CSC 366 – Database Modeling, Design, and Implementation

1. CSC 366 – Database Modeling, Design, and Implementation

2. Credit units 4  Contact hours 6

3. Course Coordinator: Alex Dekhtyar


5. a. Course Description:
The database modeling problem. Database modeling levels: external, conceptual, logical and physical. Database models: entity-relationship, relational, object-oriented, semantic, and object-relational. Normal forms. Distributed database design. Functional analysis of database applications and transaction specification, design, and implementation. 3 lectures, 1 laboratory.

b. Prerequisite: CSC 365.

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

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6. a. Course Learning Objectives
The student will be able to:
- Recall existing data models, design methodology, algorithms and properties of various data models.
- Explain the database design theory and principles and interpret them in the context of practical design requirements.
- Apply design theory to practical database design problems
- Analyze database requirements; categorize design requirements into database abstraction levels (conceptual, logical and physical)
- Combine the elements of various data models to create new designs based on a set of requirements.
- Apply design trade-offs to database design problems
b. **Level at which Student Outcomes are addressed**

(“B” = Basic level, “I” = Intermediate level, “A” = Advanced level)

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

- **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