Database Management & SQL Track

2 Months Online   1 Month Offline Program

Your Name

Program Goal & Core Topics

◎ Program Goal

Equip learners with strong theoretical understanding and practical implementation skills in database management and advanced SQL.
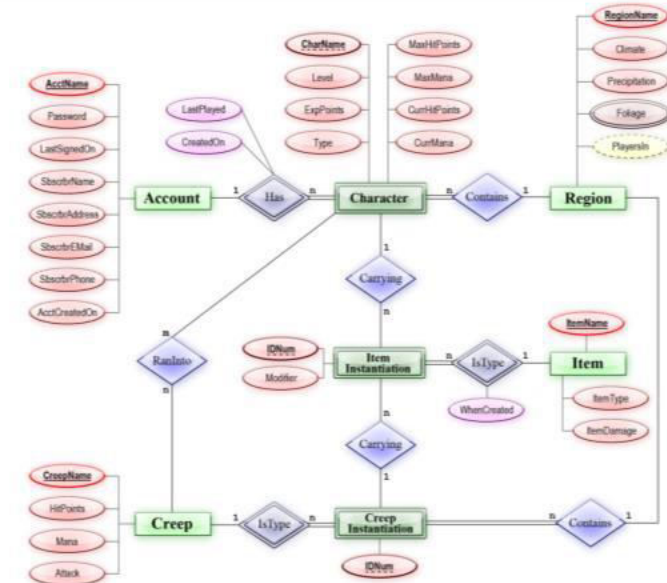
`Theoretical & Practical Skills` `Database Management`

`Advanced SQL`

📖 Core Topics

- Database Fundamentals: Types, Concepts, Relational Model
- SQL: DDL, DML, DQL, DCL
- Advanced SQL: Joins, Subqueries, CTEs, Window Functions
- Database Design `ER, Normalization`
- Indexing, Views, & Transactions
- Basic Database Administration
- Mini Project: Real-world Application

Understanding Entity-Relationship Models is crucial for effective database design, mapping real-world entities and their relationships into a structured database schema.

🛠️ Deep Dive: Database Design Excellence

Phase 1: Foundational & Core Concepts (Online)

💡 Core Objective

This phase builds a robust understanding of database principles and SQL mastery through:

- ✅ **Theoretical Understanding:** Grasping relational models, schema design, and data integrity.

- ✅ **Hands-on Proficiency:** Developing practical skills in constructing and manipulating databases.

- ✅ **Intermediate Querying:** Building expertise from basic retrieval to complex joins and subqueries.

`Foundational Concepts`

`SQL Fundamentals`

Embracing online delivery for flexible and accessible learning.

`Online Delivery`

📅 Program Timeline

Months 1 & 2
Dedicated online delivery ensures focused learning on core concepts.

🔧 Essential Tools

Exercises use industry-standard RDBMS for real-world application:

▤ PostgreSQL

▤ MySQL

`PostgreSQL` `MySQL`

🦾 Fundamentals in Focus: Why This Matters

This phase ensures learners master the bedrock of data management:

Month 1: SQL Fundamentals & Relational Databases

The inaugural month lays the essential groundwork for database mastery, meticulously covering core SQL functionalities and the principles of relational database management systems.

Gaining hands-on proficiency with SQL syntax, the universal language for database interaction.

Week 1: Introduction

DBMS vs. RDBMS: Understanding the distinctions between Database Management Systems and their relational counterparts.

Relational Model: Core principles including tables, rows, columns, and keys.

Environment Setup: Practical steps to configure and prepare the SQL working environment.

Week 2: SQL DDL

CREATE/ALTER/DROP: Defining, building, modifying, and deleting database objects.

Constraints: Implementing rules like `PRIMARY KEY`, `FOREIGN KEY`, and `NOT NULL` for data integrity.

Week 3: SQL DML

Week 4: SQL DQL

Month 2: Advanced SQL & Database Design

((•)) **Delivery Method**

Continued Online Sessions
Focus on deeper theoretical concepts and practical applications.

