SQL Basic to Advanced

Duration: 40 Hours – 28 Days

Each Session Time: 1 & ½ Hour (90 Minutes)

DAY-WISE SCHEDULE &
LEARNING ACTIVITIES

Day 1: Introduction to DBMS

- Definition, Overview of DBMS,
- Advantages of DBMS,
- Levels of abstraction,
- Data independence,
- DBMS Architecture

Day 2: Data Models

- Client/Server Architecture,
- Object Based Logical Model,
- Record Based Logical Model (relational, hierarchical, network)

Day 3: Entity Relationship Model

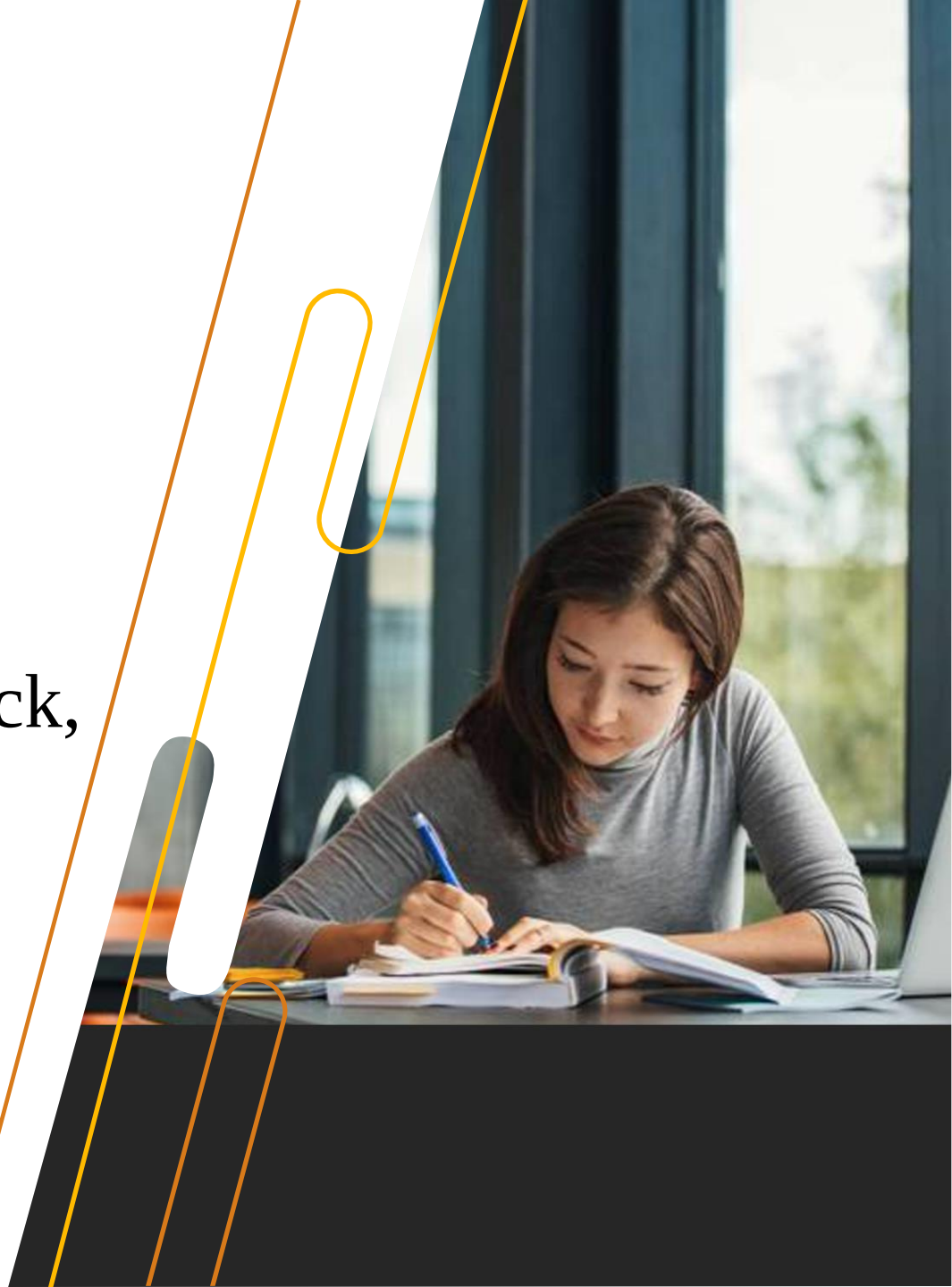
- Entities,
- Attributes,
- Entity sets,
- Relations,
- Relationship sets,
- Additional constraints (key constraints, participation constraints, weak entities, aggregation / generalization),
- Conceptual Design using ER (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER)

Day 4: ER to Table

- Entity to Table,
- Relationship to tables with and without key constraints.

