

In this class, students will learn how to create, retrieve, and manipulate objects in Oracle 11g Structured Query Language (SQL). Students will also be introduced to Oracle 10g database features and tools. The Oracle 11g release has greatly enhanced the features and functionality of PL/SQL. Students will learn the fundamentals of the PL/SQL programming language. Students will write stored procedures, functions, packages, and triggers, and implement complex business rules in Oracle. Students will learn programming, management, and security issues of working with PL/SQL program units. Programming topics will include the built-in packages that come with Oracle, the creation of triggers, and stored procedure features. This course is a combination of “Introduction to Oracle 11g SQL Programming” and “Introduction to Oracle 11g PL/SQL Programming.”

Course Objectives:

- Describe the features of a Relational Database.
- Interact with a Relational Database Management System.
- Use SQL*Plus to connect to an Oracle database and submit SQL statements.
- Write SQL queries.
- Use SQL functions.
- Use a query to join together data items from multiple tables.
- Write nested queries.
- Perform summary analysis of data in a query.
- Add, change, and remove data in a database.
- Manage database transactions.
- Work in a multi-user database environment.
- Create and manage tables and other database objects.
- Control access to data.
- Create triggers on database tables.
- Use PL/SQL's datatypes for database and program data.
- Use program structure and control flow to design and write PL/SQL programs.
- Create PL/SQL stored procedures and functions.
- Write robust programs that handle runtime exceptions.
- Use PL/SQL's collection datatypes.
- Use cursors to work with database data.
- Use bulk operations for improved performance.
- Use the packages supplied with Oracle.
- Design and write your own packages.
- Maintain and evolve your PL/SQL programs.
- Manage the security of your stored PL/SQL programs.

Audience: Database application developers.

Prerequisites: Familiarity with relational database concepts as well as a solid understanding of 3GL programming are required.

Number of Days: 5 days

1. **Course Introduction**
 - Course Objectives
 - Overview
 - Suggested References
2. **Relational Database and SQL**
 - Overview**
 - Review of Relational Database Terminology
 - Relational Database Management Systems
 - Introduction to SQL
 - Oracle Versioning and History
 - Logical and Physical Storage Structures
 - Connecting to a SQL Database
 - Datatypes
 - Sample Database
3. **Using Oracle SQL*Plus**
 - SQL*Plus
 - The SQL Buffer
 - Buffer Manipulation Commands
 - Running SQL*Plus Scripts
 - Tailoring Your SQL*Plus Environment
 - Viewing Table Characteristics
 - SQL*Plus Substitution Variables
 - Interactive SQL*Plus Scripts
 - SQL*Plus LOB Support
 - Graphical Clients
4. **SQL Queries – The SELECT Statement**
 - The SELECT Statement
 - The CASE...WHEN Expression
 - Choosing Rows with the WHERE Clause
 - NULL Values
 - Compound Expressions
 - IN and BETWEEN
 - Pattern Matching: LIKE and REGEXP_LIKE
 - Creating Some Order
5. **Scalar Functions**
 - SQL Functions
 - Using SQL Functions
 - String Functions
 - Regular Expression Functions
 - Numeric Functions
 - Date Functions
 - Date Formats
 - Conversion Functions
 - Literal Values
 - Intervals
 - Oracle Pseudocolumns
6. **SQL Queries - Joins**
 - Selecting from Multiple Tables
 - Joining Tables
 - Self Joins
 - Outer Joins
7. **Aggregate Functions and Advanced Techniques**
 - Subqueries
 - Correlated Subqueries
 - The EXISTS Operator
 - The Aggregate Functions
 - Nulls and DISTINCT
 - Grouping Rows
 - Combining SELECT Statements
8. **Data Manipulation and Transactions**
 - The INSERT Statement
 - The UPDATE Statement
 - The DELETE Statement
 - Transaction Management
 - Concurrency
 - Explicit Locking
 - Data Inconsistencies
 - Loading Tables From External Sources
9. **Data Definition and Control Statements**
 - Datatypes
 - Defining Tables
 - Constraints
 - Inline Constraints
 - Modifying Table Definitions
 - Deleting a Table Definition
 - Controlling Access to Your Tables
10. **Other Database Objects**
 - Views
 - Creating Views
 - Updatable Views

