Computer Science CSC 380
Database: Theory, Application and Organization

Credits and contact hours: Credit hours: 3, Contact Hours: 42 (1 contact hour = 50 minutes)

Instructor: Professor Randy Molmen


Specific course information

Catalog description:

a. This course stresses advanced topics in database management systems, particularly: advanced processing and SQL techniques, recovery and security issues and strategies, advanced database models, performance and tuning issues, distributed databases including data warehousing and related concepts.
b. Prerequisites: CSC-280 or CSC-245
c. Required/Elective:
   i. Computer Science – required
   ii. Software Engineering - required

Specific goals for the course

a. Specific outcomes of instruction. At the conclusion of the course, the successful student will be able to:
   i. Design, construct, and evaluate complex queries in relational databases, including
      1. Inner-, outer- end equijoins
      2. Queries using exclusion criteria
      3. Queries on tables that have internal links
      4. Queries using persistent and ad-hos subqueries
      5. Single-user and shared sequence generators
   ii. Explain and protect against contention issues in databases
   iii. Explain and use checkpoints and rollbacks to protect data integrity
   iv. Determine approximate efficiencies of common search and indexing procedures
   v. Explain interactions between the logical and physical mappings of data in databases, including performance and tuning issues
   vi. Understand and explain the basic principles of common non-relational database models
   vii. Understand and explain issues related to distributed and multi-user databases
   viii. Research and report on technical matters to listeners inside and outside the database technical community
b. CAC Criterion 3 outcomes addressed by the course:
   a. An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline
   b. An ability to analyze a problem and identify and define the computing requirements appropriate to its solution
   c. An ability to design, implement, and evaluate a computer-based system, process, component or program to meet desired needs
   d. An ability to function effectively on teams to accomplish a common goal
   e. An understanding of professional, ethical, legal, security and social issues and responsibilities
   f. An ability to communicate effectively with a range of audiences.
   g. An ability to analyze the local and global impact of computing on individuals, organizations, and society
   h. Recognition of the need for and an ability to engage in continuing professional development
   j. An ability to apply mathematical foundations, algorithmic principles and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
   k. An ability to apply design and development principles in the construction of software systems of varying complexity

c. EAC Criterion 3 outcomes addressed by the course:
   a. An ability to apply knowledge of mathematics, science, and engineering
   c. An ability to design a system, component, or process to meet desired needs within realistic constrains such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
   d. An ability to function on multidisciplinary teams
   e. An ability to identify, formulate, and solve engineering problems
   f. An understanding of professional and ethical responsibility
   g. An ability to communicate effectively
   h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
   i. A recognition of the need for, and an ability to engage in life-long learning.
   k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Brief list of topics to be covered
   a. Relational Database model, including its mathematical description
   b. SQL Data Definition, Data Manipulation, and Data Control language statements
   c. Database Design principles, including normalization
   d. Security and Contention issues in distributed and multiuser databases
   e. Backup, checkpoints and recovery
   f. indexing structures
   g. interaction of physical and logical structure, mapping to physical devices
   h. large databases, data warehousing, AI-driven database use