Day 5: DDL Statements

- Creating Databases,
- Using Databases,
- datatypes,
- Creating Tables (with integrity constraints – primary key, default, check, not null),
- Altering Tables,
- Renaming Tables,
- Dropping Tables,
- Truncating Tables



Day 6: DML

- Viewing the structure of a table,
- Insert, update, delete, select all columns, specific columns,
- Unique records,
- Conditional select,
- In clause, between clause,
- Limit,
- Aggregate functions (count, min, max, avg, sum),
- Group by clause,
- Having clause

Day 7: Relation Data Model

- Domains,
- Attributes,
- Tuples and Relations,
- Relational Model Notation,
- Characteristics of Relations,
- Relational Constraints - primary key, referential integrity, unique constraint,
- Null constraint,
- Check constraint

Day 8: Relational Algebra

- Operations (selection, projection, set operations union, intersection, difference, cross product, division),
- Joins:
  - conditional,
  - equi join,
  - natural joins

Day 9: Functions

- String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, strcmp, trim, ltrim, rtrim),
- Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate)
- Date Functions (adddate, datediff, day, month, year, hour, min, sec, now, reverse)

Day 10: Joining Tables

- Joining Tables – inner join, outer join (left outer, right outer, full outer)

Day 11: Subqueries

- Subqueries with IN, EXISTS,
- Subqueries restrictions,
- Nested subqueries,
- ANY/ALL clause,
- Correlated subqueries

Day 12: Schema Refinement and Normal Forms

- Functional dependencies,
- First, second, third, and BCNF normal forms based on primary keys,
- Lossless join decomposition

Day 13: Database Protection

- Security Issues,
- Threats to Databases,
- Security Mechanisms,
- Role of DBA,
- Discretionary Access Control,
- Backing Up and
- Restoring databases

Day 14: Views

- Creating,
- Altering,
- Dropping,
- Renaming and manipulating views

Day 15: DCL Statements

- (creating/dropping users, privileges introduction, granting/revoking privileges, viewing privileges),
- Transaction control commands – Commit, Rollback

Day 16: Index Structures of Files

- Introduction,
- Primary index,
- Clustering Index,
- Multilevel indexes

Day 17: Overview of PL/SQL

- Advantages of PL/SQL,
- Main Features of PL/SQL,
- Architecture of PL/SQL

Day 18: Fundamentals of PL/SQL

- Character Sets,
- Lexical Units,
- Declarations,
- References to Identifiers,
- Scope and Visibility of Identifiers,
- Assigning Values to Variables,
- Expressions,
- Error-Reporting Functions,
- Data Types.

Day 19: Control Statements

- Conditional Selection Statements,
- LOOP Statements,
- Sequential Control Statements,
- GOTO, and NULL Statements.

Day 20: Sequences

- Creating sequences,
- Referencing,
- Altering, and
- Dropping a sequence.

Day 21: Stored Procedures & Functions

- Procedures: Types and benefits of stored procedures, creating stored procedures, executing stored procedures, altering stored procedures, viewing stored procedures.
- Functions: Calling function and recursion function.

Day 22: Collections & Records

- Associative Arrays,
- Varrays (Variable-Size Arrays),
- Nested Tables,
- Collection Constructors,
- Assigning Values to Collection Variables,
- Multidimensional Collections,
- Collection Comparisons, Methods,
- Collection Types Defined in Package Specifications,
- Record Variables, Assigning Values to Record Variables.

Day 23: Error Handling

- Compile-Time Warnings,
- Overview of Exception Handling,
- Internally Defined Exceptions,
- Predefined Exceptions,
- User-Defined Exceptions,
- Redeclared Predefined Exceptions,
- Raising Exceptions Explicitly,
- Exception Propagation,
- Unhandled Exceptions.

Day 24: Cursors

- Overview of Cursor,
- Types of cursors,
- Invalid cursor Exception.

Day 25: Static & Dynamic SQL

- Description of Static SQL,
- Cursors Overview,
- Processing Query Result Sets,
- Cursor Variables,
- CURSOR Expressions,
- Transaction Processing and Control Autonomous Transactions.
- Dynamic SQL: Native Dynamic SQL, DBMS_SQL Package, SQL Injection.

Day 26: Triggers

- Overview of Triggers,
- Implementing triggers –
  - creating triggers, Insert, delete, and update triggers, nested triggers, viewing, deleting, and modifying triggers, and enforcing data integrity through triggers.

Day 27: Packages

- Overview of a Package.
- Need of Packages,
- Package Specification,
- Package Body,
- Package Instantiation and Initialization.

Day 28: Transaction Management

- ACID Properties,
- Serializability,
- Two-phase Commit Protocol,
- Concurrency Control,
- Lock Management,
- Lost Update Problem,
- Inconsistent Read Problem,
- Read-Write Locks,
- Deadlocks Handling,
- Two Phase Locking protocol.

Day 29: Crash Recovery

- ARIES algorithm.
- The log-based recovery,
- Recovery related structures like transaction and dirty page table,
- Write-ahead log protocol,
- Check points,
- Recovery from a system crash,
- Redo and Undo phases