

CPSC 343 Database Theory and Practice

Course Website



(not live yet – by the end of the day!)

- direct URL:
<http://math.hws.edu/bridgeman/courses/343/f26>
- via my homepage: <http://math.hws.edu/bridgeman>
- via Canvas

Course Outline – Modules

- foundations
 - data life cycle
 - why databases?
 - components of a DB system and core DBMS functions
- querying and data modification
 - SQL
- data modeling and design
 - conceptual modeling (ER/EER)
 - logical modeling (ER → relational mapping)
 - functional dependencies and normalization
 - physical design and SQL data definition
- building the application layer
 - CRUD as an application pattern
 - REST API, implemented in Java

Course Outline – Modules

- data integrity and security
 - transactions and ACID
 - concurrency control
 - DB-level access control
 - input validation/sanitization, SQL injection, auditing
- ethics and privacy
 - data privacy concepts, protections, and law
 - data ownership, custodianship, and professional responsibility
- performance and query processing
 - files, storage, and indexes
 - relational algebra, query trees, and operation algorithms
 - query optimization concepts
 - index creation, selection, and index-only plans
 - EXPLAIN and denormalization

Course Outline – Modules

- advanced database objects
 - stored procedures
 - triggers
 - views
- NoSQL
 - NoSQL concepts: why it exists, when it is (and isn't) appropriate
 - data models: key-value, document

Course Objectives

By the end of the course, the successful student should be able to:

- analyze and model the data needs of a real-world situation
- use a relational database management system to effectively store and access data
- construct an application that accesses a database
- explain how relational database systems store information and process queries, and apply that knowledge to increasing database performance

Course Logistics

- homework problems assigned most classes
 - collected weekly
 - usually two chances to hand in
 - feedback regarding correctness but graded only on completion
- semester project – building a database application
 - milestone 1: topic and requirements
 - milestone 2: modeling and design (of the database)
 - milestone 3: DB and application implementation
 - milestone 4: data integrity and security hardening
 - milestone 5: performance audit and final handin
 - 15 minute midpoint check-in and project handin meetings

Assessment and Grading

- engagement – 10%
 - completing homework – at least 70% required for full credit
 - attendance – in class, at required midpoint check-in and project handin meetings (8 meetings)
 - coming to at least 4 hours of office hours (reassessment meetings count)
- project – 20%
 - reflect the product – does the project satisfy the required criteria for each milestone and does the whole thing work?
- content – 70%
 - reflects mastery of the course's knowledge-based and skills-based standards
 - assessed through 5 written one-hour exams and the project

Assessment and Grading

- reassessment
 - some standards will be assessed in more than one way (e.g. exam and project)
 - time permitting (not at the very end of the semester), there will be reassessment opportunities for exams and project milestones
 - but – take advantage of practice opportunities beforehand so the assessments reflect mastery rather than your first feedback

AI Policy

- rationale
 - computer science is about the fundamentals, not only how to use the latest tools
 - academic environments are about learning for yourself – AI use shortcuts your thinking and inhibits your learning
 - many open source projects limit or prohibit AI use in contributions
 - AI is not responsible for the product – the developer is
 - ethical concerns about training data, bias, environmental concerns, etc

AI Policy

- AI use (generative, agentic, etc) is **not** permitted in work you turn in
 - no code generation, writing documents, generating ideas, automating tasks
 - no using AI to summarize or otherwise digest assignment handouts
- using AI as a peer tutor is **discouraged** unless specifically authorized
 - it can be valuable in helping with alternate explanations, generating practice problems, and providing feedback but it is also easy to slip into shortcutting think – and AI is not always correct in its answers
- search engine “AI overview” is acceptable in locating search results, but avoid using AI to shortcut the work of understanding sources and compiling information yourself
 - go to the links found and verify what it tells you!

