CSC/CPE 366 Database Modeling, Design, and Implementation

1. CSC/CPE 366 Database Modeling, Design, and Implementation

2. credit units 4 contact hours 6

3. Course Coordinator: Alexander Dekhtyar


b. Prerequisite: CSC/CPE 365.

c. Required/Elective/Selective Elective for CPE, CSC, EE, SE

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6. a. Course Goals/Outcomes

The student will be able to:

- Knowledge: Student to recall specific information.
  Know existing data models, design methodology, algorithms and properties of various data models.

- Comprehension: Student to interpret the information.
  Understand the database design theory and principles and interpret them in the context of practical design requirements.

- Application: Student to use abstractions in new situations.
  Apply design theory to practical database design problems

- Analysis: Student to separate a complex whole into its parts.
  Database requirements analysis, separation of design requirements into database abstraction levels (conceptual, logical and physical)

- Synthesis: Student to combine elements to form an original entity.
  Combine the elements of various data models to create new designs based on a set of requirements.

- Evaluation: Student must choose from alternatives in making a judgment.
Understand an apply design trade-offs to database design problems

- The primary goal of this course is to prepare students for graduate work in database design theory and for industry work in application software development, requiring the use of a database system.

b. **How Student Outcomes addressed**
   ("B" = Basic level, "I" = Intermediate level, "A" = Advanced level)

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7. **Major Topics Covered: (number of lecture hours each)**

- Introduction and Review (2)
  - DBMS objectives and services
  - Application Development using DBMS
  - Database levels of data abstraction
  - Data model components
  - Database modeling requirements
  - Database life cycle
- Conceptual Database Modeling (6)
  - Data and Process modeling
  - Extended ER Model Design
    - Generalization, Aggregation, Abstraction, Hierarchies
    - N-ary Relationships
    - ER Model Integrity constraints
    - Retrieval and update operations
  - ER Modeling vs OO Database Modeling
  - Semantic Object Modeling
- External-Level Design (4)
  - Application requirements analysis
  - Database requirements analysis
  - Transaction specification
  - External view modeling
  - External view integration, merging and restructuring
  - Entity clustering
  - View updates
- Logical Relational Database Design (5)
  - Review of First, Second, and Third Normal Forms
  - Boyce-Codd Normal Form (BCNF)
  - Construction of 3NF and BCNF minimal cover
  - Fourth and Fifth Normal Form
- Mapping ER Models to Relational Models (3)
  - Transformation Rules for entities and relationships
  - Automatic generation of SQL DDL code
- Design Tools
  - Physical Database Design (5)
    - File Structures, Indexes
    - Access Paths Selection
    - De-normalization
    - Join Strategies
    - Performance measurement, monitoring and database tuning
  - Introduction to Distributed Database Design (3)
    - Global Schema Design
    - Data allocation strategies
    - Fragmentation
    - Replication

Distributed transactions