database Design & Implementation	Dr. Zhixiang Chen
Fall 2017	665-2857, Email: zhixiang.chen@utrgv.edu
MW 12:15pm~1:30pm ENGR 1.272	Office: Engr. 3.264A, Office hours: MW 1:40pm~4:00pm

Textbook and/or Resource Material

The course textbook is *Database System Concepts*, by Silbershatz, Korth and Sudarshan, 6th edition. We will follow it rather closely, with additional topics in certain areas. A resource page (click here) for this textbook is maintained by the text authors.

I will use Blackboard for this class. Please make sure that you assess Blackboard often for course materials, assignments, and especially submitting your assignments. Assignment deadlines will be enforced by Blackboard. Additional materials may be available at my web page: http://faculty.utrgv.edu/zhixiang.chen/

Course Description and Prerequisites

Study of logical (hierarchical, network, relational) and physical (sequential, indexed, relative) organization of databases. Database management systems and their features, querying databases, distributed databases, and data compression. Equivalent course: CMPE 4333, a student may receive credit in only one course. Prerequisites: CSCI 3333 or CMPE 3333.

Learning Objectives/Outcomes for the Course

Upon successfully completing the course each student should be able to:

1. Knowledge and Comprehension
   - Discuss the history of data management including file-based systems, 1st Generation DBMS, 2nd Generation DBMS, & 3rd Generation DBMS.
   - Describe basic DBMS concepts and terminology (database, DDLs, DMLs, DB Roles, system catalog, relation, column, tuple, intension, degree, extension, cardinality, n-tuple, relation schema, relational database schema, relation instance, keys, base/home relation, integrity/domain/general constraints).
   - Discuss the ANSI-Sparc three-level architecture and discuss how data independence and views affect our interaction with databases.
   - Draw and discuss different DBMS topologies (teleprocessing, file-server, n-tier).
   - Describe the characteristics in Relational Algebra & Set Theory that are supported in the Relational Model. Including :
     - E. F. Codd, the relational db model & properties of relations
     - Relational Algebra (sets & operators)
   - Describe the main operations used to define and manipulate a database management system(create, drop, select, insert, update, delete)
   - Describe the physical level of a database management system, wrt file organizations and optimizations for speeding up search/retrieval (indexes, clusters).
   - Describe the different stages in designing a database application (conceptual, logical, and physical) and be aware of the importance of documenting each phase of database design. Describe the purpose and contents of an ER Diagram including:
     - How an ER Model improves database design.
     - The importance of understanding the relationships (multiplicity) of the entities
   - Describe the concept of Normalization and be able to:
     - Discuss the anomalies that require normalization of relations.
     - Understand what functional dependencies are and how to identify them.
     - Describe 1st, 2nd and 3rd Normal Forms of relations.
   - Describe the basic syntax for programming in a DBMS language (SQL)
   - Describe the Oracle Physical DB Architecture (database, tablespace, schema, data files, redo log files, control files)

2. Application and Analysis

- List the main differences between file-based systems and database management systems and understand the issues and advantages of each.
- Differentiate between the different DBMS topologies giving their advantages and disadvantages.
- Compare different SQL operations and state the advantages they provide (ex. Views vs Queries, Sub-queries vs. Joins)
- Compare the advantages of different normalization levels.
- Apply the steps to solve physical database issues (e.g., when to increase tablespace size).
- Analyze SQL statements and determine the results on the relational database schema that they operate on
- Prove that a relation is in 1st, 2nd or 3rd normal forms.
- Differentiate between file indexes and physical file formats and describe the advantages each provides.
- Determine the impact of changes (domain, constraints) in the structure of a relational database schema
- Study integrity and security
- Understand concepts of transactions
- Understand concurrency control
- Understand recovery system
- Study Distributed database
- Study advanced data mining and information retrieval
- Study MS SQL paradigm, and Oracle Paradigm