- Sequences
- Synonyms
- 11. Triggers**
 - Beyond Declarative Integrity
 - Triggers
 - Types of Triggers
 - Trigger Sequencing
 - Row-Level Triggers
 - Trigger Predicates
 - Trigger Conditions
 - Using Sequences
 - Cascading Triggers and Mutating Tables
 - Generating an Error
 - Maintaining Triggers
- 12. PL/SQL Variables and Datatypes**
 - Anonymous Blocks
 - Declaring Variables
 - Datatypes
 - Subtypes
 - Character Data
 - Dates and Timestamps
 - Date Intervals
 - Anchored Types
 - Assignment and Conversions
 - Selecting into a Variable
 - Returning into a Variable
- 13. PL/SQL Syntax and Logic**
 - Conditional Statements – IF/THEN
 - Conditional Statements – CASE
 - Comments and Labels
 - Loops
 - WHILE and FOR Loops
 - SQL in PL/SQL
 - Local Procedures and Functions
- 14. Stored Procedures and Functions**
 - Stored Subprograms
 - Creating a Stored Procedure
 - Procedure Calls and Parameters
 - Parameter Modes
 - Named Parameter Notation
 - Default Arguments
 - Creating a Stored Function
 - Stored Functions and SQL
 - Invoker's Rights
- 15. Exception Handling**
 - SQLCODE and SQLERRM
 - Exception Handlers
 - Nesting Blocks
 - Scope and Name Resolution
 - Declaring and Raising Named Exceptions
 - User-Defined Exceptions
- 16. Records, Collections, and User-Defined Types**
 - Record Variables
 - Using the %ROWTYPE Attribute
 - User-Defined Object Types
 - VARRAY and Nested TABLE Collections
 - Using Nested TABLES
 - Using VARRAYs
 - Collections in Database Tables
 - Associative Array Collections
 - Collection Methods
 - Iterating Through Collections
- 17. Cursors**
 - Multi-Row Queries
 - Declaring and Opening Cursors
 - Fetching Rows
 - Closing Cursors
 - The Cursor FOR Loop
 - FOR UPDATE Cursors
 - Cursor Parameters
 - The Implicit (SQL) Cursor
- 18. Bulk Operations**
 - Bulk Binding
 - BULK COLLECT Clause
 - FORALL Statement
 - FORALL Variations
 - Bulk Returns
 - Bulk Fetching with Cursors
- 19. Using Packages**
 - Packages
 - Oracle-Supplied Packages
 - The DBMS_OUTPUT Package
 - The DBMS_UTILITY Package
 - The UTL_FILE Package
 - Creating Pipes with DBMS_PIPE
 - Writing to and Reading from a Pipe

- The DBMS_METADATA Package
- XML Packages
- Networking Packages
- Other Supplied Packages
- 20. Creating Packages**
 - Structure of a Package
 - The Package Interface and Implementation
 - Package Variables and Package State
 - Overloading Package Functions and Procedures
 - Forward Declarations
 - Strong REF CURSOR Variables
 - Weak REF CURSOR Variables
- 21. Working with LOBs**
 - Large Object Types
 - Oracle Directories
 - LOB Locators
 - Internal LOBs
 - LOB Storage and SECUREFILEs
 - External LOBs
 - Temporary LOBs
 - The DBMS_LOB Package
- 22. Maintaining PL/SQL Code**
 - Privileges for Stored Programs
 - Data Dictionary
 - PL/SQL Stored Program Compilation
 - Conditional Compilation
 - Compile-Time Warnings
 - The PL/SQL Execution Environment
 - Dependencies and Validation
 - Maintaining Stored Programs
- 23. Appendix A – The Data Dictionary**
 - Introducing the Data Dictionary
 - DBA, ALL, and USER Data Dictionary Views
 - Some Useful Data Dictionary Queries
- 24. Appendix B – Dynamic SQL**
 - Generating SQL at Runtime
 - Native Dynamic SQL vs. DBMS_SQL Package
 - The EXECUTE IMMEDIATE Statement
 - Using Bind Variables
 - Multi-row Dynamic Queries
 - Bulk Operations with Dynamic SQL
- Using DBMS_SQL
- DBMS_SQL Subprograms
- 25. Appendix C – PL/SQL Versions, Datatypes, and Language Limits**
- 26. Appendix D – Oracle 11g Supplied Packages**