

# Mastering PL/SQL for Enterprise Data Solutions

## Course Description

This program delivers in-depth mastery of Oracle PL/SQL, structured for professional developers and database engineers who aim to design efficient enterprise solutions. The 10-day curriculum engages participants with hands-on labs, optimizing, securing, and integrating PL/SQL applications in enterprise-scale environments.

## Prerequisites

- Proficiency in SQL and RDBMS fundamentals
- Basic programming experience
- Oracle Database and SQL Developer familiarity

## Learning Objectives

After completing the course, participants will be able to:

- Understand PL/SQL architecture and execution processing
- Design modular and optimized PL/SQL code
- Manage transactions, exceptions, and automated logic
- Apply performance, debugging, and security best practices
- Integrate PL/SQL with ETL, APIs, and microservices
- Develop and deploy enterprise-grade database solutions

## Course Outline

### Module 1: Database & PL/SQL Architecture

- Oracle database components and processes
- PL/SQL compiler and runtime engine

- Understanding the anonymous block structure
- Execution context, dependencies, and privilege models
- SQL vs. PL/SQL – comparative functionality

## **Module 2: Data Types, Variables, and Control Flow**

- Declaring and initializing variables
- Anchored, scalar, composite, and record types
- Scope, lifetime, and nested blocks
- Conditional and iterative constructs (IF, CASE, LOOP, WHILE)
- Optimizing control flow for maintainability

## **Module 3: SQL Operations Within PL/SQL**

- Using SELECT INTO and DML operations
- Handling multi-row queries with cursors
- Parameterized cursors and attributes
- Using FOR UPDATE and WHERE CURRENT OF
- Implementing BULK COLLECT and FORALL

## **Module 4: Procedures and Functions**

- Creating stored procedures and reusable functions
- Parameter modes and argument passing
- Overloading and default parameters
- Deterministic and pipelined functions
- Handling return types, cursors, and result sets

## **Module 5: Packages and Modular Programming**

- Purpose and advantages of packages
- Designing specifications and bodies
- Managing global state with package variables
- Dependency management and recompilation
- Common package frameworks for enterprise systems

### **Module 6: Exception Handling and Debugging**

- Predefined and user-defined exceptions
- Exception propagation hierarchy
- Application-level and global exception handling
- Logging with DBMS\_OUTPUT and DBMS\_DEBUG
- Structured error logging with autonomous transactions

### **Module 7: Triggers and Event-Driven Programming**

- Trigger types: DML, DDL, and INSTEAD OF
- Statement vs. row-level operation
- Preventing recursion and dependency loops
- Using conditional predicates in triggers
- Implementing audit and business logic automation

### **Module 8: Collections and Advanced Data Handling**

- Working with VARRAY, Nested Table, and Associative Array types
- Bulk binding and performance optimization
- Using collection methods (COUNT, DELETE, EXTEND)
- Working with LOBs (CLOB, BLOB, NCLOB)
- JSON and XML data manipulation in PL/SQL

## **Module 9: Dynamic SQL and Ref Cursors**

- EXECUTE IMMEDIATE for dynamic DDL and DML
- Using DBMS\_SQL for complex requirements
- Implementing weak and strong REF CURSORS
- Passing cursors as parameters
- Dynamic query building patterns

## **Module 10: Performance and Optimization**

- Code profiling with DBMS\_PROFILER and tracing tools
- Query optimization techniques using indexes and statistics
- Bulk operations and array processing
- Instrumentation using logging tables
- Best practices for modular efficiency and caching

## **Module 11: Security, Roles, and Privileges**

- Managing database privileges and access
- Encrypting sensitive data (DBMS\_CRYPTO, TDE)
- Preventing SQL injection
- Implementing fine-grained auditing (FGA) and VPD

## **Module 12: Transaction Management and Concurrency**

- Savepoints, commits, and rollbacks
- Autonomous transactions and nested commits
- Lock handling and concurrency models
- Read consistency and isolation levels

- Deadlock prevention strategies

### **Module 13: Enterprise Integration and Automation**

- Using PL/SQL in ETL and data pipeline contexts
- Consuming REST and SOAP APIs from PL/SQL
- Integrating PL/SQL with external Python/Java components
- Scheduling jobs with DBMS\_SCHEDULER
- Event-driven integration with Oracle AQ

### **Module 14: Testing, Troubleshooting, and Deployment**

- Unit testing with DBMS\_UNIT and utPLSQL
- Version control and deployment best practices
- Backup, recovery, and rollback planning
- Performance health-check automation
- Code migration and DevOps pipeline integration