Introduction to Oracle 11g Programming

In this class, students will learn how to create, retrieve, and manipulate objects in Oracle 11*g* Structured Query Language (SQL). Students will also be introduced to Oracle 10*g* database features and tools. The Oracle 11*g* 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 11*g* SQL Programming" and "Introduction to Oracle 11*g* 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

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1 Course Introduction
Course Objectives
Course Overview
Using the Workbook
Suggested References

2 Relational Database and SQL Overview
Review of Relational Database Terminology
Relational Database Management Systems
SQL Datatypes
Introduction to SQL

3 Oracle Database
Oracle Versioning and History
Logical and Physical Storage Structures
Datatypes
Overview of Oracle Architecture
Connecting to Oracle
SQL*Plus
Graphical Clients
The Oracle Data Dictionary
Sample Database

4 SQL Queries – The SELECT Statement
The SELECT Statement
Choosing Rows with the WHERE Clause
NULL Values
Compound Expressions
IN and BETWEEN
Pattern Matching: LIKE and REGEXP_LIKE
The CASE…WHEN Expression
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
Equijoins, Non-equijoins & Antijoins

7 Aggregate Functions & 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
Indexes

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 & 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
Appendix A: 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
Appendix B: The Data Dictionary
Introducing the Data Dictionary
DBA, ALL, and USER Data Dictionary Views
Some Useful Data Dictionary Queries
Appendix C: 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
Appendix D: Oracle 11g Supplied Packages