CMPSC 431W: Database Management Systems - Spring 2023

Updated 01/11/2023

Material:	Announcements, lecture slides, project information, homeworks, and so on will be made available in Canvas.		
Class Meetings:	Mondays, Wednesdays, Fridays Section 1: 2:30 – 3:20 p.m. at 113 Carnegie Building Section 2: 3:35 – 4:25 p.m. at 262 Willard Building		
Instructor:	Wang-Chien Lee	**Email:**	Canvas☜☺ or wul2@psu.edu
Office:	W332 Westgate Building	**Hours:**	MWF 1:20pm – 2:10pm
TA/LA:	Fang He (F) Sheryll Martutartus (S) Werner Hager (W) Jasmine Lin (J) Chin Kai Ling (C) Vedant Sahai (V)	**Email:**	(F) fxh35@psu.edu (S) sbm5761@psu.edu (W) wuh168@psu.edu (J) jjl6314@psu.edu (C) lzc5542@psu.edu (V) vzs5356@psu.edu
Office Hours:	(F) Tuesdays/Thursdays 4-5pm, Friday1-2pm at 343 Westgate (S) Tuesdays/Thursdays 1:45-2:45pm, Wednesdays1-2pm at 300 College (W) Mondays, Wednesdays, Fridays 5-6pm at 300 College (J) TBA (C) Mondays, Wednesdays, Fridays 9:50-10:50am at 300 College (V) Tuesdays/Thursdays 11:30am-1pm at 300 College		

☺ **Emails via Canvas are preferred for timely communications on course matters.**

Exam Schedule

- **Midterm I: Wednesday evening, 02/15/23, 6:15-7:30pm, 121 Sparks**
- **Midterm II: Monday evening, 03/27/23, 6:15-7:30pm, 010 Sparks**
- **Final Exam: Based on University Final Exam Schedule**

Course Mode and Face Masking

This course adopts **in-person teaching/learning mode** in Fall 2023. There is NO remote/online access to the lectures. We closely follow the health guidelines and policies of Pennsylvania State University. Coronavirus information and guidance for Penn Staters can be found at https://virusinfo.psu.edu/.

Course Description

This course introduces the student to the design, use, and applications of database management systems. Topics include: the relational data model, relational query languages, conceptual data design/modeling, logical schema design/normalization theory, design and tools for database/Internet/Web applications. Broad introduction of database internal system issues that is important to database designers (such as views, integrity

constraints, triggers, data storage, indexing, query processing, transactions, and security) will also be covered. If time allows, we will consider some new and advanced topics.

At the completion of this course, the students shall have a good understanding of relational model, how to transform Entity-Relationship designs to relations, learn the query languages for relational databases, i.e., Relational Algebra and Structured Query Language (SQL), and how to use a relational database system to create database applications. Students are expected to design and implement database applications in the setting of World Wide Web. In addition, as part of the University's writing across the curriculum, students are expected to report their projects in a clear and well-written document.

After this course, those who are interested in pursuing an in-depth research study on database systems are encouraged to take CSE541 or a related special topic course (e.g., CSE598 or CSE597).

Course Goals

- Introduce the design, use, and applications of database management systems
- Obtain broad knowledge in concepts of database management systems

Course Objectives

After successfully finish this course, the students are expected to be able to:

- Understand the important concepts behind *database management systems.*
- Understand the basic concepts and pros/cons of different *data models*, including relational, hierarchical, network, and other new data models.
- Understand the fundamental concepts in *conceptual modeling* and perform conceptual database design based on Entity-Relational (ER) Diagrams.
- Understand the detailed concepts of *Relational Data Model* and perform *logical database design* by translating ER diagrams into relational database schemas.
- Understand the concepts of *functional dependencies* and perform *schema refinement* to obtain normalized database schemas.
- Learn *formal query languages* for relational database, including Relational Algebra and Structural Query Language (SQL), to express queries in relational algebra expressions and use SQL to retrieve data in relational databases.
- Understand the concepts and current technologies, including languages, tools, architectures, protocols, standards, and so on, for the *development of database and Internet/Web applications*.
- Understand the basic concepts and the *architecture* of modern database management systems and its components, including *storage/indexes, query engine*, and *transaction manager*, and their functionalities.
- Understand the impact of database technology and applications on individuals, institutes as well as local and global society.
- Understanding *computer ethics, privacy, security*, and its impact on society

- Design and develop a large database/web application project; speak clearly and persuasively about technical subjects and use supporting materials effectively; write clear and effective technical reports.

