SQL: Foundations to Advanced Techniques

Workshop Duration: 5 Days (3 hours each day): 15 Hrs

Objectives:

1. Introduce the fundamentals of SQL and database management.

2. Enable students to write SQL queries for data retrieval, insertion, updating, and deletion.

3. Familiarize participants with advanced SQL techniques such as joins, subqueries, and indexes.

4. Develop problem-solving skills by working on real-world database scenarios.

5. Showcase how SQL integrates with applications and its importance in industries like data analytics, software development, and more.

Day 1: Fundamentals of SQL

Session 1: Introduction to Databases and SQL

- What is a database?

- Types of databases: Relational vs. Non-relational

- Importance of SQL in modern applications

- Overview of database systems (MySQL, PostgreSQL, etc.)

Session 2: Basics of SQL

- Creating and understanding databases and tables

- SQL Data Types

- Basic operations:

  - SELECT, INSERT, UPDATE, DELETE

  - Filtering with WHERE and ORDER BY clauses

Hands-on Exercise**:

- Create a student database with tables for personal details, marks, and attendance.

- Write simple queries to add, retrieve, and update records.

Day 2:

Session 3: Grouping and Aggregation

- Using GROUP BY and HAVING clauses

- Aggregate functions: SUM, AVG, COUNT, MAX, MIN

- Practical examples: Generating reports (e.g., total marks of a student, average attendance)

Session 4: Practical Lab Session

- Students solve predefined SQL challenges.

- Live query-building with instructor support.

Day 2: Advanced SQL and Real-World Applications**

Day 3:

Session 5: Advanced SQL Concepts

- Joins: INNER, LEFT, RIGHT, FULL OUTER

- Subqueries: Inline and correlated

- Working with indexes for optimization

- Transactions and ACID properties

Session 6: SQL in Applications

- Connecting SQL with programming languages (Python/Java)

- Demonstration: SQL integration in a web application

- Introduction to tools like SQLite, pgAdmin, and MySQL Workbench

Day 4:

Session 7: Case Study & Group Activity

- Analyze a real-world problem (e.g., designing a database for an e-commerce platform).

- Teams design the schema, create tables, and write queries to manage and retrieve data.

Day 5

Session 8: Career Insights and Closing

- Career paths leveraging SQL: Data Analysis, Backend Development, Database Administration

- Best practices for SQL proficiency

- Resources for continuous learning (courses, books, and certifications)

- Q&A session with a SQL expert

Materials Provided:

- Pre-configured database dumps for practice

- PDF handouts of SQL commands and syntax

- Cheat sheet for advanced SQL concepts

- Links to online resources and tutorials

Workshop Requirements:

1. Hardware: Laptop with at least 4GB RAM.

2. Software:

- MySQL/PostgreSQL installed

  - MySQL Workbench or pgAdmin for GUI-based interactions

  - Python (optional for integration demos)

3. Venue: Computer Lab 326

Outcomes:

By the end of the workshop, participants will:

1. Have a strong foundation in SQL.

2. Be capable of designing and managing relational databases.

3. Write complex SQL queries for real-world use cases.

4. Understand SQL's role in various industries and applications.

This workshop equips students with practical skills and insights into database management, enhancing their employability and technical expertise.