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## **20MC103 DATABASE MANAGEMENT SYSTEMS**

### **Course Description and Objectives:**

The objective of this course is to present the issues of database management systems, with an emphasis on how to organize, maintain and retrieve.

### **Course Outcomes:**

The students will be able to:

- Understand the elements of relational database management systems.
- Analyze the basic concepts of relational data model, entity-relationship model, relational database design, and relational algebra.
- Design ER-models to represent simple database application scenarios.
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
- Create and improve the database design by normalization.
- Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and Hashing.

### **Skills:**

- Design a conceptual database using ER-Model.
- Formulate database queries using Structured Query Language (SQL).
- Build and run DDL and DML commands.
- Design and implement normalized databases.
- Construct B+ Trees.

### **Activities:**

- Design of ER diagram for the development of web applications.
- Transformation of ER diagram into a relational schema.
- Creation of relations with entity and referential integrity constraints for a given Relational schema.
- Representation of queries using Relational Algebra.
- Formulation of queries using SQL.
- Design of relational database using normalization techniques.

## **Syllabus**

### **UNIT – 1**

**9 Hours**

ESSENTIALS OF DATABASES: Introduction, Characteristics of the database approach, Actors of database, Advantages of databases, History of database applications, Database system concepts & architecture - Data models, Schemes, Instances; Database languages interfaces database system environment architectures for DBMS, Classification of DBMS.

**UNIT – 2****9 Hours**

DATA MODELING USING THE ER MODEL: Notations, Entity types, Entity sets, Attributes, Keys, Relationships, Roles, Constraints, Weak entity types, Binary and ternary relationships. EER modeling specialization, Generalization, University EER schema example.

**UNIT – 3****9 Hours**

RELATIONAL MODEL: Relational Model & Relational Database constraints. ER-EER to relational mapping. SQL Basics.

**UNIT – 4****9 Hours**

NORMALIZATION: Normalization, Design guidelines, Definition of FD, Normal forms based on primary keys, Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Multi-valued Dependencies, 4NF, Other Dependencies and Normal Forms.

**UNIT – 5****9 Hours**

TRANSACTION PROCESSING AND INDEXING: Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Concurrency Control Technique - Two-Phase Locking Techniques for Concurrency Control; Indexing Structures for Files, Types of Single-Level Ordered Indexes, Multilevel Indexes, Dynamic Multi-level Indexing using B-Trees and B+ Trees.

**List of experiments:**

1. Database Creation- usage of Data types
2. Execute a single line and group functions for a table.
3. Execute DCL and TCL Commands.
4. Create and manipulate various DB objects for a table.
5. Create views, partitions and locks for a particular DB.
6. Writing Triggers
7. Write PL/SQL procedure for an application using exception handling.
8. Write PL/SQL procedure for an application using cursors.
9. Write a DBMS program to prepare reports for an application using functions.
10. Write a PL/SQL block for transaction operations of a typical application using triggers.
11. Procedures and Functions
12. Designing a basic application.

**Typical Applications** – Banking, Course registration, Electricity Billing, Library Management, Pay roll, Insurance, Inventory etc.

**Text Book:**

RamezElmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, 5<sup>th</sup> Edition, Pearson Education, 2008.

**Reference Books:**

1. Silberschatz, Korth, "Database System Concepts", 4<sup>th</sup> Edition, McGraw hill, 2006.
2. Raghuram Ramakrishnan and Johannes Gehrke, "Database Management Systems", 3<sup>rd</sup> Edition, McGraw Hill, 2003.
3. Peter Rob and Carlos Coronel, "Database Systems- Design, Implementation and Management", 7<sup>th</sup> Edition, Cengage Learning, 2007.