Intended Audience

This course is designed to be beneficial to students in computer science and computer engineering majors, as well as others interested in studying the development of software applications with large-scale data management needs.

Recommended Background

Prerequisite Courses (Required): CMPSC 221 Object Oriented Programming with Web-Based Applications; ENGL 202C GWS - Effective Writing: Technical Writing.

CSE465 or equivalent knowledge is desired, which includes fundamental concepts of computer science: data structures, analysis of algorithms, trees, graphs, sorting, etc. This course has a project that involves intensive database design and implementation under the context of World Wide Web. *Experiences and familiarity with Web site/application design and programming* (e.g., familiar with Python, JAVA, C/C++, JSP/ASP/PHP, HTML, SQL, Web Design Tools and Platforms) are expected.

Textbook

- R. Ramakrishnan and J. Gehrke, *Database Management Systems*, Third Edition, McGraw-Hill Publisher.

Helpful Optional Readings

Many tutorials and reading materials for SQL, databases, HTML, Web Design tools are available on the WWW (see Projects for details).

Grading Policy

Final grades computed based on 100 points:

- 50 points: Exams - two midterms (15 points each) and a final exam (20 points)
- 31 points: Two-Phase Project - Phase 1 (11 points, including Web Programming Exercise: 1 point and Database Design Report: 10 points) and Phase 2 (20 points, including Progress Review: 2 points, Demonstration: 16 points, Video: 2 points)
- 13 points: Homework Assignments
- 6 points: In-Class Participation and Discussion **(No makeup!)**
- **Top Hat** is used in lectures to facilitate the collection of responses to participation and discussion questions from students attending the classes in person.
- Extra points may be earned by submitting bonus homework, implement extra features in project, and so on. Extra participation questions with bonus points may be given.

Final grades will reflect the extent to which you have demonstrated understanding of the material, and completed the assigned homework and project. No incomplete grade will be assigned unless there is an exceptional, extenuating circumstance.

In-Class Participation and Discussion

Participations and discussions in classes are essential for effective learning in the course. Penn State IT finalized a university-wide agreement to provide Top Hat, an online response system, at no cost to students and instructors. Only students attending classes in person can use their phones, tablets, or laptops to participate in polling and discussions. Please note that responding to Top Hat questions outside the classroom is a violation of academic integrity.

For setup information of Top Hat, please refer to https://pennstate.service-now.com/sp?id=kb_article_view&sysparm_article=KB0015827&sys_kb_id=476eb94edb47e81029b24a28139619b1&spa=1. Please also check your university email address for the invitation and click on the unique link provided in the email to enroll.

Homework

Several homework assignments will be given throughout the course. They should be answered based on the concepts and notation introduced in lectures and textbook, with proper citations (e.g., slide #, section # in the textbook, or other sources relevant to the questions). Homework is meant to be **individual work**, but discussion with classmates for clarification of questions and concepts is encouraged. Homework should be turned in *electronically* via CANVAS.

Exams

The exams will be held in the evenings and will be **closed book**. The exams will test your understanding of the basic ideas and objectives of the class as covered in the course book and the lectures. **Make-up exams are not allowed unless a student has an unavoidable severe situations. In these cases, please inform the instructor *at least one week* in advance.**

Individual Project

There is a two-phase project to be performed by students **individually**. The goal of this project is for students to gain in-depth knowledge and hands-on experiences on certain issues of databases design and implementation. Students will need to make a video recording of presentation at the end of the project. Tentative due dates for milestones and deliverables of the project are as follows:

- Project Phase 1 – Database Application Design Report (Phase 1): 03/03/23
- Project Progress Review: 03/20/23
- Project Phase 2 – Final Demonstration/Review: 04/24/23 – 04/25/23.
- Project Presentation (video recording): 04/26/23

Writing

This course satisfies the 'Writing Across the Curriculum' course requirement. Accordingly, the quality of technical writing in your project report and individual writing assignments (included with homework assignments) will constitute a significant portion of your overall course grade.

Late Policy

Students are strongly encouraged to turn in assignments on-time. Unless otherwise noted for a particular assignment, the following late policy holds. *Late assignments will be penalized by subtracting 20% of the total achievable points of that deliverable, if turned in within the first 24 hours after the due time/date. Between 24 to 48 hours late turn in will result in a reduction of 50% of the total achievable points. Submissions after 48 hours will receive no point.* Certain deliverables may not have ANY LATE day, as announced. Late point reductions cannot be made up by later improvements.

