**1. Topics to be covered:**

| List of Topics in Theory | No. of Weeks | List of Topics in Practical |
|---|---|---|
| Chapter 1<br>Introduction, Characteristics of Database Approach, Files Vs. Databases, Characteristics of Database approach, Advantages of using DBMS, When not to use DBMS,<br><br>Chapter 2<br>Data Model, Schema and Instance, three schema architecture and data independence, classification of DBMS, database languages & Interfaces, Database systems environment.<br><br>Chapter 5<br>Relational Model Concepts, Relational Model Constraints | **2** | **Lab-01:** Introduction & History of Database Systems, Introduction of SQL<br><br>**Lab-02:** Basic SQL Schema and Statements, Arithmetic operators, Column Alias, Concatenation Operator, Where Clause, Comparison Operators & Conditions, Logical Conditions (AND, OR, NOT), Functions (count, max, min, Dates),Operators (Like, Rownum, In, Between), Order by clause |
| Chapter 5<br>Relational Database Schemas, Update Operations, Transactions, and Dealing with Constraint Violations<br><br>Chapter 6<br>SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL, Additional Features of SQL | **2** | **Lab-03:** DDL(create, alter, drop, truncate, rename), Defining constraints on table, types of constraints, deferred constraint checking(chicken egg problem) and DML (Create, insert, update, delete)<br><br>**Lab-04:** Sub queries ( Single Row, Multiple Rows and correlated),Groups of Data(Group by ,Having) |
| Chapter 7<br>More Complex SQL Retrieval Queries, Views (Virtual Tables) in SQL, Schema Change Statements in SQL | **1** | **Lab-05:** Joins, Types of Joins (Equality Joins, Non Equality Joins, Outer Joins and Self Joins), Set Operators (union, union all, intersection, minus). |
| *WEEK 6========== MID 1 ========== There will be no Lab* | | |
| Chapter 3<br>Using High-Level Conceptual Data Models for Database Design, A Sample Database Application. Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database, ER Diagrams, Naming Conventions, and Design Issues, Relationship Types of Degree Higher than Two | **1.5** | **Lab-06:** Connectivity: PHP with MYSQL, JAVA with MYSQL, C# with SQL Server<br><br>**Lab-07:** Relational Modeling **(ER modeling software)**<br><br>**WEEK 9 : LAB MID EXAM** |

| | | |
|---|---|---|
| Chapter 14<br>Informal Design Guidelines for Relation Schemas<br>Functional Dependencies/Normal Forms Based on Primary Keys<br>General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form<br>Multivalued Dependency and Fourth Normal Form<br>Join Dependencies and Fifth Normal Form | **2.5** | **Lab-08:** PL/SQL: Block Structure, Variable & types, Conditional Logic, Cursors, Views, Procedures &Functions) |
| *WEEK 11 ========== MID 2 ========== there will be no Lab* | | |
| Chapter 8<br>Unary Relational Operations: SELECT and PROJECT<br>Relational Algebra Operations from Set Theory<br>Binary Relational Operations: JOIN and DIVISION<br>Examples of Queries in Relational Algebra | **1** | **Lab-09:** Triggers |
| Chapter 20<br>Introduction to Transaction Processing<br>Transaction and System Concepts<br>Desirable Properties of Transactions<br>Characterizing Schedules Based on Recoverability<br>Characterizing Schedules Based on Serializability<br>Transaction Support in SQL,<br><br>Chapter 21<br>Two-Phase Locking Techniques for Concurrency Control<br>Concurrency Control Based on Timestamp Ordering<br>Multiversion Concurrency Control Techniques<br>Validation (Optimistic) Concurrency Control Techniques<br>Granularity of Data Items and Multiple Granularity Locking | **2** | **Lab-10:** Transaction<br><br>**Lab 11:** Mongo DB (Installation & Basics, Projections & Functions) |
| Chapter 22<br>Recovery Concepts<br>NO-UNDO/REDO Recovery Based on Deferred Update<br>Recovery Techniques Based on Immediate Update<br><br>Chapter 24<br>Introduction to NOSQL Systems | **1.5** | **Lab 12:** Transaction Experiments [commit, rollback, savepoint, multi-user experiment]<br><br>**Revision & Final Lab Exam** |

| | | | |
|---|---|---|---|
| Document-Based NOSQL Systems and MongoDB<br>NOSQL Key-Value Stores<br>Column-Based or Wide Column NOSQL Systems | | | |
| Review | **0.5** | **1.5** | **1,2,3** |
| Total | **16** | **45** | |