

Course Number: CSC 675/775

Course Title: Introduction to Database Systems

Number of Credits: 3

Schedule: Three hours of lecture/discussion per week.

Prerequisite: CSC 413 with grade of C or better. Students should be familiar with memory based data structures, including binary search trees, 2/3 trees and hash tables. A good working knowledge of the C++ and Java languages, object oriented design and implementation and the UNIX programming environment are also prerequisite.

Catalog Description

Relational query languages. Semantic data models. Logical and physical database design. Privacy issues. Implementation techniques (catalogs, query optimization, concurrency control, security and integrity enforcement). Paired with [CSC 775](#). Students who have completed [CSC 775](#) may not take [CSC 675](#) for credit. Extra fee required.

Fall 2006 Detailed Description

The goal of this course is to introduce upper division Computer Science students to relational database systems implementation techniques. Topics that will be covered include: relational query languages; semantic data models; logical and physical database design; privacy issues, introduction to implementation techniques (catalogs, query optimization, concurrency control, security and integrity enforcement). Although this course will be taught in lecture format, student questions and limited class discussion are encouraged.

Expanded Description

1. Introduction and basic concepts:
2. Data Definition
 - File Systems & Storage Structures
 - ER Model
 - Relational DDL
3. Data Manipulation
 - Relational Algebra
 - Relational Implementation Algorithms
 - SQL
4. Design Principles
 - Normalization Theory
 - Physical Database Design
5. Intro to Advanced Topics: (as time permits, material below will not be covered completely) System Catalogs, Query Optimization, Crash Recovery, Concurrency Control, Security & Authorization

Course Objectives and Role in Program

The objectives of this course include:

- Introduce the student to the design and implementation of database applications using sound ER/Relational design techniques.
- Survey the theoretical foundations of the relational data model

- Introduce basic systems implementation techniques: file systems and access methods and an overview of query processing and optimization

Students will implement and evaluate a series of design problems illustrating the correct use of relational technology for building stand-alone and Web-based applications. The term project will integrate these techniques by allowing students to design & implement a prototype application. A working knowledge of advanced relational programming techniques (including SQL scripting and JDBC/ODBC application development) play an important role in developing our students into skilled professional programmers.

Learning Outcomes

At the end of this course students will

- Be able to translate informal requirements specifications into a well-formed ER Schema (and accurately identify incomplete specifications), to map well formed ER schema into equivalent relational schema.
- Understand the semantics of relational queries and be able to express simple and complex queries using both the relational algebra and ANSI SQL2.
- Clearly and accurately explain major decisions in well written and complete design documentation
- Be familiar with the mechanics of executing queries under several different relational database systems (e.g. Oracle under Solaris, SQLServer under MS Windows)
- Understand the process of query execution, including the standard access methods (B+ trees, Extendible Hashing, Linear Hashing) and an iterator-based implementation of relational queries.

Method of Evaluation

Student learning will be evaluated on the basis of

- Completeness and quality of programming/homework assignments.
- Grade on quizzes after each major topic is completed
- Grade on final examination
- Class participation.

The weight assigned to each element of evaluation will be determined by the instructor of the course on the first day of the class.

Required Textbooks

Ramkrishnan, "Database Management Systems, Third Edition", McGraw Hill, 2003

M. Murphy, "CSC 675/775 Course Reader, Fall 2006", published on-campus

Additional Supplementary readings are available through the SFSU Library On-Line Reserves (ERES) and/or posted to the class Web site.

Recommended References

Elmasri & Navathe, "Fundamentals of Database Systems, any edition

*Garcia-Molina, Ullman & Widom, "Database Systems: The Complete Book",
any edition*

Lewis, Bernstein & Kifer, "Databases and Transaction Processing", any edition

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