INFX 543 Relational Database Management Systems

INFX 543 – Relational Database Management Systems (4 Cr): Database design and development theory, concepts and skills. Traditional transactional database theory, architecture and implementation in a user-centered systems context using SQL. Introduces database modeling, security and privacy issues. Prerequisite: Skills covered in INFX 502 (Prepares students for INFX 563)

Degree Program:
Masters of Library and Information Science
Masters of Science in Information Management

Course Justification
Database applications, database management systems and database querying are primary enabling technologies for information professionals. An in-depth understanding of the principles and application of database systems is a critical success factor for information professionals taking leadership roles in future information systems initiatives. This course provides a rigorous introduction to the traditional principles of database design, implementation and usage. In addition, this course extends students understanding to include the use various modeling tools, database security concepts, and privacy issues.

Course Format
This course can be offered either as an online or residence course with two separate simultaneous tracks that each run the length of the course. One track is composed of hands-on skills labs, discussion boards (goPost), and ePeer assignment feedback. The other track introduces and discusses the related concepts and skills in developing and working with database management systems. The course is designed to challenge both new and more advanced users.

Course Objectives
Upon completion of the course, the student will be able to:

- Better understand and use existing database resources
- Develop and implement relatively complex database projects
- Be an effective member of a database development team
- Supervise employees and contractors developing database projects
- Add database development to your consulting portfolio
- Provide solid theoretical foundation in relational database technology.
- Create basic data and process models.
- Create a basic relational database model based on the data and process models.
- Understand and discuss the concepts and principals of database security.
- Understand and discuss the concepts and principals of personal privacy relative to database systems.
Outline of Course Content

1) Database Systems.
   a) The difference between data and information
   b) What is a database and why they are valuable assets for decision making
   c) The importance of database design
   d) The main components of the database system
   e) The main functions of a database management system (DBMS)

2) Data Models.
   a) What are data modeling and why data models are important
   b) What are the basic data-modeling building blocks
   c) What business rules are and how they influence database design
   d) How the major data models evolved
   e) How data models can be classified by level of abstraction

3) The Relational Database Model.
   a) The relational database model offers a logical view of data
   b) About the relational model’s basic component: relations
   c) That relations are logical constructs composed of rows (tuples) and columns (attributes)
   d) That relations are implemented as tables in a relational DBMS
   e) About relational database operators, the data dictionary, and the system catalog
   f) How data redundancy is handled in the relational database model
   g) Why indexing is important

4) Entity Relationship (ER) Modeling.
   a) The main characteristics of entity relationship components
   b) How entity relationships are defined, refined, and incorporated into the database design process
   c) How ERD components affect database design and implementation
   d) That real-world database design often requires the reconciliation of conflicting goals

5) Advanced Data Modeling.
   a) Extended entity relationship (EER) model
   b) How entity clusters are used to represent multiple entities and relationships
   c) The characteristics of good primary keys and how to select them
   d) How to use flexible solutions for special data modeling cases
   e) Result of adding more semantic constructs to original entity relationship (ER) model
   f) Create a diagram using this model, called an EER diagram (EERD)

6) Normalization of Database Tables.
   a) What is normalization and what role it plays in the database design process
   b) About the normal forms 1NF, 2NF, 3NF, BCNF and 4NF
   c) How normal forms can be transformed from lower normal forms to higher normal forms
   d) That normalization and ER modeling are used concurrently to produce a good database design
   e) That some situations require denormalization to generate information efficiently

7) Introduction to Structured Query Language (SQL).
   a) The basic commands and functions of SQL
   b) How to use SQL for data administration (to create tables, indexes, and views)
c) How to use SQL for data manipulation (to add, modify, delete, and retrieve data)

d) How to use SQL to query a database for useful information

8) Advanced SQL.
a) Relational set operators UNION, UNION ALL, INTERSECT, and MINUS
b) How to use the advanced SQL JOIN operator syntax
c) The different types of subqueries and correlated queries
d) How to use SQL functions to manipulate dates, strings, and other data
e) How to create and use updatable views
f) How to create and use triggers and stored procedures
g) How to create embedded SQL

9) Database Design.
a) How a successful database design must reflect the information system of which it is a part
b) How successful information systems are developed within a framework known as the Systems Development Life Cycle (SDLC)
c) That within the information system, the most successful databases are subject to frequent evaluation and revision within a framework known as the Database Life Cycle (DBLC)
d) How to conduct evaluation and revision within the SDLC and DBLC frameworks
e) Database design strategies:
   i) Top-down vs. bottom-up design
   ii) Centralized vs. decentralized design

Concept Topics
The following concept topics will be covered in readings, presentations, group discussions and will be included in written assignments and/or presentations.

- Information Systems and Systems Analysis
- Data Modeling Methods and Skills
- Relational Database Model
- Database Security Issues
- Database Privacy Issues
- Project Management
- Managing the Database System
- Misc topics and the future

Assessment
Each major subject area will have one or more tests, lab exercises, or worksheets to be completed. There will be a comprehensive final project developed throughout the course.

Textbook

Other content will be PDFs, web pages and online tutorials.