

# DATABASES

*Revised 11/28/2011*

**/training/etc**

*The Art of Knowledge.*

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**Course Description:** This course is designed to give users an understanding of SQL Language. The course covers SQL commands for DML, DDL, Query, and Transaction Control operations.

**Who Should Attend:** Application designers and developers, database administrators and operators, and end users should attend this course.

**Prerequisites:** There are no prerequisites for this course.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Explain the difference between SQL, DML, and DDL statements
- Write basic SQL queries to retrieve desired data
- Use DML statements (insert, update, and delete)
- Use DDL statements (create, alter, and drop)
- Use transaction control statements to commit and rollback
- Write advanced queries
- Write scripts to perform queries and display reports
- Control access to your database objects

### Course Outline:

#### Database Design

Database Models  
Beginnings  
Some Introductory Terminology  
Codd's 12 Rules  
Normalization  
First Normal Form  
Higher Order Normal Forms

#### Standard Interfaces

SQL  
Architecture  
Command Line Interface  
Viewing a Sample Table

#### The Sample Database

The Entity Relationship Model  
Entity Relationship Diagrams  
The Sample Database  
ER Diagram for Sample Database  
Creating the Sample Data  
Viewing Sample Data  
Data Types of the Sample Data

#### Data Definition Language

Categories of SQL Statements  
Datatypes  
The CREATE Statement  
The DROP Command  
The ALTER Command  
Integrity Constraints  
Entity Integrity Constraints  
Referential Integrity Constraints  
Modifying Table to Use Constraints  
Checking Constraints  
The Data Dictionary

#### Data Manipulation Language

DML Statements  
The SELECT Statement  
The INSERT Statement  
The DELETE Statement  
The UPDATE Statement

#### Transaction Control

Transactions  
Command Classification

#### SQL Operators

Simple Selects  
Comparison Operators  
IN and NOT IN Operators  
BETWEEN Operator  
The LIKE Operator  
Logical Operators  
IS NULL and IS NOT NULL  
ANY  
ALL

#### SQL FUNCTIONS

Introduction

The DISTINCT Keyword  
Aliases  
Miscellaneous Functions  
Mathematical Functions  
String Functions  
Date Functions  
Conversion Functions  
Pseudo Columns

#### Joining Tables

Joins  
Cartesian Product  
Inner joins  
Equi-Join  
Table Aliases  
Non-Equi Join  
Non-Key Join  
Reflexive Join  
Natural Join  
Outer Joins  
Right Outer Join  
Left Outer Join  
Full Outer Join  
Syntax for Outer Joins

#### Set Operators

Introduction  
Selection Criteria  
Union  
Union All  
Intersect  
Minus

#### SQL Subqueries

Introduction  
Using a Subquery with a DML Statement  
Typical Subqueries  
Subquery Operators  
Standard vs. Correlated Subqueries  
Correlated Subquery Example  
Predicate Operators

#### Groups

SQL Statements  
GROUP BY Clause  
HAVING Clause  
Order of a SELECT Statement

#### More Database Objects

More Database Objects  
Relational Views  
Updating a View  
Create or Replace  
Forcing a View  
The Data Dictionary Revisited  
Indexes  
Synonyms

**Course Description:** This course is designed to give users an understanding of Oracle SQL and Oracle PL/SQL languages using Oracle's SQL\*Plus and iSQL\*Plus tools. The course covers SQL commands for DML, DDL, Query, and Transaction Control operations. Students are also introduced to procedural programming using PL/SQL. The course topics are applicable to all versions of Oracle through Oracle 10g.

**Who Should Attend:** Application designers and developers, database administrators and operators, and end users should attend this course.

**Prerequisites:** There are no prerequisites for this course.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Explain the difference between SQL, PL/SQL and SQL\*PLUS.
- Write basic SQL queries to retrieve desired data.
- Use DML statements (insert, update, and delete).
- Use DDL statements (create, alter, and drop).
- Use transaction control statements to commit, rollback, and create savepoints.
- Write advanced queries.
- Write scripts to do queries and display SQL\*PLUS reports.
- Control access to your database objects.
- Write a PL/SQL block using all elements of block structure.
- Write PL/SQL statements using lexical units, declared variables, and assignment statements.
- Use control structures to loop, branch, and jump.
- Use PL/SQL named exceptions and user-defined exceptions.
- Use explicit cursors.

