LESSON PLANNING

Phase 1: Foundations of Databases

Lesson 1: Introduction to Databases

- What is a Database?
- Types of Databases: Relational vs Non-Relational
- Basic SQL Command Line Interface (CLI) Usage

Lesson 2: SQL Basics

- Data Types in SQL
- Creating Databases and Tables
- CRUD Operations: CREATE, READ, UPDATE, DELETE
- Basic Queries: SELECT, WHERE, ORDER BY, LIMIT

Lesson 3: Working with Data

- Inserting Data: INSERT INTO
- Updating Data: UPDATE
- Deleting Data: DELETE
- Filtering Data: WHERE, AND, OR, IN, BETWEEN
- Sorting Data: ORDER BY
- Limiting Results: LIMIT, OFFSET

Lesson 4: Data Relationships

- Understanding Primary Keys and Foreign Keys
- Types of Relationships: One-to-One, One-to-Many, Many-to-Many
- Joins: INNER JOIN, LEFT JOIN, RIGHT JOIN, FULL OUTER JOIN
- Practical: Designing a Simple Relational Database
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Phase 2: Intermediate Concepts

Lesson 5: Advanced Queries

- Aggregation Functions: COUNT, SUM, AVG, MIN, MAX
- Grouping Data: GROUP BY, HAVING
- Subqueries and Nested Queries
- Set Operations: UNION, INTERSECT, EXCEPT

Lesson 6: Indexing and Optimization

- What are Indexes? (Primary, Unique, Composite)
- Creating and Managing Indexes
- Query Optimization Techniques
- Analyzing Query Performance: EXPLAIN, EXPLAIN ANALYZE

Lesson 7: Data Integrity and Constraints

- NOT NULL, UNIQUE, CHECK, DEFAULT

- Foreign Key Constraints
- Cascading Updates and Deletes
- Practical: Enforcing Business Rules with Constraints

Lesson 8: Transactions and Concurrency

- ACID Properties
- BEGIN, COMMIT, ROLLBACK
- Isolation Levels and Locking
- Handling Deadlocks
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Phase 3: Advanced Database Features

Lesson 9: Stored Procedures and Functions

- Creating Stored Procedures
- Writing User-Defined Functions (UDFs)
- Parameters and Return Values
- Practical: Writing a Function to Calculate Discounts

Lesson 10: Triggers and Events

- What are Triggers?
- Creating BEFORE and AFTER Triggers
- Using Triggers for Auditing and Logging
- Scheduled Events in MySQL

Lesson 11: Views and Materialized Views

- Creating and Managing Views
- Updatable Views
- Materialized Views in PostgreSQL
- Practical: Creating a Dashboard View

Lesson 12: Advanced Data Types

- JSON and JSONB in PostgreSQL
- Spatial Data Types (GIS)
- Arrays and Composite Types
- Practical: Storing and Querying JSON Data

Phase 4: Industry-Ready Skills

Lesson 13: Database Security

- User Management and Roles
- Granting and Revoking Permissions
- Encryption and SSL
- Best Practices for Securing Databases

Lesson 14: Backup and Recovery

- Types of Backups: Full, Incremental, Differential

- Backup Tools: pg_dump, mysqldump
- Point-in-Time Recovery (PITR)
- Practical: Restoring a Database from Backup

Lesson 15: Replication and High Availability

- Setting Up Master-Slave Replication
- Failover and Load Balancing
- Practical: Configuring Replication in PostgreSQL and MySQL

Lesson 16: Database Design and Normalization

- Normalization: 1NF, 2NF, 3NF, BCNF
- Denormalization for Performance
- Practical: Designing a Database for an E-Commerce Platform

Lesson 17: Working with Large Datasets

- Partitioning Tables
- Sharding Techniques
- Query Optimization for Large Datasets
- Practical: Handling Millions of Records