COMPUTER SCIENCE 455

INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

I. Introduction

   A. Catalog Description

      The design and implementation of database management systems with emphasis on the relational and object-oriented models for data. Topics include data models, design methods and tools for design, SQL, database tools, and implementation issues, and include substantial work with a commercial main-frame relational database management system and associated tools. Satisfies a writing requirement in major contracts. *Prerequisites: CSCI 261, and either MATH 210 or 290.* Offered Spring term only.

   B. Purpose

      CSci 455 is the capstone course in the Computer Science/Business curriculum. Its purpose is to present the basics of database management systems and the role these systems play in the modern business world. Students study the four basic data models for database management systems (with emphasis on the relational and object oriented models), database design, and implementation techniques, and gain substantial experience with a commercial main-frame relational database system and associated tools. A writing-intensive group project will be a significant part of the course. The course is also designed as an elective course in the Computer Science/Mathematics curriculum.

   C. Prerequisites

      CSci 261, (Math 210 or Math 290). A grade of C- is required in the prerequisite courses.

II.   Learning Objectives

   A. Programming Techniques.

      Students will learn the basics of file organizations and file techniques, including sequential, relative, and indexed files, and the following file access techniques:

         a. Access methods in relative files.

         b. The structure of indexed files.

         c. The role of a file management system (e.g., RMS)

         d. B-trees

         e. Implementing relational operations using indexed files

   B. Database Techniques.

      Students will learn the basics of the hierarchical, network/CODASYL, relational, and object oriented data models for database management systems. The primary emphasis will be on the relational model and the ACID properties: Atomicity, Consistency, Isolation, and Durability.

B. Database Techniques. (cont.)

Students will gain substantial experience with the ANSI standard Structured Query Language (SQL) for relational database systems.

Students will learn to write queries in the relational calculus and the relational algebra, and will learn the relationship of these query languages to standard SQL.

C. Software Engineering Techniques.

Students will learn the basics of the discipline of software engineering as it is applied to database management systems, learning in particular

1. The database design process.

    a. Entity-relationship diagrams (top-down design)

    b. Forms-based design (bottom-up design)

    c. Resolution of top-down and bottom-up design

    d. Data-flow diagrams

    e. Data normalization

2. Database development tools

    a. Forms development

    b. Report Writers

    c. Applications development

    d. Embedded database languages

Class exercises will include practice with actual database management systems. In addition, software developed at the University of Puget Sound will be used for exercises in the relational algebra and relational calculus.

The term project will involve a substantial effort in the specification, design and implementation of an information system using a current database management system. The information system will include data entry/enquiry forms, possibly embedded SQL code in Java or C programs, and reporting capabilities.

D. Optional Topics

1. Java Database Connectivity (JDBC)

2. Stored Procedures

3. Triggers and constraints

4. Databases and the Internet

5. Open source databases

III. Bibliography

Potential Course Textbooks:

C. J. Date	An Introduction to Database Systems
Ramakrishnan & Gerhke	Database Management Systems
Abraham Silberschatz	Database System Concepts
Ullman & Widom	A First Course in Database Systems
Molina, Ullman, & Widom	Database Systems: The Complete Book

Additional Resources:

Hellerstein & Stonebraker	Readings in Database Systems
Abiteboul, Buneman, & Suciu	Data on the Web : From Relations to Semistructured Data and XML

Shasha & Bonnet Database Tuning: Principles, Experiments, and Troubleshooting Techniques

Katz, et. al.   XQuery from the Experts: A Guide to the W3C XML Query Language