COURSE DESCRIPTION

Dept., Number	**CSC 174**	Course Title	**Database Management Systems**
Semester hours	**3**	Course Coordinator	**William Mitchell**
		URL (if any):	**http://gaia.ecs.csus.edu/~mitchell/**

Catalog Description

Topics in database analysis and design, and applications; Extended Entity-Relationship and UML modeling; SQL view, query processing, and query optimization; concurrency control, transaction performance and recovery algorithms; integrity constraints and triggers; functional dependencies and normalization algorithms; application generator technologies; performance and security issues in Internet database processing; introduction to data mining; introduction to database administration. Prerequisite: At least a C- grade in both CSC 131 and CSC 134 and full CSC major status.

Textbook

Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, 5th Edition, Addison-Wesley, 2007.

References

ORACLE, version 8/9i, Database Administrator's Reference Manual.

Course Goals

Study design and implementation issues in database management systems including:

1. Database administrator functions; integrity and security methods.
2. UML and ERD analysis; mapping data models to relational schemas.
3. Advanced normalization.
4. Query optimization algorithms.
5. Database catalog facilities.
6. Transaction processing (tp) systems.

Prerequisites by Topic

Thorough understanding of:

- Programming experience in at least one high-level language.
- File systems, organizations, and access methods.
- Data structures.
- Elementary software engineering background - first course.
- Working knowledge of SQL.

Basic understanding of:

- Programming experience in at least one high-level language.
- File systems, organizations, and access methods.
- Data structures.
- Elementary software engineering background – first course.
- Working knowledge of SQL.

Exposure to:

- Programming experience in at least one high-level language.
- File systems, organizations, and access methods.
- Data structures.
- Elementary software engineering background – first course.
- Working knowledge of SQL.

Major Topics Covered in the Course

1. Database architecture (3-level schema) components in more detail.
2. Database administration for resource allocation, security and performance.
3. Advanced data modeling.
4. Integrity control.
5. Normalization of a database – advanced normal forms.
6. Advanced relational operators (outer join, union, intersection).
7. Query optimization.
8. Internal data storage methods.
9. Tp models and their use; tp workflows.
10. Brief introduction to data warehousing and data mining.

Laboratory Projects

1. Design and implement a database application in one or more database models (3 weeks).
2. Advanced SQL processing (3 weeks).
3. Tp and recovery techniques (4 weeks).
4. Query analysis (2 weeks).

Estimated Curriculum Category Content (Semester hours)

Area	*Core*	*Advanced*	*Area*	*Core*	*Advanced*
Algorithms		1.0	Data Structures		
Software Design		0.5	Prog. Languages		
Comp. Arch.					

Oral and Written Communications

Three written reports 2-3 pages each.

Social and Ethical Issues

No significant component.

Theoretical Content

1. Data normalization based on data dependencies.
2. Serialization theory in transaction processing.
3. Relational Algebra.

Problem Analysis

Data modeling is carried out using available analysis tools such as a robust UML environment as well as (non-automated) notation systems such as ER and EER. Additional manual analysis is necessary for activities such as translating an English specification for a database into ER/EER and also for translating ER/EER into valid relational schemas. Database normalization analysis is manually performed based on user specifications of the meanings and keys of data.

Written analysis is also involved for performing database sizing estimates as well as computing estimated query processing costs for given query processing load. There is significant manual practice needed to apply the principles of query processing optimization found in state of the art relational environments. Finally, there are written assignments for scheduling techniques (both for execution order of transactions as well as actions needed for recovery of failed transactions) associated with concurrent tp.

Solution Design

Design activities involve choice of Oracle software component capabilities needed to implement class projects. Components include the SQL and tp language elements built into SQL*PLUS. In addition, more involved application logic dealing with triggers and transaction directives utilize Oracle PL/SQL and possibly JDeveloper considerations. Assignments for query processing and optimization rely on Oracle documentation for optimization capabilities specific to the version of Oracle used in the course. In the area of database normalization, the levels of normalization and form of normalization depend on (normalization or de-normalization) assigned problems.

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