DBMS Curriculum

Outcome: Students can **design schemas, write complex SQL, and reason about transactions & performance**

Module 1: Foundations of DBMS

⏱ **4 Hours**

Topics

- Introduction to DBMS
- Data vs Information
- File Systems vs Databases
- DBMS vs RDBMS
- Core database terminology
- ACID overview (high level)

Students will be able to:

- Explain why databases are required over file systems
- Use correct database terminology confidently
- Reason about consistency, isolation, and durability at a conceptual level

SQL Practice (LeetCode – Easy):

- **1757. Recyclable and Low Fat Products**
- **584. Find Customer Referee**

- **595. Big Countries**
- **1148. Article Views I**
- **1683. Invalid Tweets**

Module 2: Database Setup & Environment

⏱ **3 Hours**

Topics

- Installing MySQL
- MySQL Server vs Client
- CLI & Workbench usage
- Schema creation
- Import/export data

Students will be able to:

- Set up a working SQL environment
- Run queries using CLI and GUI tools
- Manage schemas and datasets

SQL Practice (LeetCode – Easy):

- **1873. Calculate Special Bonus**
- **1667. Fix Names in a Table**
- **620. Not Boring Movies**
- **1527. Patients With Condition**

Module 3: Data Modeling & Keys

⏱ **3 Hours**

Topics

- Primary, candidate, composite keys
- Foreign keys
- UNIQUE, NOT NULL
- Referential integrity

Students will be able to:

- Design tables with correct keys and constraints
- Enforce data integrity using SQL
- Model one-to-one and one-to-many relationships

SQL Practice (LeetCode – Easy → Medium):

- **610. Triangle Judgement**
- **1050. Actors and Directors Who Cooperated At Least Three Times**
- **1581. Customer Who Visited but Did Not Make Any Transactions**
- **1378. Replace Employee ID With The Unique Identifier**

Module 4: CRUD Operations

⏱ **5 Hours**

Topics

- CREATE, INSERT, SELECT
- WHERE, ORDER BY, LIMIT
- UPDATE, DELETE
- NULL handling
- LIKE, BETWEEN, IN

Students will be able to:

- Perform complete CRUD operations
- Write filtered and sorted queries
- Update and delete data safely

SQL Practice (LeetCode – Easy → Medium):

- **181. Employees Earning More Than Their Managers**
- **182. Duplicate Emails**
- **183. Customers Who Never Order**
- **596. Classes More Than 5 Students**
- **607. Sales Person**

Module 5: Joins & Relationships

⏱ **5 Hours**

Topics

- INNER, LEFT, RIGHT JOIN
- JOIN vs WHERE

- Self joins
- Multi-table joins

Students will be able to:

- Combine data from multiple tables
- Choose correct join strategies
- Solve real-world relational queries

SQL Practice (LeetCode – Medium):

- **175. Combine Two Tables**
- **176. Second Highest Salary**
- **178. Rank Scores**
- **180. Consecutive Numbers**
- **184. Department Highest Salary**

Module 6: Aggregation & Nested Queries

⏱ **4 Hours**

Topics

- COUNT, SUM, AVG, MIN, MAX
- GROUP BY
- HAVING vs WHERE
- Subqueries
- Correlated subqueries

Students will be able to:

- Perform grouped analysis on data
- Use HAVING correctly
- Solve ranking and comparison problems using subqueries

SQL Practice (LeetCode – Medium):

- **177. Nth Highest Salary**
- **185. Department Top Three Salaries**
- **262. Trips and Users**
- **570. Managers with at Least 5 Direct Reports**
- **579. Find Cumulative Salary of an Employee**

Module 7: Performance Optimization

⏱ **3 Hours**

Topics

- Indexing fundamentals
- Types of indexes
- Query optimization
- EXPLAIN keyword

Students will be able to:

- Understand query execution plans
- Optimize slow queries using indexes

- Avoid unnecessary indexing

SQL Practice (LeetCode – Medium):

- **197. Rising Temperature**
- **511. Game Play Analysis I**
- **512. Game Play Analysis II**
- **534. Game Play Analysis III**
- **550. Game Play Analysis IV**

Module 8: Transactions & Concurrency

⏱ **3 Hours**

Topics

- Transactions
- COMMIT & ROLLBACK
- ACID properties
- Isolation levels
- Locks and deadlocks (conceptual)

Students will be able to:

- Use transactions to maintain consistency
- Explain isolation anomalies clearly
- Reason about concurrent data access

SQL Practice (LeetCode – Medium):

- **603. Consecutive Available Seats**
- **615. Average Salary: Departments VS Company**
- **626. Exchange Seats**
- **1204. Last Person to Fit in the Bus**

Module 9: Schema Design & Normalization

⏱ **4 Hours**

Topics

- ER diagrams
- Entity relationships
- Functional dependency
- Normalization (1NF, 2NF, 3NF)
- Denormalization trade-offs

Students will be able to:

- Convert requirements into ER diagrams
- Normalize schemas correctly
- Design scalable real-world schemas

SQL Practice (LeetCode – Medium):

- **1098. Unpopular Books**
- **1158. Market Analysis I**
- **1164. Product Price at a Given Date**

- **1174. Immediate Food Delivery II**
- **1212. Team Scores in Football Tournament**

Total Duration

⏱️ **34 – 36 Hours**

Final Outcome 🎯

After completing this curriculum, students will be able to:

- **Design normalized, scalable schemas**
- **Write complex SQL queries confidently**
- **Optimize performance using indexing**
- **Handle transactions and concurrency scenarios**
- **Crack SQL-heavy interviews and backend system rounds**