

**PREREQUISITES**

A course on “Data Structures”.

**COURSE OBJECTIVES**

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

**COURSE OUTCOMES:** After Completion of the course, student will be able to

CO1: Gain knowledge of fundamentals of DBMS, database design and normal forms

CO2: Master the basics of SQL for retrieval and management of data.

CO3: Be acquainted with the basics of transaction processing and concurrency control.

CO4: Have Familiarity with database storage structures and access techniques

**UNIT - I**

**Database System Applications:** A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

**Introduction to Database Design:** Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model

**UNIT - II**

**Introduction to the Relational Model:** Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

**UNIT - III**

**SQL: QUERIES, CONSTRAINTS, TRIGGERS:** form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases. **Schema Refinement:** Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

**UNIT - IV**

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

## **UNIT - V**

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

### **TEXT BOOKS:**

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, Tata McGraw Hill, 3rd Edition, 2014
2. Silberschatz, Korth, Database System Concepts, McGraw Hill, 7th edition, 2021.

### **REFERENCE BOOKS:**

1. Peter Rob, Carlos Coronel, Database Systems design Implementation and Management, 7th Edition, 2006.
2. Elmasri Navrate, Fundamentals of Database Systems, Pearson Education, 7th edition 2016
3. C.J. Date, Introduction to Database Systems, Pearson Education, 8th edition, 2006.
4. S. Shah and V. Shah, Oracle for Professionals, The X Team, SPD, 2008.
5. Shah, Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, PHI, 2nd edition, 2002
6. M. L. Gillenson, Fundamentals of Database Management Systems, Wiley Student Edition, 2011