

CS5T2

**3/4 B.Tech. FIRST SEMESTER  
DATABASE MANAGEMENT SYSTEMS  
(Common to CSE & IT)**

**Credits: 4**

**Required**

**Lecture: 4 periods/week**

**Internal assessment: 30 marks**

**Tutorial: 1 period /week**

**Semester end examination: 70 marks**

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**Course context and Overview:** Investigates how database management system techniques are used to design, develop, implement and maintain modern database applications in organizations.

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**Prerequisites: data, file structure, data information, application costs, DB Language.**

**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. 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:**

Ability to:

1. Understand the basic principles of database management systems.
2. Design Entity-Relationship diagrams to represent simple database application scenarios.
3. Develop relational tables and sql queries for a given context in relational database.
4. Apply normalization techniques to a given database application.
5. Apply hashing and indexing techniques to a database storage structure.
6. Describe transaction processing, concurrency control and data recovery concepts.

**UNIT – I**

**Introduction to Databases:** Characteristics of the Database Approach, Advantages of using the DBMS Approach, A Brief History of Database Applications.

**Overview of Database Languages and Architectures:** 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

**Relational Model:** The Relational Model Concepts, Relational Model Constraints and Relational Database Schemas.

**SQL:** Data Definition, Constraints, and Basic Queries and Updates,

**SQL: Advanced Queries,** Assertions, Triggers, and Views.

## UNIT – III

**Formal Relational Languages: Relational Algebra:** Unary Relational Operations: Select and Project, Relational Algebra Operations from Set Theory, Binary Relational Operations: Join and Division, Examples of Queries in Relational Algebra.

**Relational Calculus:** The Tuple Relational Calculus, The Domain Relational Calculus.

## UNIT – IV

**Conceptual Data Modeling :** High-Level Conceptual Data Models for Database Design, A Sample 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, Relationship Types of Degree Higher Than Two.

**Relational Database Design Using ER-to-Relational Mapping, UML Class Diagrams.**

## UNIT – V

**Database Design Theory:** Functional Dependencies, Normal forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

**Further Topics in Functional Dependencies:** Inference Rules, Equivalence, and Minimal Cover. **Properties of Relational Decompositions:** Relation Decomposition and Insufficiency of Normal Forms, Dependency Preservation Property of a Decomposition, Nonadditive (Lossless) Join Property of a Decomposition.

## UNIT – VI

**File Organization & Indexing:** Secondary Storage Devices, Buffering of Blocks, Placing File Records on Disk, Operations on Files, Files of Unordered Records and Ordered Records, Hashing Techniques, Disk Access using RAID Technology, Types of Single Level Ordered Indexes, Multilevel Indexes, Dynamic Multilevel Indexes using B-Trees and B+-Trees, Indexes on Multiple Keys.

## UNIT – VII

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

**Concurrency Control:** Two-Phase Locking Techniques, Timestamp Ordering, Multisession Concurrency Control Techniques, Optimistic Concurrency Control, Granularity of Data Items and Multiple Granularity Locking, Using Locks for Concurrency Control in Indexes.

## **UNIT – VIII**

**Database Recovery:** Recovery Concepts, Recovery Techniques Based on Deferred Update and Immediate Update, Shadow Paging, The ARIES Recovery Algorithm.

### **Learning Resources**

#### **Text Books:**

**DATABASE SYSTEMS Models, Languages, Design and Application Programming,** 6<sup>th</sup> Edition, **Ramez Elmasri ,Shamkant B.Navathe , Pearson.**

#### **Reference Books:**

- 1. Data base System Concepts, 5<sup>th</sup> Edition, Abraham Silberschatz, Henry F Korth, S.Sudarshan,Mc Graw Hill.**
- 2. Data base Management Systems, 3<sup>rd</sup> Edition, Raghurama Krishnan, Johannes Gehrke, TMH**
- 3. Introduction to Database Systems, 8<sup>th</sup> Edition , C.J.Date, Pearson**