

MCC 304: DATABASE SYSTEMS

Module 1

(10 hours)

Introduction: Data & Information, Evolution of Database Systems, Overview of a DBMS, Database System Concepts & Architecture - Data models, schemas and instances, Data Abstraction, Data Independence, Database languages and interfaces.

Database Characteristics: Data modeling using Entity - Relationship (ER) Model: Entity sets, attributes and keys, Relationship types, sets, roles and structural constraints, Weak Entity types. Data Models: Relational, Network, Hierarchical and Object Oriented.

The Relational model: Relational data model concepts, Codd's 12 rules, Relational model constraints and schemas, Relational Algebra and Relational calculus, Constraints on Relations, Relational database design by ER & EER to Relational Mapping, Database Language SQL & QBE. SQL Programming Techniques: Constraints and Triggers, Views and Indexes, SQL in Server Environment.

Module 2

(16 hours)

Database Design: Data dependency, Armstrong's Axioms, Functional dependencies and Normalization of Relational Databases, First, Second and Third Normal forms, Boyce-Codd Normal form (BCNF), Relational Database design Algorithms and further dependencies, De-normalization

Storage Strategies and file organizations: Disc Storage, Basic File Structures and Hashing, Indexing structures for files, multi-level indexing using B-trees and B⁺-trees.

Query Processing and Optimization: Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Execution, Query Compiler, and Query Optimization Algorithms.

Module 3

(14 hrs)

Transaction processing concepts: Introduction to Transaction Processing concepts and Theory, ACID Properties, concurrency control, Serializability and Recoverability, Database recovery techniques - Shadow paging, ARIES recovery algorithm, Database Security. Deadlock: Detection, Avoidance and Recovery.

Outline of: Information Integration, Data Mining, Data Warehousing and OLAP, Database Systems and the Internet, Search Engines, Semi-structured Data Model, XML and Web Databases, Object & Object Relational Databases, Distributed Databases, Deductive Databases, Mobile Databases, Multimedia Databases, GIS.

Text Books:

1. Ramez **Elmasri** and Shamkant B. **Navathe**, "*Fundamentals of Database Systems*", Fifth Edition (2007), Pearson Education Inc., New Delhi.
2. Abraham **Silberschatz**, Henry F. **Korth** and S. **Sudarshan**, "*Database Systems Concepts*", Fifth Edition (2006), McGraw-Hill Education, New Delhi

Reference Books:

1. Hector **Garcia-Molina**, Jeffret D. **Ullman**, Jenniffer **Widom**, "*Database Systems: A Complete Book*", Second Edition, 2009, Pearson Education Inc., New Delhi.
2. Peter **Rob** & Carlos **Coronel**, "*Database Systems: Design, Implementation, and Management*", Eighth Edition, 2009, CENGAGE Learning India Pvt. Ltd., New Delhi.
3. Mark L. **Gillenson**, "*Fundamentals of Database Management Systems*", First Edition, 2005, Wiley India Pvt. Ltd., New delhi.
4. Nilesh **Shah**, "*Database Systems Using Oracle*", Second Edition, 2005, PHI Learning Pvt. Ltd., New Delhi.
5. **Raghu Ramakrishnan**, Johannes **Gehrke**, "*Database Management Systems*", Third Edition (2003), McGraw-Hill Education (India), New Delhi.