Course Name: Database Development I

Course Number: CSC* E233

Credits: 4

Catalog description: An in-depth introduction to information management techniques with emphasis on data modeling and relational database design. Topics include conceptual data modeling, relational database design and normalization, database query languages, schema integration and integrity constraints, physical database design, and database usability issues, entity-relationship modeling, normalizing designs, transforming logical design into physical databases, commercial DBMSs, and using RDBMS database technology. Students will design and implement a database application, working from the E-R modeling stage through to the actual implementation.

The course requires substantial hands-on work with a modern relational database management system in a computerized classroom environment.

Prerequisite: CSC *E105 or CSC* E223 or permission of the instructor

Corequisite or Parallel:

General Education Competencies Satisfied:

HCC General Education Requirement Designated Competency Attribute Code(s):

None

Additional CSCU General Education Requirements for CSCU Transfer Degree Programs:

None

Embedded Competency(ies):

None

Discipline-Specific Attribute Code(s):

☒ COMP **Computer Science**

Course objectives:

General Education Goals and Outcomes:

None

Course Specific Objectives:

1. Demonstrate understanding of basic information management concepts: information systems as sociotechnical systems, data vs. information, data storage, retrieval and representation, reliability, scalability, efficiency, and effectiveness

2. Explain the characteristics that distinguish the database approach from the traditional approach of programming with data files

3. Categorize data models based on the types of concepts that they provide

4. Describe the modeling concepts and notation of widely used conceptual modeling approaches. Apply Entity-Relationship Modeling in the development of a small information system

5. Describe the basic principles of the relational data model and apply its modeling concepts and notation in the development of a small information system

6. Apply techniques of normalization up to 3NF to reduce data redundancy, and explain the impact of normalization on the efficiency of database operations

7. Create a relational database schema in SQL that incorporates key, entity integrity, and referential integrity constraints; populate and query the database of a small information system using SQL

8. Explain the purpose and techniques for physical database design. Perform physical design including field design, data volume analysis, data usage analysis and index selection for a small information system

9. Explain the purpose and the basic approaches of data partitioning and replication, and allocation during the distributed database design process

10. Explain the issues related to information assurance and security. Compare strategies for resolving these issues

11. Describe the environmental impacts of design choices with respect to material and energy consumption. Discuss the effects of information pollution and how to avoid it

Course Content:

A. Introduction
   1. Data, information, knowledge; impact of advances of technology on information storage and retrieval
   2. Information privacy, integrity, security, preservation
   3. Efficiency, effectiveness and scalability of systems for information management

4. Components of database systems, functions of DBMS, database architecture, data independence, use of query languages. Centralized vs. distributed databases

B. Conceptual Data Modeling
1. Conceptual, representational and physical models
2. Entity-Relationship modeling
3. Model transformations to reduce the degree and cardinality of relationships

C. Relational Database Design
1. Foundations of the Relational data model
2. SQL
3. Overview of other query languages, embedding query languages into procedural languages
4. Functional dependencies and normalization
5. 1st, 2nd, and 3rd Normal Forms. Normalizing to 3NF
6. Mapping of a conceptual schema to a relational schema
7. Schema integration and integrity constraints

D. Physical Database Design
1. Data volume and usage analysis
2. Physical records design
3. Ways to improve database performance. Disadvantages of denormalization. Comparison of horizontal vs. vertical partitioning
4. Index selection

E. Usability issues
1. Information assurance
2. Environmental impact of design choices

F. Trends in database systems
1. Overview of current trends

Date Course Created: Spring 2018

Date of Last Revision: 01/22/2018