

**CS 3211: Database System Concepts (4)****Catalog Description:**

Design and use of database management systems. Emphasis on the relational data model, SQL, integrity constraints, relational database design, file structures, indexing, query processing, and optimization. Oracle-based laboratory work.

**Textbook:** Abraham Silberschatz, Henry Korth, and S. Sudarshan, *Database System Concepts, 5th Ed.*, McGraw Hill, 2006.

**Course Goals:**

This course presents a comprehensive introduction to the design of databases and the use of database management systems in building applications. The primary goals are to learn database system concepts and to gain experience using database systems to construct applications. The concepts and theory underlying database management, including a study of abstract query languages and the physical underpinnings of database systems, are investigated. We present a comprehensive guide to the development of database applications using Oracle, thereby providing the students with a firm foundation in the use of a modern large-scale relational database system. As time permits, we cover a variety of other aspects of database systems, including XML, transactions, data analysis and mining, and information retrieval. The practical application focused on in this course is the building of applications using a database system.

**Prerequisites by Course & Topic**

CS 2511: Software Design and Analysis – software engineering, object-oriented design, software testing and debugging

FMIS 2201: Information Technology in Business – information technology, personal productivity tools, system development

**Major Topics Covered in the Course**

- Database Design and Organization (ER diagrams, the Relational Model)
- Query Languages (Relational Algebra, Relational Calculus, SQL)
- Relational Database Design (Normalization)
- Application Design (User Interfaces, Web Applications)
- Storage, File Structures, Indexing
- Query Processing

**Class/Laboratory Schedule:** Lecture: 3 hours per week, Laboratory: 2

**Course Outcomes**

1. Proficiency with query languages for database systems.
  - a. Understand the basics of relational algebra and relational calculus and construct queries using them.
  - b. Understand SQL, construct queries using SQL, and prepare forms and reports using advanced features of SQL.
  - c. Understand the interactions of relational algebra, calculus, and SQL.
  - d. Understand PL/SQL and use it to manipulate DBs
2. Proficiency in relational database design
  - a. Understand conceptual modeling using E-R approach
  - b. Understand normalization using functional dependencies
3. Proficiency with database file structures
  - a. Understand basic file, tuple and page organizations.
  - b. Understand a variety of indexing methods including both tree and hash based indexes.
4. Further proficiency with software design in high-level languages.
  - a. Design and implement a database.
  - b. Create a user interface for accessing the database.
  - c. Develop SQL solutions for numerous problems.

**Relationship to Program Outcomes**

CS 3211 is a required course for IS&T majors that is taken after successful completion of software analysis and design and management information systems. This course contributes to meeting the following program outcomes:

2. *Students can design, develop, and analyze significant software systems.*

This course deepens a student's knowledge of analysis and design.

3. *Students understand the fundamentals of computer organization and architecture, data structures and related algorithms, and programming languages.*

Students increase their proficiency in Java and learn PL/SQL. As part of the course, they develop programs for accessing and analyzing data using embedded SQL commands. Students also learn advanced features of the database programming language SQL.

4. *Students can apply computer science principles and practices to a variety of problems.*

The students have the opportunity to design and implement a complete DB and sample SQL queries.

5. *Students can work independently and also work effectively in teams.*

Students work individually on all programming assignments and homework assignments.

**Assessment Plan for Course:**

This course is assessed every third year by the instructor and a course assessment document covering all of the course outcomes and their effect on the program outcomes is prepared.

|                 | CORE | ADVANCED |  | CORE | ADVANCED |
|-----------------|------|----------|--|------|----------|
| Data Structures |      | 1        | Computer Organization and Architecture |      |          |
| Algorithms      |      | 1        | Concept of Programming Languages       |      | 1        |
| Software Design |      | 1        |  |      |          |

**Coordinator/Prepared by:** D. Crouch (Revised June 2006)