Prasad V. Potluri Siddhartha Institute of Technology, Kanuru, Vijayawada.

1/2 M.Tech. FIRST SEMESTER
CSCS1T4   DATABASE MANAGEMENT SYSTEMS   **Credits: 4**
Lecture: 4 periods/week   **Internal assessment: 30 marks**
Tutorial: 1 period /week   **Semester end examination: 70 marks**

Objectives:

1. The main objective of this course is to enable students to the fundamental concepts and data base analysis, design and some implementations.
2. To recognize the importance of database analysis and design in the implementation of any Data base application and to understand the process drawing the ER-Diagrams, and how to perform the normalization process of relations and then producing the final ER-Diagram of any database application before implementation., Understanding the types of attributes, primary keys, foreign keys, super keys … etc.
3. Knows how to perform query optimization.
4. It also gives the knowledge the roles of transaction processing and concurrency control in a modern DBMS; it includes query processing, security and integrity.

Learning Outcomes:

1. Understand the Database approaches, Data Models, types of Languages and Interfaces that DBMSs support.
2. Understand the Formal Relational languages and instructs SQL database language.
3. Understand the different issues involved in the design and schema refinement.
4. Develop the File Organization & Indexing.
5. Understand the transaction management system, Concurrency techniques, and

   Database Recovery techniques.

   a. Since every application we use has to store, process and retrieve data,

   b. This course is of significant importance to real life applications.

UNIT - I
Introduction: Databases, Characteristics of the Database Approach, Advantages of using the DBMS Approach, Overview of Database Applications. Database System Concepts and Architecture: Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, Database System environment, Centralized and Client-Server Architecture for DBMSs.

UNIT - II
Data Modeling: Entity Relationship(ER) Model – High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, UML Class Diagrams, Relationship Types of Degree Higher Than Two.

UNIT - III
Relational Model: The Relational Data Model and Relational Database Constraints, Relational Algebra and Relational Calculus, Relational Database Design by ER-to-

Relational Mapping, SQL-99: Schema Definition, Constraints, Queries, and Views, Embedded SQL, Dynamic SQL, SQLJ.

UNIT - IV
Database Design: Functional Dependencies, Normal forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form. Further Dependencies: Relational Decompositions, Algorithms for Relational Database Schema Design, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form

UNIT - V
File Organization & Indexing: Introduction, Secondary Storage Devices, Buffering of Blocks, Placing of File Records on Disk, Operation on Files, Files of Unordered Records (Heap Files), Files of Ordered Records (Sorted Files), Hashing Techniques, Disk Access using RAID Technology, Storage Area Networks, Types of Single Level Ordered Indexes, Multilevel Indexes, Dynamic Multilevel Indexes using B-Trees and B+- Trees, Indexes on Multiple Keys.

UNIT - VI
Query Optimization: Translating SQL Queries into Relational Algebra, Algorithms for External Sorting, SELECT, JOIN Operations, PROJECT and Set Operations, Implementing Aggregate Operations and OUTER JOINS, Combining Operations Using Pipelining, Using Heuristics in Query Optimization, Using Selectivity and Cost Estimates in Query Optimization. Overview of Query Optimization in Oracle and Semantic Query Optimization.

UNIT - VII
Transaction Processing: Introduction, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability & Serializability, Transaction Support in SQL.

UNIT - VIII
Concurrency Control: Two-Phase Locking Techniques, Timestamp Ordering, Multiversion Concurrency Control Techniques, Optimistic Concurrency Control, Granularity of Data Items and Multiple Granularity Locking, Using Locks for Concurrency Control in Indexes, Other Concurrency Control Issues. Database Recovery: Recovery Concepts, Recovery Techniques Based on Deferred Update and Immediate Update, Shadow Paging, The ARIES Recovery Algorithm.

Learning Resources

Text Book:
1. Fundamentals of Database Systems, Ramez Elmasri, Shamkanth B. Navathe, 5th Edition, Pearson.

Reference Books
1. Database Management Systems, 3rd Edition, Raghu RamaKrishnan, Johannes Gehrke, TMH.
2. Database System Concepts, 4th Edition, Silberschatz, Korth, TMH.
3. Introduction to Database Systems, 8th Edition, C.J.Date, Pearson.