Attendance Policy

Class attendance is one of the most important ways students learn and understand course materials. It is a critical element of student success. Class attendance recognizes on exceptional occasions, students may miss a class meeting to participate in a regularly scheduled university-approved curricular or extracurricular activity (such as Martin Luther King's Day of Service, field trips, debate trips, choir trips, and athletic contests), or due to unavoidable or other legitimate circumstances such as illness, injury, military service, family emergency, religious observance or post-graduate, career-related interviews when there is no opportunity for students to re-schedule these opportunities (such as employment and graduate school final interviews.)

In all cases, students should inform the instructor in advance, where possible, and discuss the implications of any absence. Missing class, even for a legitimate purpose, may mean there is work that cannot be made up, hurting the student's grade in the class. **Students should provide documentation/evidence** for participation in University-approved activities, for illness, injury, family emergency, as well as for career-related interviews. **Students who will miss a class in accordance with Senate Policy 42-27, should present a class absence form.**
https://undergrad.psu.edu/aappm/class_absence_v3.pdf.

If a medical problem (e.g., COVID) prevents a student from attending class for an extended period of time, please provide documentation of *when the student should be excused from class* and discuss with the instructor material needed to help the student makeup missed material. Please note the condition causing the absence does not need to be provided, just the *time period*. Students experiencing high fevers, vomiting, excessive coughing, etc. should consult a medical professional as soon as possible.

Academic Integrity

The University defines academic integrity as the pursuit of scholarly activity in an open, honest and responsible manner. All students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts (refer to Senate Policy 49-20. Dishonesty of any kind will not be tolerated in this course. Dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. **Students who are found to be dishonest will receive academic sanctions and will be reported to the University's Office of Student Accountability and Conflict Response for possible further disciplinary sanctions (refer to Senate Policy G-9).**

Additionally, The Department of Computer Science and Engineering expects all student programming work assigned in a class to be completed independently by students (or by teams if permitted/required) and to consist of code designed and developed solely by the students. The use of any other code is not permitted unless the course instructor explicitly allows it and such code is clearly identified as coming from an external source and that source is credited. Students will never be given credit for code which they did not construct. Refer to **Academic Integrity Standards for CMPSC, DS, CMPEN, and CSE Programming Courses** at http://www.eecs.psu.edu/students/resources/EECS-CSE-Academic-Integrity.aspx

If you violate academic integrity in this course, you cannot drop the course or opt-in to the alternative grading scheme (even if it's offered.) Violators will receive academic sanctions **(e.g., 0 for the whole assignment/exam + half letter grade reduction in the final overall grade)** and will be reported to the University's Office of Student Accountability and Conflict Response for possible further disciplinary sanctions **(i.e., repeated violators will result in serious Disciplinary Sanctions!)**

Accessibility

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Student Disability Resources Web site provides contact information for every Penn State campus. For further information, please visit the Student Disability Resources Web site.

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with an accommodation letter. *To arrange the accommodation, please share this letter with the instructor to discuss your requests as early as possible - at least two weeks before the first midterm exam.* You must follow this process for every semester that you request accommodations.

Counseling & Psychological Services (CAPS)

Students who experience personal issues that interfere with their academic performance, social development or satisfaction at Penn State are encouraged to seek confidential assistance from Counseling and Psychological Services (CAPS) Center (http://studentaffairs.psu.edu/counseling/). They can be reached at (814) 863-0395. Some of the more common concerns they can help with include anxiety, depression, difficulties in relationships (friends, roommates, or family); sexual identity; lack of motivation or difficulty relaxing, concentrating or studying; eating disorders; sexual assault and sexual abuse recovery; and uncertainties about personal values and beliefs. Crisis intervention is available from Centre County CAN HELP (http://centrecountypa.gov/index.aspx?NID=593) at 1-800-643-5432, 24 hours a day, seven days a week.

Education Equity Reporting

Consistent with University Policy AD29, students who believe they have experienced or observed a hate crime, an act of intolerance, discrimination, or harassment that occurs at Penn State are urged to report these incidents as outlined on the University's Report Bias webpage: http://equity.psu.edu/reportbias/.

Consent of Policies

I have carefully read the information provided on the Syllabus of CMPSC431W and fully understand ALL the policies listed in the course syllabus, CANVAS, as well as department and university websites.

Christopher Kramer	943321112
Student Name	**PSU ID**
	1/11/2023
Signature	**Date**