### Course Outline:

<p><b>Database Design</b></p> <p>Database Models Beginnings Some Introductory Terminology Codd's 12 Rules Normalization First Normal Form Higher Order Normal Forms</p> <p><b>Oracle Standard Interfaces</b></p> <p>SQL SQL*Plus Oracle Architecture Interfaces to Oracle Command Line Interface Viewing a Sample Table The Graphical User Interface The SQL Buffer The Web-Based Interface Describe</p> <p><b>The Sample Database</b></p> <p>The Entity Relationship Model Entity Relationship Diagrams The Sample Database ER Diagram for Sample Database Creating the Sample Data Viewing Sample Data Data Types of the Sample Data</p> <p><b>Data Definition Language</b></p> <p>Categories of SQL Statements Oracle Datatypes The CREATE Statement The DROP Command The ALTER Command Integrity Constraints Entity Integrity Constraints Referential Integrity Constraints Modifying Table to Use Constraints Checking Constraints The Data Dictionary</p> <p><b>Data Manipulation Language</b></p> <p>DML Statements The SELECT Statement The INSERT Statement The DELETE Statement The UPDATE Statement</p>	<p>More SQL*Plus Commands</p> <p><b>Transaction Control</b></p> <p>Transactions Command Classification Savepoints The SET TRANSACTION Command</p> <p><b>SQL Operators</b></p> <p>Simple Selects Comparison Operators IN and NOT IN Operators BETWEEN Operator The LIKE Operator Logical Operators IS NULL and IS NOT NULL ANY ALL</p> <p><b>SQL FUNCTIONS</b></p> <p>Introduction The DISTINCT Keyword Aliases Miscellaneous Functions Mathematical Functions String Functions Date Functions Conversion Functions Pseudo Columns</p> <p><b>Joining Tables</b></p> <p>Joins Cartesian Product Inner Joins Equi-Join Table Aliases Non-Equi Join Non-Key Join Reflexive Join Natural Join Outer Joins Right Outer Join Left Outer Join Full Outer Join Oracle-Specific Syntax for Outer Joins</p> <p><b>Set Operators</b></p> <p>Introduction Selection Criteria Union</p>	<p>Union All Intersect Minus</p> <p><b>SQL Subqueries</b></p> <p>Introduction Using a Subquery with a DML Statement Typical Subqueries Subquery Operators Standard vs. Correlated Subqueries Correlated Subquery Example Predicate Operators</p> <p><b>Groups</b></p> <p>SQL Statements GROUP BY Clause HAVING Clause Order of a SELECT Statement</p> <p><b>More Database Objects</b></p> <p>More Database Objects Relational Views Updating a View Create or Replace Forcing a View The Data Dictionary Revisited Indexes Synonyms</p> <p><b>Reports</b></p> <p>Report Features Session Control The SET Command The COLUMN Command The BREAK Command The COMPUTE Command</p> <p><b>Introduction</b></p> <p>SQL vs. PL/SQL A Few Simple Examples Saving Procedures A More Complete Picture Comments Variable Substitution Simple Exception Handling Advantages of PL/SQL Assignments</p> <p><b>Declarations and Data Types</b></p>	<p>Declarations Standard Data Types Initialization Variable Names Specialized Data Types - %TYPE Specialized Data Types - %ROWTYPE Building Your Own Data Types - Records A Quick look at Loops Arrays Tables Nested Blocks</p> <p><b>Language Components</b></p> <p>Introduction Assignments Decision Making Statements Simple Loops Loops - for Loops - indefinite Loops - while Simple Loops Nested Loops Boolean Variables PL/SQL Relational Operators PL/SQL Logical Operators The CASE Construct</p> <p><b>Cursors</b></p> <p>Introduction Cursor Manipulation Using the Cursor For Loops Cursors Cursor Attributes Cursor Parameters Nested Cursors Cursor Exceptions</p> <p><b>Exceptions</b></p> <p>Errors in Programs Run Time Exceptions Oracle Built In Exceptions Unnamed Exceptions Built in Exception Functions Creating Your Own Exceptions Building Non Terminating Exceptions</p> <p><b>Functions and Procedures</b></p> <p>Introduction</p>	<p>Creating a Procedure Example Procedure Using Parameters Functions Procedures and Exceptions</p> <p><b>Appendix A: An SQL and SQL*Plus Reference</b></p> <p>DDL Statements DML Statements Transaction Control Statements Operators Common SQL*Plus Commands</p>
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**Course Description:** This course starts with an introduction to PL/SQL and proceeds to list the benefits of this powerful programming language. Participants are made aware of how to create PL/SQL blocks of application code that can be shared by multiple forms, reports, and data management applications. In addition, creation of anonymous PL/SQL blocks as well as stored procedures and functions are covered in this course.

