

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 will include data models, design methods and tools for design, SQL, database tools, and implementation issues, and will include substantial work with a commercial main-frame relational database management system and associated tools. A group term project will be a significant part of the course. *Prerequisites: CSci 261, (MA 211 or MA 232).* Satisfies a writing requirement in major contracts.

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, (MA 211 or MA 232). 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, with primary emphasis on the relational model.

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. The University of Puget Sound has a commercial copy of the Oracle relational database management system which is currently used for the majority of database exercises in the class. 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 a information system using Oracle. The information system will include data entry/enquiry forms, possibly embedded SQL code in Java or C programs, the use of the Oracle report writer, and the use of the Oracle menu-building system.