PostgreSQL - Course Details

Course Objective

The objective of this course is to provide a comprehensive understanding of PostgreSQL, one of the most powerful and widely-used open-source relational database management systems.

This course is designed to cater to beginners aiming to build a strong foundation in SQL and database concepts, as well as professionals seeking to deepen their knowledge of advanced PostgreSQL features for real-world application and enterprise-level projects.

By the end of this course, learners will be able to:

- Understand fundamental database concepts and relational database design.
- Write efficient SQL queries to create, read, update, and delete data using PostgreSQL.
- Design normalized data models and build relational schemas.
- Use pgAdmin and psql to interact with PostgreSQL databases.
- Build simple data-driven applications and projects using PostgreSQL as the backend.
- Master advanced SQL techniques such as window functions, CTEs, and subqueries.
- Optimize query performance using indexing, query plans.

Course Content

Introduction to Databases

- What is a Database?
- What is SQL?
- Introduction to RDBMS
- Overview of PostgreSQL
- Installation and setup (Windows/Linux/macOS)
- Using pgAdmin and psql

Basic SQL with PostgreSQL

- Creating a database
- Creating tables
- Data types in PostgreSQL
- Inserting data (INSERT)
- Retrieving data (SELECT)
- Filtering data (WHERE, AND, OR, NOT)
- Sorting data (ORDER BY)
- Limiting results (LIMIT, OFFSET)
- Updating data (UPDATE)
- Deleting data (DELETE)

Intermediate SQL Queries

- Aliases
- Pattern matching (LIKE, ILIKE)
- Aggregate functions (COUNT, SUM, AVG, MIN, MAX)
- Grouping (GROUP BY, HAVING)
- Joins (INNER, LEFT, RIGHT, FULL OUTER)

- Subqueries

Data Modeling Basics

- Understanding primary and foreign keys
- Normalization basics (1NF, 2NF, 3NF)
- Entity Relationship Diagrams (ERDs)

PostgreSQL Tools

- Using pgAdmin effectively
- Backup and restore using pgAdmin
- Introduction to psql (PostgreSQL CLI)

Advanced SQL Techniques

- Advanced joins (SELF JOIN, CROSS JOIN)
- Common Table Expressions (CTEs)
- Window functions (ROW_NUMBER, RANK, DENSE_RANK, LEAD, LAG)
- Pivoting and unpivoting data
- Advanced subqueries (correlated subqueries)

PostgreSQL Data Types and Functions

- Array data types
- JSON and JSONB
- HSTORE data type
- Date and Time functions
- String functions
- Mathematical and statistical functions

Indexing and Performance

- Understanding indexes
- Types of indexes (B-tree, Hash, GIN, GiST)

- EXPLAIN and EXPLAIN ANALYZE
- Query optimization techniques
- VACUUM, ANALYZE, REINDEX

Transactions and Concurrency

- ACID properties
- Transactions (BEGIN, COMMIT, ROLLBACK)
- Savepoints
- Concurrency and isolation levels
- Deadlocks and locking

Views

- Creating and using views
- Materialized views

Security and Permissions

- PostgreSQL roles and users
- Granting and revoking permissions
- Role inheritance
- Schema-based access control

Total Duration of the Course

- Total duration: 1 month(s)
- Days: Monday to Friday (1 hr daily)
- Mode: Online

Certificate

A course completion certificate will be awarded once you have successfully completed this course.

Wishing you a Smooth Coding ahead!