3. Synthesis and Evaluation
   - Create a relational database schema in a RDBMS using SQL.
   - Construct relation schemas and instances for a particular problem.
   - Convert Relational Algebra expressions to SQL and vice versa.
   - Design a relational database schema from a problem statement through conceptual/logical/physical database design.
   - Write SQL expressions to perform operations (modify data or structure) on a relational database schema.
   - Create an ER Model from the mission statement and objectives for a database application and change it given changes to requirements.
   - Derive relations from an ER Model.
   - Identify functional dependencies on relations and normalize database relations using the 1st, 2nd and 3rd normal forms.
   - Create physical database tables for a set of normalized relations.
   - Complete a class project in three stages: (1) ER and relational designs for a problem. Normalize the relational design. (2) Design a three-tiered: browser/interface, Web server, DB server + application server. (3) Using MySQL and PHP to implementation the system.

ABET Student Outcomes for CSCI 3333

The list of ABET student outcomes related to this class is:

(a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline.
(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
(d) An ability to function effectively on teams to accomplish a common goal.
(e) An understanding of professional, ethical, legal, security and social issues and responsibilities.
(g) An ability to analyze the local and global impact of computing on individuals, organizations, and society.
(h) Recognition of the need for and an ability to engage in continuing professional development.
(i) An ability to use current techniques, skills, and tools necessary for computing practice.
(j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

(k) An ability to apply design and development principles in the construction of software systems of varying complexity.

Learning Objectives for Core Curriculum Requirements
This course is not a part of the University Core Curriculum.

Grading Policies
There will be two midterm exams, plus a final exam. Course grades will be assigned in consistency with the following weighting formula: attendance 5%, midterm one 12.5%, midterm two 12.5%, homework 15%, project 25%, final 30%.

A=90 or higher, B=80~89, C=70~79, D=60~69, F=0~59

Note: Bonus projects will be announced during the semester.

Assignment Policies

- All assignments must be submitted to BlackBoard on or before the due date which will be specified on each assignment. Late assignments will be accepted up to one week with a onetime 20% late penalty.
- Assignments will be graded on the basis of correctness, quality of design, documentation, and style.
- Any assignment submitted without documentation will automatically receive a 20% deduction. Documentation, design, and style guidelines will be discussed as the semester progresses. No programming assignment will be graded which contains syntax errors.

Homework Grading Criteria

1. If submission is within one week past the deadline, your grade will have 20% penalty reduction. That is, your work is first graded on 100% scale to receive a mark, say X, then the final mark Y is adjusted to Y= 80% * X.
2. No submission one week past the deadline is accepted.
3. If your submitted program cannot be compiled or built, you get 0.
4. If your program has 70% or above similarity as detected by SafeAssign or grader, you get 0.
5. Now assume that your submission passes above 4 criteria.
   5.1. If your program passes compiling and building, the grader can give you 40% to 50% of the credit, depending on his evaluation.
   5.2. If your program passes 5.1, but cannot produce any desired outcomes, the grader can give you 50% to 60% of the credit, depending on his evaluation.
   5.3. If your program passes 5.1 and can produce partial desired outcomes, the grader can give you 60% to 100% of the credit, depending on his evaluation. For example, if the assignment asks for three outcomes with respect to three testing scenarios, the grader can allocate some percentage for each of the three outcomes, or consider some outcomes are more substantial and use them to judge whether you shall receive full credit.
   5.4. If your program passes 5.1 and can produce the desired outcomes as required by the assignment, you get 100% of the credit.
6. About proper formatting and documentation: The grader can take 5% to 10% off your program, if he thinks that this is necessary.

