**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

**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

**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