DATABASE MANAGEMENT SYSTEM

1.1Course Description

Provides fundamental knowledge of, and practical experience with, database concepts.Includes study of information concepts and the realization of those concepts using the relational data model. Practical experience gained designing and constructing data models and using SQL to interface to both multi-user DBMS packages and to desktop DBMS packages.

1.2 Learning Targets/Outcomes

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

- Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
- Define the terminology, features, classifications, and characteristics embodied in database systems.
- Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
- Demonstrate an understanding of the relational data model.
- Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.

1.3 Course Organization

There will be 3-hours lecture per week, 1-hours tutorial/discussion and 2 hours Laboratory session each week. Please note that some of the tutorial/discussion sessions may be converted to lectures if need be. Students are expected to attend all lectures and to participate in class discussions.

2.1 Text Book

- Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw
- Hill, 2010.R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.

1.3 Reference Books

- R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
- R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education,2013.

3. Course content

3.1 Introduction

3.1.1 Database-system Application, Purpose of Database System, View of Data
3.1.2 Database Languages, Relational Database, Database Design, Data Storage and Query
3.1.3 Database Users and Administrator, History of Database Systems

3.2 Introduction to the Relational Model

3.2.1 Structure of Relational Databases, Database Schema, Keys
3.2.2 Schema Diagrams
3.2.3 Relational Query Languages, Relational Operations

3.3 Overview of the SQL Query Language

3.3.1 SQL Data Definition, Basic Structure of SQL Queries
3.3.2 Additional Basic Operations, Set Operations
3.3.3 Aggregate Functions, Nested Sub queries

3.4 Intermediate SQL

3.4.1 Join Expressions, Views
3.4.2 Transactions, Integrity Constraints
3.4.3 SQL Data Types and Schemas, Authorization

3.5 Advanced SQL

3.5.1Accessing SQL from a Programming Language
3.5.2 Functions and Procedures - I
3.5.3 Functions and Procedures -II

3.6 Advance SQL-II

3.6.1 Functions and Procedures - III
3.6.2 Triggers
3.6.3 Advanced Aggregation Features

3.7 Database Design and the E-R Model

3.7.1 Overview of the Design Process
3.7.2 The Entity-Relationship Model, Constraint, Removing Redundant Attributes inEntity Sets
3.7.3 Entity-Relationship Diagrams, Entity-Relationship Design Issues

3.8 E-R Model and E-R Diagram

3.8.1 Extended E-R Features
3.8.2 Alternative Notations for Modeling Data.
3.8.3 Other Aspects of Database Design

3.9 Relational Database Design

3.9.1 Features of Good Relational Designs
3.9.2 Atomic Domains and First Normal Form
3.9.3 Decomposition Using Functional Dependencies

3.10 Relational Database Design - II

3.10.1 Functional-Dependency Theory
3.10.2 Algorithms for Decomposition
3.10.3 Decomposition using multivalued Dependencies

3.11 Relational Database Design - III

3.11.1 Third Normal Form, Fourth Normal Form
3.11.2 Fifth Normal Form, BCNF
3.11.3 Database-Design Process

3.12 Transactions-I

3.12.1 Transaction Concept

3.12.2 A Simple Transaction Model
3.12.3 Transaction Atomicity and Durability

3.13 Transactions-II
3.13.1 Transaction Isolation
3.13.2 Serializability, Transaction Isolation and Atomicity
3.13.3 Validation-Based Protocols, Snapshot Isolation

3.14 Concurrency Control
3.14.1 Lock-Based Protocols
3.14.2 Deadlock Handling
3.14.3 Multiple Granularities, Timestamp-Based Protocols

3.15 Recovery System
3.15.1 Failure Classification
3.15.2 Recovery and Atomicity, Recovery Algorithm
3.15.3 Buffer Management

4. Plagiarism

The University intends to develop and promote original work. Taking another person's words or ideas and using them as if they were your own or Plagiarism, as it is called, is taken very seriously at the University. Plagiarism may be deliberate or accidental.