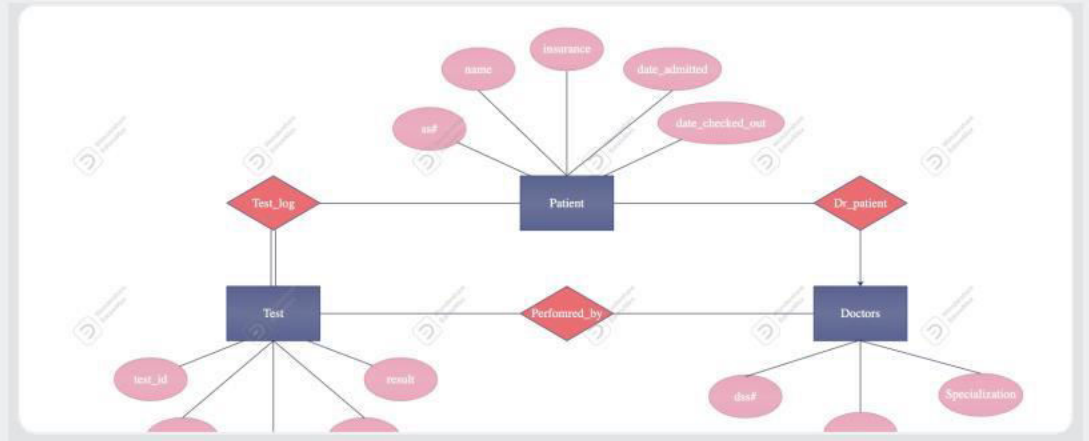## 📊 Objective: Master Complex SQL Querying

Delving into sophisticated SQL syntax for powerful data analysis and manipulation.

Building on foundational SQL, this module elevates querying skills to handle intricate data retrieval and manipulation challenges.

Complex Joins — Describe into various JOIN types

✂️ Objective: Learn Systematic Database Design

Conceptualizing and structuring data relationships through effective ER modeling and normalization.

This module provides a systematic approach to designing robust, scalable, and efficient databases from the ground up.

📈 Advanced SQL Deep Dive

Building upon foundational knowledge, this phase significantly elevates SQL proficiency, enabling learners to tackle complex data challenges through advanced querying and analytical techniques, crucial for driving insightful decisions.

🔀 Week 5: Joins & Set Operations

Master techniques for data consolidation and comparison by combining data from multiple sources.

SQL Joins:

`INNER JOIN` `LEFT JOIN` `RIGHT JOIN` `FULL JOIN` `Self-Join`

Set Operations:

`UNION` `UNION ALL` `INTERSECT` `EXCEPT`

🔷 Week 6: Advanced DQL

Unlock advanced analytical capabilities with nested queries, reusable logic, and powerful window functions.

Core Concepts:

`Subqueries` `CTEs (WITH)` `Aggregates`

Window Functions:

`ROW_NUMBER()` `RANK()` `LAG()` `LEAD()`

📈 Hands-on Focus: Driving Analytical Insights

This module strongly emphasizes real-world scenarios, focusing on practical application for impactful data roles.

Database Design Principles

This pivotal phase equips learners with the essential knowledge and methodologies for designing robust, efficient, and well-structured databases, forming the backbone of reliable data systems.

Week 7: Entity-Relationship (ER) Modeling

Master the art of conceptualizing and visualizing database structures, translating real-world scenarios into logical data models.

`ER Modeling` `Data Structuring`

- **Entities:** Identifying core objects (e.g., Customer, Product).

- **Attributes:** Defining properties describing entities (e.g., CustomerID).

- **Relationships:** Understanding associations (1:1, 1:N, M:N).

- **Cardinality & Modality:** Specifying instance counts and participation rules.

- **Drawing ER Diagrams:** Constructing professional ER

Week 8: Normalization & Indexing/Views

Optimize database design for data integrity, efficiency, and security, ensuring robust and performant data storage.

`Normalization` `Indexing` `Views` `Optimization`

- **Normalization:** Eliminating redundancy via 1NF, 2NF, 3NF, and BCNF. Considering denormalization for performance.

- **Indexing:** Creating B-tree and hash indexes for faster data retrieval.

- **Views:** Using virtual tables to simplify complex queries and manage access.

Phase 2: Project Application & Administration (Offline)

This critical final phase transitions theoretical learning into tangible results, requiring learners to synthesize all acquired knowledge into a comprehensive real-world database project.

📅 Phase Overview

Duration **Month 3**

This period is dedicated to focused, hands-on project work in an intensive offline phase.

Format **Collaborative & Guided**

An immersive environment fostering teamwork and direct instructor support for project development.

🔧 Core Objective: Project Development

Apply all learned concepts to design, implement, and administer a full-fledged relational database for a chosen application.

- **Design & Schema:** Apply ER modeling and normalization to ensure data integrity.

- **Implementation:** Build the database, tables, constraints, and stored procedures.

