# Database Systems – Syllabus

## SECTION-A

**Introduction to Database Systems:** File Systems Versus a DBMS, Advantages of a DBMS, Components of DBMS, Describing and Storing Data in a DBMS, Database System Architecture, Data abstraction, Data independence, Schemas.

**Physical Data Organization:** Fixed length and Variable Length Records, File Organizations and Indexing, Index Data Structures, Hashing, B-trees, Clustered Index, Sparse Index, Dense Index.

**Data Models:** Relational Model, Network Model, Hierarchical Model, ER Model: Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Database Design with the ER Model, Comparison of Models.

**The Relational Model:** Introduction to the Relational Model, ER to Relational Model Conversion, Integrity Constraints over Relations, Enforcing Integrity Constraints, Relational Algebra, Relational Calculus, Querying Relational Data.

**Relational Query Languages:** SQL: Basic SQL Query, Creating Table and Views, SQL as DML, DDL and DCL, SQL Algebraic Operations, Nested Queries, Aggregate Operations, Cursors, Dynamic SQL, Integrity Constraints in SQL, Triggers and Active Database, Relational Completeness, Basic Query Optimization Strategies, Algebraic Manipulation and Equivalences.

## SECTION-B

**Database Design:** Functional Dependencies, reasoning about Functional Dependencies, Normal Forms, Schema Refinement, First, Second and Third Normal Forms, BCNF, Multi-valued Dependency, Join Dependency, Fourth and Fifth Normal Forms, Domain Key Normal Forms, Decompositions.

**Transaction Management:** ACID Properties, Serializability, Concurrency Control, Concurrency problems: Dirty read, Lost update, Incorrect summary, Lock Management, Locking Protocols: Two phase, Time stamp, Validation based, Multiversion and Granularity based, Deadlocks Handling.

**Backup and Recovery:** Types of Database Failures, Types of Database Recovery, Recovery Techniques: Deferred Update, Immediate Update, Shadow Paging, Checkpoints, Buffer Management.

**Database Protection:** Threats, Access Control Mechanisms, Discretionary Acc Control, Grant and Revoke, Mandatory Access Control, Bell LaPadula Model, Role Based Security, Firewalls, Encryption and Digital Signatures.