3/4 B.Tech. FIFTH SEMESTER

EM5T3 **DBMS** **Credits: 3**

Lecture: 3 periods/week **Internal assessment : 30 marks**

Tutorial: 1 period /week **Semester end examination: 70 marks**

Course Objectives

- To provide knowledge on fundamental concepts of DBMS, architecture and components.
- To demonstrate use of SQL to create, update and query database.
- To give an introduction to systematic database design approaches covering conceptual design(ERmodeling), relational database design and normalization
- To provide knowledge on the role of transaction processing and concurrency control in a modern
- DBMS which includes query processing, scheduling, security, concurrency and integrity.

Learning Outcomes:

Upon successful completion of the course, students will

- Understand the Database approaches, Data Models, types of Languages and Interfaces that DBMSs support.
- Understand the Formal Relational languages and able to write relational algebra expressions.
- Populate and query database using Structured Query Language DDL/DML commands.
- Understand the different issues involved in the design and schema refinement.
- Develop the File Organization & Indexing.
- Understand the transaction management system, Concurrency techniques and Database Recovery techniques.

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 Opearations: Join and Division, Examples of Queries in Relational Algebra.

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

UNIT – IV

Conceptual Data Modeling using Entities and Relationships – 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, Multiversion 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:

1. Data base System Concepts, **5th Edition**, Abraham Silberschatz, Henry F Korth, S.Sudarshan,Mc Graw Hill **Higher Education, International Edition 2005.**.

REFERENCE BOOKS:

1.Data base Management Systems, **3rd Edition**, Raghurama Krishnan, Johannes Gehrke, TMH **2003**
2.DATABASE SYSTEMS Models, Languages, Design and Application Programming, **6th Edition**, Ramez Elmasri ,Shamkant B.Navathe ,**Pearson 2010.**
3.Introduction to Database Systems, **8th Edition** , C.J.Date, **Pearson 2006**