

A Relational Database Management System (RDBMS) is a software system that allows you to create and manage a relational database. Minimum requirements for such a system are defined by both ANSI and ISO. PL/SQL is Oracle's Procedural Language for SQL. It is Oracle's database programming language for creating stored procedures, functions, database triggers, and object methods. PL/SQL can be used for implementing business rules, computing algorithms, manipulating data, and for stand-alone programs.

Oracle 12c focuses on Oracle's cloud-based offerings with a new architecture – Pluggable Databases (PDBs) – designed for rapid deployment and migration in a multi-tenant environment. This courseware is designed to teach both end-users and developers accessible but powerful SQL query and data manipulation (DML) skills, then teach critical programming and optimization techniques using advanced PL/SQL features.

### Course Objectives:

- 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 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:** Application developers and database administrators.

**Prerequisites:** *Introduction to Oracle 12c SQL Programming* is required. Programming experience in a high-level language, such as COBOL, Java, or Perl is also required.

**Number of Days:** 3 days

<b>1 Course Introduction</b> Course Objectives Course Overview Using the Workbook Suggested References	<b>2 Triggers</b> Beyond Declarative Integrity Triggers Types of Triggers Trigger Sequencing Row-Level Triggers	<b>3 PL/SQL Variables and Datatypes</b> Anonymous Blocks Declaring Variables Datatypes Subtypes
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	Character Data		
	Dates and Timestamps		
	Date Intervals		
	Anchored Types		
	Assignment and Conversions		
	Selecting into a Variable		
	Returning into a Variable		
<b>4</b>	<b>PL/SQL Syntax and Logic</b>		
	Conditional Statements – IF/THEN		
	Conditional Statements – CASE	<b>9</b>	
	Comments and Labels		
	Loops		
	WHILE and FOR Loops		
	SQL in PL/SQL		
	Local Procedures and Functions		
<b>5</b>	<b>Stored Procedures and Functions</b>		
	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		
<b>6</b>	<b>Exception Handling</b>		
	SQLCODE and SQLERRM		
	Exception Handlers		
	Nesting Blocks		
	Scope and Name Resolution		
	Declaring and Raising Named Exceptions		
	User-Defined Exceptions		
<b>7</b>	<b>Records and Collections</b>		
	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		
		<b>8</b>	<b>Cursors</b>
			Multi-Row Queries
			Declaring and Opening Cursors
			Fetching Rows
			Closing Cursors
			The Cursor FOR Loop
			FOR UPDATE Cursors
			Cursor Parameters
			The Implicit (SQL) Cursor
		<b>9</b>	<b>Bulk Operations</b>
			Bulk Binding
			BULK COLLECT Clause
			FORALL Statement
			FORALL Variations
			Bulk Returns
			Bulk Fetching with Cursors
		<b>10</b>	<b>Using Packages</b>
			Packages
			Oracle-Supplied Packages
			The DBMS_OUTPUT Package
			The DBMS_UTILITY Package
			The UTL_FILE Package
			The DBMS_METADATA Package
			XML Packages
			Networking Packages
			Other Supplied Packages
		<b>11</b>	<b>Creating Packages</b>
			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
		<b>12</b>	<b>Working with LOBs</b>
			Large Object Types
			Oracle Directories
			LOB Locators
			Internal LOBs
			LOB Storage and SECUREFILES
			External LOBs
			Temporary LOBs
			The DBMS_LOB Package

- 13 **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
- 14 **Appendix A – 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
- 15 **Appendix B – PL/SQL Versions, Datatypes, and Language Limits**