- **Administration:** Manage users, data, backups, and monitor performance.

🏆 Culmination

Month 3: Capstone Project Kick-off & Design

🚶 Week 9: Project Initiation - Laying the Foundation

The transition into the intensive Capstone Project begins with a structured kick-off to ensure all teams are prepared for success.

- **Arrival & Orientation:** On-site welcome and comprehensive orientation.
- **Team Formation:** Collaborative teams are formed to foster diverse skill sets.
- **Mentor Allocation:** Each team is assigned an expert mentor for personalized guidance.
- **Project Application Selection:** Teams select a real-world project application.

The Capstone Project journey begins with strategic planning and team synergy.

▦ Detailed ER Modeling & Normalization

Refining the conceptual database design into a robust, normalized structure to ensure data integrity and efficiency.

Key Steps:

REFINE Refine conceptual design to translate business needs.

IDENTIFY Identify all entities, attributes, and relationships.

NORMALIZE Ensure 3NF/BCNF compliance to eliminate redundancy.

🛠 Schema Implementation

Translating the refined ER model into executable DDL scripts, forming the database's physical structure.

Key Tasks:

TRANSLATE Translate ER model into DDL statements (CREATE TABLE).

CONSTRAIN Apply constraints (PRIMARY KEY, FOREIGN KEY) for integrity.

INDEX Incorporate indexes to optimize query performance.

Project Development & Advanced Features

Week 10 marks a pivotal stage in the Capstone Project, where theoretical knowledge transforms into practical, high-performance database solutions, integrating advanced features for operational efficiency and business intelligence.

Synthesizing advanced database concepts into a comprehensive project solution.

Data Population

Populate the designed database with substantial and realistic sample data, enabling comprehensive testing and demonstration of the application.

Key Task:

Write DML scripts   Develop robust `INSERT` statements and leverage data generation tools to create a realistic dataset, ensuring the database can be thoroughly tested under simulated real-world conditions.

Stored Routines

Implement reusable code blocks to encapsulate common operational tasks, enhancing modularity, security, and performance.

Key Implementations:

Stored Procedures   Create parameterized procedures for complex business logic.

Functions   Develop UDFs for specific calculations or data transformations.

Database Administration & Performance

Week 11 deepens understanding of database operational management, ensuring data security, integrity, availability, and optimal performance, alongside exploring the landscape of NoSQL databases.

🛡️ Data Control Language (DCL)

`Core Admin Skills` `Security`

Mastering DCL is crucial for safeguarding sensitive data and managing access efficiently.

User Management: Create, alter, and drop user accounts to regulate database access.

Granting/Revoking Permissions: Utilize `GRANT` and `REVOKE` for specific privileges on objects.

Role-Based Access Control (RBAC): Implement roles to group privileges and assign to users, streamlining security.

## 🔄☁️ Backup & Restore

`Core Admin Skills` `Resilience`

Implementing robust backup and restore strategies is paramount for disaster recovery and business continuity.

Full Database Backups: Perform comprehensive backups to safeguard against data loss.

Practice Restoration: Hands-on experience with restoring databases from backups to ensure recoverability.

CLOUD STORAGE

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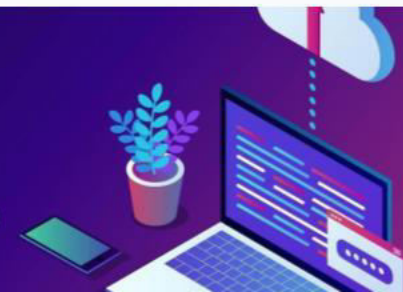
Project Showcase & Career Launchpad

Week 12 represents the grand culmination of your journey, where theoretical knowledge meets practical application, and career readiness takes center stage. It's a moment to demonstrate mastery, celebrate achievements, and forge connections for the future.

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Demonstrating insights from comprehensive project development.

Showcase your comprehensive Capstone Project, demonstrating mastery of end-to-end database development.

Key Demonstrations

- **ER Diagram & Schema:** Present the conceptual, logical, and physical design.
- **DQL & Stored Routines:** Illustrate complex querying and

📇 Project Documentation

Organizing intricate database architecture into clear documentation.

Prepare a comprehensive report that encapsulates your project's entire lifecycle and technical details.

Report Inclusions

- **ER Diagrams & Schema:** Visual and textual representation of structure.
- **DDL/DML Scripts:** All scripts for database creation and population.
- **Key Queries:** Examples of critical and performance-tuned queries.