Database Management Systems (DBMS) – MCA Syllabus (Perfect & Structured)

Unit	Course Topics	Hours
1	**Introduction to DBMS:** Data vs information, file-based systems, drawbacks of traditional file processing, database approach, characteristics of DBMS, database users, database administrators (DBA), data models (hierarchical, network, relational), three-schema architecture, data independence	4L
2	**Relational Model & SQL Basics:** Relational structure (tables, attributes, tuples), keys (primary, foreign, candidate), relational algebra (select, project, join, union, intersection, difference), SQL basics – CREATE, SELECT, INSERT, UPDATE, DELETE, constraints (NOT NULL, UNIQUE, CHECK, DEFAULT)	6L
3	**Advanced SQL & PL/SQL:** Joins (inner, outer, cross), grouping & aggregation, subqueries, views, sequences, indexes, transactions, stored procedures, triggers, cursors, exception handling in PL/SQL	6L
4	**Functional Dependencies & Normalization:** Functional dependency (FD), closure of attributes, minimal cover, anomalies (update, insert, delete), decomposition, normalization (1NF, 2NF, 3NF, BCNF), multivalued dependencies, 4NF, 5NF	6L
5	**Transaction Management & Concurrency Control:** ACID properties, transaction states, serializability, conflict and view serializability, concurrency issues (lost update, dirty read), locking protocols, two-phase locking (2PL), deadlocks, timestamp ordering	5L
6	**File Organization & Indexing:** File structures (heap, sequential, hashing), indexing fundamentals (primary, secondary), clustered index, B-trees and B+ trees, multi-level indexing, hashing techniques	4L
7	**Database Recovery & Security:** Recovery concepts, log-based recovery, checkpoints, shadow paging, backup strategies, security issues, authorization, authentication, SQL injection prevention, database auditing, access control models	4L