CS 450-001/005 Database Concepts
Spring 2025

Course Description

This course covers fundamental knowledge of database management, emphasizing the design, implementation, and utilization of relational database systems. Students will experience the complete database creative process, including database design, construction, and programming. Formal theories of database design and normalization will be presented, along with an introduction of NoSQL databases.

Course Outcomes

- Knowledge of fundamental concepts of file and database management.
- Knowledge of database design principles, and ability to model real-world environments using the ER model.
- Knowledge of the formal principles of the relational database model and its query languages, and ability to design relational databases and express queries in the relational algebra and calculus.
- Knowledge of the Structured Query Language (SQL) and database programming principles, and ability to author SQL queries and implement Java database applications using the Oracle database system.
- Knowledge of the basic principles of the mathematical theory of database design, and ability to design databases that adhere to Boyce-Codd Normal Form.
- Experience in the complete database creative process: from database design, to database construction, to database programming.

Class Time & Location

001: MW 1:30-2:45 PM Exploratory Hall L102
002: MW 3:00-4:15 PM Buleridge Hall 129

Textbook

Required:

- Fundamentals of Database System (7th Edition) by Ramez Elmasri and Shamkant B. Navathe

Recommended:

- Oracle 10g Programming: A Primer by Sunderraman
- NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence by Sadalage and Fowler

Instructor

Dr. Ping Deng
E-mail: pideng@gmu.edu
Office hours: MW 12-1 PM @ ENGR 4608 or by appointment

Prerequisites

C or better in CS 310 (Data Structures) and CS 330 (Formal Methods and Models)

Disability Accommodations

If you are a student with a disability and you need academic accommodations, please contact the Office of Disability Services (ODS) at 703-993-2474 or visit http://ods.gmu.edu. Additionally, please inform me at the beginning of the semester. All academic accommodations **must** be arranged through the ODS. Please ensure that you proactively request the use of your accommodations **well in advance** of exam/quiz dates and project deadlines.

Honor Code Statement

Please be familiar with the GMU Honor Code. In addition, the CS department has its own Honor Code policies. Any deviation from this is considered an Honor Code violation. All graded work must be your own effort. AI is viewed as a tool to aid in your learning process, rather than a means to complete assignments and thereby replace your opportunity for learning. Students who rely on Generative AI models to complete their assignments risk the following:

- Missing out on the opportunity to develop the knowledge, skills, and critical thinking that are integral to the course.
- Struggling to meet academic expectations in situations where Generative AI is not available, such as during exams.
- Undermining their future employability by failing to demonstrate the ability to produce original work without reliance on Generative AI.

Therefore, no AI tools can be used for any graded work unless stated otherwise. Any attempts at cheating will not be tolerated and will be reported to the Honor Committee. **The usual sanction applied is Level 2 (F in the course)**.

Counseling and Psychological Services

As a student, you may face various challenges that can affect your learning, such as increased anxiety, global pandemics, or lack of motivation. We all

benefit from support during difficult times. To learn more about Counseling and Psychological Services on campus, visit: https://caps.gmu.edu/.

Inclusion:
Regardless of background, sex, gender, race, ethnicity, class, political affiliation, physical or mental ability, veteran status, nationality, or any other identity category, every student in this class is an equal and valued member. Our goal is to build an inclusive learning community as the semester goes on. You have the right to be addressed by the name of your choice, to be referred to using the pronouns you identify with, and to modify these preferences at any time. Please don't hesitate to let me know if you ever feel uncomfortable with any aspect of our instructions or interactions.

Grading Weights
Quizzes: 13%
Projects: 35%
Midterm: 25%
Final exam: 25%
Participation: 2%

For participation, you can earn 0.1% credit for each class you attend **in person** and answer **all** the poll questions. The maximum participation credit you can earn is 2%.

Grading Policy

- All projects must be submitted on Canvas.
- You have a budget of three late days that can be used for projects. Late work will not be accepted otherwise. If a student is likely to miss a deadline, the late days policy will apply first. Further requests for extensions or exceptions are unlikely to be granted unless accommodations are formally established through the Office of Disability Services (ODS).
- If a one-time extension or exception is granted after you have exhausted all your late days, you will be placed on a no-exception list. This decision will be made based on individual circumstances. Once placed on this list, no further exceptions will be granted for the remainder of the semester.
- The lowest quiz score for the semester will be dropped.

- Grades will be changed only when a grading error has been made. All grade change requests are due **within a week** of the grade becoming available on Canvas. After that week, the window to contest a grade has closed other than recording errors.
- No exam or quiz make-up will be permitted unless arrangements are made with the instructor at least **one day** in advance.
- **Unexcused absence** from the final exam will result in **0** for the final exam.
- If any extra credit is available, it might be available on specific quiz, exam or assignment, but not as an end-of-semester batch of extra work.

Grading Scale

A^+	>98
A	92-98
A^-	90-92
B^+	88-90
B	82-88
B^-	80-82
C^+	78-80
C	72-78
C^-	70-72
D	60-70
F	<60

Tentative Course Outline

Introduction to database concepts
ER & EER model
Relational data model
ER & EER to relational mapping
Relational algebra
SQL
Midterm exam
Database programming
Functional dependency and normalization
NoSQL
Final exam

Helpful Notes

Welcome to CS 450-001/005! This class is designed to be highly interactive and optimized for in-person learning to enhance your overall experience. We will cover a wide range of topics and introduce many new concepts. Time management is key to success in this class. It's important to attend regularly, actively participate in group exercises and discussions, review the lecture slides after class, and begin working on assignments as soon as they are posted on Canvas. We are here to support your learning and reaching out to us sooner rather than later is almost always helpful. Good luck!