Winter 2005

CS 405/605-01: Introduction to Database Management Systems

Guozhu Dong
Wright State University - Main Campus, guozhu.dong@wright.edu

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Description: Survey of logical and physical aspects of database management systems. Data models including entity-relationship (ER) and relational are presented. Physical implementation (data organization and indexing) methods are discussed. Query languages including SQL, relational algebra, relational calculus, and QBE are introduced. Students will also gain experience in creating and manipulating a database.

The course is mostly concerned with the design and querying of databases. A follow up course, CS701, is concerned with the design of system functions for managing databases.

Prerequisite: CS 400 Data Structure and Software Design

Instructor: Dr. Guozhu Dong.

Office: 430 Russ Engineering Center

Phone No.: (937)-775-5066

Email: gdong@cs.wright.edu

Class time and venue: 6:05-7:20pm, T Th, Russ 155

Office hours: 3:00 - 3:50, TTh. Use e-mail for short questions.

Course materials: Students are responsible for collecting handouts from classes.

Class directory: `/common/users7/group12/w001gxd/405public` on paladin.
Copies of some slides plus other relevant materials will be available in this directory. Use ftp from your computer to download materials.

Text Book: R. Elmasri and S. B. Navathe, Fundamentals of Database Systems, 4th edition, Addison Wesley.

R. Sunderraman, Oracle 9 (or 8) Programming: A Premier, Addison Wesley.

Reference texts: Raghu Ramakrishnan, and J. Gehrke, Database Management Systems, McGraw Hill.

Silberschatz, Korth, and Sudarshan, Database System Concepts, 3rd edition, McGraw Hill.

J.D. Ullman, and J. Widom, A First Course in Database Systems, Prentice-Hall.

Topics:
1. DBMS concepts and architecture (Chap 1, 2) [2 classes]
2. Entity-Relationship model and enhancements (Chap 3, 4) [2]

3. Relational data model and relational algebra (Chap 5, 6) [3]
4. SQL - a relational database language (Chap 8, 9) [3]
5. ER and EER to relational mapping (Chap 7) [1]
6. Relation storage and file organizations, index structures (Chap 13, 14) [2]
7. Other relational languages (the relational calculus, QBE – Chap 6, Appendix D – brief discussion) [1]
8. Hierarchical and network data models. Brief discussion. [0.5]
9. Functional dependencies and relational design (normalization) (Chap 10, 11) (if time permits) [2]

The numbers in square brackets indicate the approximate time (in number of lectures) needed for the topics. We plan to cover these topics in this order.

Grading: A:[90,100], B:[80,90), C:[70,80), D:[60,70), F:[0,60)

Midterm 30%, Project 20%, Final 40%, Homeworks 10%.

No late homeworks or projects will be accepted except for documented medical reasons.

All exams are closed book and closed notes, except that you can use one sheet of notes for the midterm, and two sheets of notes for the final. There will be no make-up exams.

Project: The project is about database design, relational algebra, and SQL programming. You will be given a project specification, with details about the application and the problems. You should design the ER schemas (3%) and the relations schemas (3%) for the application, initialize your database with some given relations, implement the given queries in SQL (8%), and implement some of the given queries in relational algebra (3%).

You can use MS-Access, Oracle, or other DBMS to implement your database and to test your SQL queries. The SQL queries must be entirely done by hand (without machine translations) to ensure understandability; they should also follow the SQL standard as discussed in the text.

You need to write a report, which will be used to mark your project. In the report you should include your ER and relational schemas, your SQL codes of the queries, your relational algebra expressions of the queries, and results of test runs of your SQL queries. It is **important** that this final report be nicely presented; 3% marks will be allocated to the clarity and organization of the report.

Independent work: All project and examination work must be your own. Academic dishonesty will be "rewarded" with a grade of "F".

Important dates:
- 2/1, in class midterm.
- Project specification handed out around midterm.
- Project due at the beginning of last class for quarter.
- 3/17, Th, 8:00-10:00 – Final.

Graduate students: Graduate students may be asked to do more in the projects and exams.