

CIS 560 – Database System Concepts

Lecture 1

Course Overview

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Staff

Instructor

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Meeting Times

- MWF 11:30am-12:30pm in Nichols 019

Course Description and Requirements

- The purpose of this course is to introduce concepts, approaches, and techniques in database management. This includes exploring the representation of information as data, data storage techniques, foundations of logical data models, data retrieval, database design, transaction management, integrity and security.
- Prerequisites:
 - CIS 300 – Data and Program Structures
 - CIS 301 – Logical Foundations of Programming
 - MATH 312 Finite Application of Mathematics, OR MATH 510 Discrete Mathematics

Course Objectives

We will have been successful if...

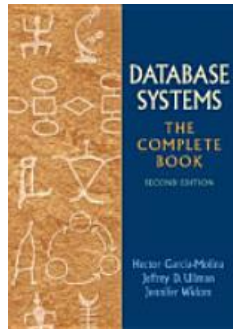
- You have an understanding of database management systems
- You have an understanding of SQL and how to apply it in the programming environment

Course Objectives

- In addition to learning a broad overview of relational database management systems, this course aims at helping students learn to
 - Be aware of the power of database possibilities in the research environment
 - Understand the possibility of utilizing this power by extending the discussion to research-focused special topics

Required Textbook

For most lectures, there will be assigned readings from the textbook



- Textbook Companion Website
 - <http://infolab.stanford.edu/~ullman/dscb.html>

Course Resources

- K-State Online:
 - **Modules**
 - Lecture PPTs
 - Assignments
 - References
 - **Message board**
 - make sure to check it regularly for questions/clarifications

Other Useful Links

- CIS Support Page
 - <http://support.cis.ksu.edu/FrequentlyAskedQuestions>
- SQL for Nerds, by Philip Greenspun
 - <http://philip.greenspun.com/sql/>

Tentative Course Work

- Homework Assignments (200 points)
- Term Project (100 points)
 - Written report and oral presentation required.
- Exams (200 points)
 - There will be 2 exams (September and November), each worth 100.

A: 100 to 89
B: 88 to 76
C: 75 to 64

....

Class Participation Encouraged

- Keys to participation
 - Show up to class!
 - Do the assigned reading
 - Don't be afraid to ask questions
- Lecture structure
 - Short review
 - New concepts
 - Exercises
 - Conclusions
 - Evaluate the lecture, point out sections that are unclear, make suggestions for improvements.
 - Do not save content questions for the end of the class. Ask them in class.

Class Project

- Goal: Implement a database-driven web-based information system (DB programming, Web programming)
- Will be done in stages
 - you will submit some work at the end of each stage
- Will show a demo at the end of the semester
- For now: be aware of this project
- Next Steps:
 - Get to know your classmates. This is a group project (2-3 students per group).
 - Learn how to work in a group: valuable skills
 - Select a database project to tackle
 - Sample list will be provided, OR
 - Choose your own project

Submission Policies

- All assignments will be submitted through K-State online.
- Assignments are due one week after they are assigned (unless otherwise noted).
- Late submissions are not encouraged. We will accept late submissions the first three days after the due date, but we will subtract 2 points for each late day.

Collaboration Policies

- Students are encouraged to discuss the course material, concepts, and assignments, but they should write their answers independently.
- For each assignment, you are required to list students with whom you discussed the assignment.
- Your submission should reflect your own knowledge and you should be able to reproduce the material you turn in at any time.
- Sharing answers will not be tolerated.
- Plagiarism will not be tolerated either.
- Appropriate citations for any external sources used in your work are mandatory. Never use sentences or phrases taken directly from a paper you are reviewing.
- Using solutions from previous years is not allowed.

Honor Pledge

Honor Pledge applies to all assignments, examinations, and other course work undertaken by students:

“On my honor, as a student, I have neither given nor received unauthorized aid on this academic work.”

Students with Disabilities

"Any student with a disability who needs an accommodation or other assistance in this course should make an appointment to speak with me as soon as possible."

Other Policies

- Expectations for classroom conduct:
 - “All student activities in the University, including this course, are governed by the Student Judicial Conduct Code as outlined in the Student Governing Association By Laws, Article VI, Section 3, number 2. Students who engage in behavior that disrupts the learning environment may be asked to leave the class.”
- No make-up exams
- No incompletes

Introduce Yourself

- Background, prior experience with database systems
- Are you interested more in being
 - An IT Guru at your favorite company (database user)
 - A Database System Developer

Two Perspectives of DBMS

- **User perspective**
 - How to use a database system
 - Conceptual data modeling, database schema design, relational algebra, the SQL query language, embedded SQL
- **System perspective**
 - How database systems work - how to design and implement a database system
 - Data storage and indexing, query optimization and processing, transaction management, concurrency control, crash recovery

People

- DBMS user
 - queries/modifies data
- DBMS application designer
 - sets up schema, loads data, ...
- DBMS application programmer
 - develops (web) applications that query the database
- DBMS administrator
 - user management, performance tuning, ...
- DBMS implementer
 - builds systems

First Set of Topics: User Perspective

- Relational Model
- Relational Algebra
- SQL and DBMS Functionalities:
 - SQL Programming
 - Queries and Updates
 - Indexes and Views
 - Constraints and Triggers
- Relational Database Design
 - ER and UML diagrams
 - Functional dependencies and normalization
- Embedded SQL

Next Set of Topics: System Perspective

- Data storage and indexing
- Query execution
- Query optimization
- Transaction management

Last Set of Topics

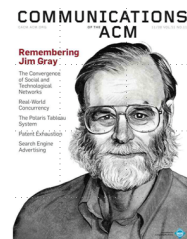
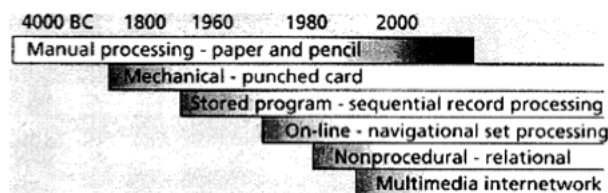
- NoSQL Databases
 - MapReduce/Hadoop/Hive/Pig Latin
 - Key-value stores, column families, document databases, graph databases
- XML/XPath/XQuery
- Information Retrieval
- Parallel and Distributed DB
- Information Integration
- Data warehousing/Data mining

Data Management Evolution

Jim Gray: *Evolution of Data Management.*

IEEE Computer 29(10): 38-46 (1996):

- Manual processing: -- 1900
- Mechanical punched-cards: 1900-1955
- Stored-program computer-- sequential record processing: 1955-1970
- Online navigational network DBs: 1965-1980
- Relational DB: 1980-1995
- Post-relational and the Internet: 1995-



Database

What is a database?

Give examples of databases

Database

What is a database?

- A collection of files storing related data

Give examples of databases

- Accounts database; payroll database; KSU's students database; Amazon's products database; airline reservation database

Database Management System

What is a DBMS?

Give examples of DBMS

Database Management System

What is a DBMS?

- *A big program written by someone else that allows us to manage efficiently a large database and allows it to persist over long periods of time*

Give examples of DBMS

- DB2 (IBM), SQL Server (MS), Oracle, Sybase
- MySQL, Postgres, ...

Reading Assignments

- Textbook Reading:
 - Chapters 1 and 2.1-2.3
 - Chapter 6, sections 6.1-6.3