Calendar of Activities
Include in this section a table or list that provides information for students regarding important dates, assignments or activities. The UTRGV academic calendar can be found at https://my.utrgv.edu/home at the bottom of the screen, *prior to login*. Some important dates for Fall 2017 include:

August 28	First day of classes
August 31	Last day to add a course or register for fall 2017
September 4	Labor Day – NO classes
November 15	Last day to drop a course; will count toward the 6-drop rule
November 23 – 26	Thanksgiving Holiday – NO classes
December 6	Last day of classes

December 7 Study Day – NO class
December 8 -14 Fall 2017 Final Exams
December 15-16 Commencement Ceremonies

Topics and Schedule

Lecture	Topic / Activity	Reading	Homework and handout
Week 1	Introduction; Policy explanation; Relational DB	Chapter 1 & 2	Project Assignments: Part A, Part B, Part C, Part D.
Week 2	Relational DB	Chapter 2	Chapter 1 ppt Chapter 2 ppt Chapter 3 ppt Chapter 4 ppt Chapter 5 ppt
Week 3	SQL	Chapter 3 & 4	Materials prepared by our TAs 1. How to create a DB in MySQL server 2. How to Program PHP through MySQL
Week 4	SQL & Other Relational Languages	Chapter 4 & 5	HW 2
Week 5	(1) MySQL Server (2) PHP server-side scripting (3) PHP DB access (4) Client side scripting and GUI design Reviews for Midterm 1	handouts	Chapter 6 ppt Chapter 7 ppt Chapter 8 ppt Chapter 9 ppt Chapter 10 ppt
Week 6	Lab Instruction: Coding Case study	handouts	Midterm 1.
Week 7	DB Design & ER-model	Chapter 6	TDB: Sample solutions to Midterm 1.
Week 8	Relational DB Design	Chapter 7	Chapter 11 ppt Chapter 12 ppt Chapter 13 ppt
Week 9	Application Design and Development	Chapter 8	Chapter 14 ppt Chapter 15 ppt Chapter 16 ppt
Week 10	Indexing and Hashing	Chapter 12	Chapter 17 ppt Chapter 18 ppt Chapter 19 ppt Chapter 20 ppt Chapter 21 ppt Chapter 22 ppt
Week 11	Querying processing and Optimization	Chapter 13 & 14	Midterm 2. HW3
Week 12	Transactions	Chapter 15	TDB: Sample solutions to Midterm 2.
Week 13	Concurrency Control & Recovery System	Chapters 16, 17	HW4

Week 14	(1) Data Mining	Chapters 18	HW5
Week 15	(2) Information Retrieval	Chapter 19	
Final Week	Project Testing		
Final Week	Final Exam		Final Exam TBD: Sample solutions to Final Exam

Additional Topics in the following areas will be covered, if time permits

1. Indexing techniques
2. Data Mining
3. Disk management techniques
4. Object-oriented DBs
5. Query optimization

Other Course Information

Please visit my web page and BlackBoard regularly for additional course information and materials.

UTRGV Policy Statements

STUDENTS WITH DISABILITIES:

Students with a documented disability (physical, psychological, learning, or other disability which affects academic performance) who would like to receive academic accommodations should contact Student Accessibility Services (SAS) as soon as possible to schedule an appointment to initiate services. Accommodations can be arranged through SAS at any time, but are not retroactive. Students who suffer a broken bone, severe injury or undergo surgery during the semester are eligible for temporary services. **Brownsville Campus**: Student Accessibility Services is located in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at ability@utrgv.edu. **Edinburg Campus:** Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at ability@utrgv.edu.

MANDATORY COURSE EVALUATION PERIOD:

Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (http://my.utrgv.edu); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available:

Fall 2017 Module 1	Oct. 5 – Oct. 11
Fall 2017 Module 2	Nov. 29 – Dec. 5
Fall 2017 (full semester)	Nov. 15 – Dec. 6

ATTENDANCE:

Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV's attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

SCHOLASTIC INTEGRITY:

As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism (including self-plagiarism), and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all

students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

SEXUAL HARASSMENT, DISCRIMINATION, and VIOLENCE:

In accordance with UT System regulations, your instructor is a "Responsible Employee" for reporting purposes under Title IX regulations and so must report any instance, occurring during a student's time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at www.utrgv.edu/equity, including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect that is free from sexual misconduct and discrimination.

COURSE DROPS:

According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the "3-peat rule" and the "6-drop" rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.