Course Title: PostgreSQL Database Management

Course Description:

This course provides an in-depth exploration of PostgreSQL, one of the world's most powerful and popular open-source relational database management systems. Students will gain a comprehensive understanding of database design, SQL querying, performance optimization, and advanced features of PostgreSQL. The course combines theory with hands-on practice to develop practical skills for managing PostgreSQL databases.

Course Objectives:

Understand the fundamental concepts of relational databases.

Master PostgreSQL installation, configuration, and administration.

Design and implement efficient database schemas in PostgreSQL.

Develop proficiency in SQL querying for data retrieval and manipulation.

Learn about advanced PostgreSQL features such as triggers, views, and stored procedures.

Explore performance optimization techniques and indexing strategies.

Understand security and access control in PostgreSQL.

Gain hands-on experience with real-world database projects.

Course Outline:

Module 1: Introduction to PostgreSQL

Overview of PostgreSQL and its history

Installing PostgreSQL on various platforms

Introduction to the psql command-line tool

Module 2: Relational Database Fundamentals

Key concepts in relational databases

Data modeling and database design principles

Primary keys, foreign keys, and constraints

Module 3: PostgreSQL Data Types

Understanding PostgreSQL data types

Text, numeric, date, and other data types

User-defined data types

Module 4: SQL Querying in PostgreSQL

Basic SQL commands in PostgreSQL

Retrieving, updating, and deleting data

Aggregation, sorting, and filtering data

Module 5: Advanced SQL and PostgreSQL Features

Advanced SQL concepts (subqueries, common table expressions, window functions)

Views, stored procedures, and triggers in PostgreSQL

Module 6: PostgreSQL Administration

Configuring PostgreSQL for optimal performance

Backup and restore strategies

Monitoring and troubleshooting PostgreSQL

Module 7: Indexing and Optimization

Understanding indexing and its importance

Index types in PostgreSQL

Query optimization and performance tuning

Module 8: Security and Access Control

User authentication and role management

Database permissions and security best practices

Data encryption and security features

Module 9: Real-world Applications and Case Studies

Applying PostgreSQL to practical scenarios

Case studies from various domains (e.g., e-commerce, finance, healthcare)

Module 10: Final Project

Students work on a comprehensive PostgreSQL database project

Database design, implementation, and optimization

Project presentation and documentation

Assessment Methods:

Quizzes and midterm exams

Database design and SQL query assignments

Hands-on projects

Final PostgreSQL database project

Grading:

Quizzes and Exams: 20%

Assignments: 30%

Hands-on Projects: 30%

Final Project: 20%

Textbook:

"PostgreSQL: Up and Running" by Regina O. Obe and Leo S. Hsu (or equivalent)

Note: This course outline serves as a general framework, and specific topics and depth of coverage may vary depending on the institution and the level of the course (introductory or advanced). Additionally, practical exercises and projects should be included to provide students with hands-on experience in using PostgreSQL.