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## 1. **INTRODUCTION**

The document provides a description of a training course on SQL programming language.

## 2. **OVERVIEW**

SQL forms the cornerstone of all relational database operations. The ability to write the SQL language is essential for those who develop database applications. This course provides a solid foundation of the SQL programming language that enables students to build, query and manipulate databases. Working in Oracle database throughout this course, students compare the ANSI/ISO standard with the SQL implementation of this database product.

## 3. **COURSE OBJECTIVES**

Students will learn how to:

- Understand the basics of Relational Databases
- Write SQL code based on ANSI/ISO standards to build and maintain database structures
- Update database content with SQL and transaction handling
- Retrieve data from single or multiple tables
- Process data with row and aggregate functions
- Manipulate data with correlated and noncorrelated subqueries
- Apply views to break down problems and enhance security

## 4. **COURSE DURATION**

40 hours:

Lectures – 20 hours

Practical and Assignments – 18 hours

Test – 2 hours

## 5. **PREREQUISITES**

This training course is valuable for anyone who needs to learn SQL programming. The course is designed for students new to writing SQL queries or having insufficient practice experience. An understanding of relational database and basic programming concepts is helpful.

## 6. **HANDS-ON TRAINING**

In this course, students gain hands-on experience programming with SQL in Oracle databases.

Exercises include:

- Creating and modifying tables, constraints and indexes
- Modifying table contents
- Retrieving data from tables
- Joining multiple tables
- Applying row and aggregate functions
- Embedding subqueries within statements

## 7. COURSE CONTENT

### Lecture 1. Introduction to SQL.

What is SQL? What is ANSI SQL? Define and understand the Basics of the RDBMS: relational databases, database normalization (briefly). SQL sessions. Types of SQL commands: DDL, DML, DQL, DCL...

### Lecture 2. Using DDL Statements to Create and Manage Tables.

What is Data? What are database objects? What is a schema? Create a simple table: naming a table or other object, The SQL statement CREATE TABLE. Review the table structure. List the data types that are available for columns: character, numeric, date, large objects (LOBs). Explain how constraints are created at the time of table creation: Creating CONSTRAINTS in the CREATE TABLE statement, The types of CONSTRAINTS. ALTER TABLE and DROP TABLE commands. Creating a table from an existing table.

### Lecture 3. Manipulating Data Using DML. Managing database transactions.

Overview of data manipulation. Insert rows into a table: default column list, enumerated column list. Update rows in a table. Delete rows from a table. Control transactions: COMMIT, ROLLBACK, SAVEPOINT. Inserting data from another table.

### Lecture 4. Retrieving Data Using the SQL Select Statement. Restricting and Sorting Data.

Execute a basic SELECT statement. The SELECT statement—an example. List the capabilities of SQL SELECT statements.

Limit the rows that are retrieved by a query: The WHERE clause, boolean logic, additional WHERE clause features (IN, BETWEEN, IS NULL/IS NOT NULL). Sort the rows that are retrieved by a query: reference by name, reference by position.

### Lecture 5. Using Single-Row Functions to Customize Output.

Describe various types of functions that are available in SQL: character functions, number functions, date functions, conversion functions, other functions. Use character, number, and date functions in SELECT statements. Nesting functions. Describe the use of conversion functions: conversion functions, automatic datatype conversions.

### Lecture 6. Reporting Aggregated Data. Using the Group Functions.

Identify the available group functions. Describe the use of group functions: COUNT, SUM, MIN/MAX, AVG.

Group data by using the GROUP BY clause: multiple columns, ORDER BY revisited, nesting functions. Include or exclude grouped rows by using the HAVING clause.

### Lecture 7. Displaying Data from Multiple Tables.

Write SELECT statements to access data from more than one. Table using equijoins and non-equijoins. Using table aliases. Types of joins: inner joins, outer joins, NATURAL joins. Multitable joins. Join a table to itself by using a self-join.

### Lecture 8. Retrieving Data Using Subqueries. Using the Set Operators.

Define subqueries. Describe the types of problems that subqueries can solve. List the types of subqueries: single-row subqueries, multiple-row subqueries, multiple-column subquery, scalar subqueries. Solve problems with correlated subqueries.

Describe set operators. Use a set operator to combine multiple queries into a single query: UNION, UNION ALL, INTERSECT, EXCEPT (MINUS). Control the order of rows returned.

### **Lecture 9. Creating Other Schema Objects. Database Tuning. Controlling User Access.**

Utilizing views. Create and use simple and complex views. The purpose of WITH CHECK OPTION. Performance impact of using nested views. Create and maintain indexes: implicit index creation, single column, composite, unique, dropping. When should indexes be considered/avoided? Create private and public synonyms.

Database tuning vs. SQL statement tuning. Formatting SQL statements: the format of SQL statements for readability, the order of tables in the FROM clause the placement of the most restrictive conditions in the WHERE clause, the placement of join conditions in the WHERE clause.

Differentiate system privileges from object privileges. Controlling user access: GRANT/REVOKE command. Controlling privileges through roles. Distinguish between privileges and roles.

### **Lecture 10. Oracle Database Structure and Error Handling**

Detailed structure of the Oracle Database and how to understand the storage of the data inside the Oracle DB. Also, to go through all the errors faced during the course and additional real time error types, description and handling methods.

## **8. METHOD OF EVALUATION**

<b>Evaluation Item</b>	<b>The Number of Times</b>	<b>Evaluation Proportion</b>	<b>Remarks</b>
Assignments	8	80%	
Final Test	1	20%	