Participants enhance their developer skills by learning to develop, execute, and manage PL/SQL stored program units such as procedures, functions, packages, and database triggers. Understanding the basic functionality of how to debug functions and procedures using the SQL Developer Debugger gives way to refined lines of code. Participants also learn to manage PL/SQL subprograms, triggers, declaring identifiers, and trapping exceptions. The utilization of some of the Oracle-supplied packages is also in the course. Additionally participants learn to use Dynamic SQL, understand design considerations when coding using PL/SQL, understand and influence the PL/SQL compiler, and manage dependencies.

This is appropriate for a 10g and 11g audience. There are minor changes between 10g and 11g features.

**Who Should Attend:** Database Administrators, Forms Developers, Portal Developers, Developers, Technical Consultants, System Analysts, Application Developers, and PL/SQL Developers will benefit from this course.

**Prerequisites:** Students should have taken an introductory Oracle Database 10g: Introduction to SQL course.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Create and debug stored procedures and functions
- Use conditional compilation to customize the functionality in a PL/SQL application without removing any source code
- Design PL/SQL packages to group related constructs
- Create overloaded package subprograms for more flexibility
- Design PL/SQL anonymous blocks that execute efficiently
- Use the Oracle supplied PL/SQL packages to generate screen output, file output and mail output
- Write dynamic SQL for more coding flexibility
- Describe the features and syntax of PL/SQL
- Use PL/SQL programming constructs and conditionally control code flow (loops, control structures, and explicit cursors)
- Manage dependencies between PL/SQL subprograms
- Handle runtime errors
- Create triggers to solve business challenges
- Design PL/SQL code for predefined data types, local subprograms, additional pragmas, standardized constants and exceptions

## Course Outline:

### Introduction

Course Objectives  
Course Agenda  
Describe the Human Resources (HR) Schema  
PL/SQL development environments available in this course  
Introduction to SQL Developer

### Introduction to PL/SQL

Overview of PL/SQL  
Identify the benefits of PL/SQL Subprograms  
Overview of the types of PL/SQL blocks  
Create a Simple Anonymous Block  
How to generate output from a PL/SQL Block?

### Declare PL/SQL Identifiers

List the different Types of Identifiers in a PL/SQL subprogram  
Usage of the Declarative Section to Define Identifiers  
Use variables to store data  
Identify Scalar Data Types  
The %TYPE Attribute  
What are Bind Variables?  
Sequences in PL/SQL Expressions

### Write Executable Statements

Describe Basic PL/SQL Block Syntax Guidelines  
Learn to Comment the Code  
Deployment of SQL Functions in PL/SQL  
How to convert Data Types?  
Describe Nested Blocks  
Identify the Operators in PL/SQL

### Interaction with the Oracle Server

Invoke SELECT Statements in PL/SQL  
Retrieve Data in PL/SQL  
SQL Cursor concept  
Avoid Errors by using Naming Conventions when using Retrieval and DML Statements  
Data Manipulation in the Server using PL/SQL  
Understand the SQL Cursor concept  
Use SQL Cursor Attributes to Obtain Feedback on DML  
Save and Discard Transactions

### Control Structures

Conditional processing using IF Statements  
Conditional processing using CASE

Statements  
Describe simple Loop Statement  
Describe While Loop Statement  
Describe For Loop Statement  
Use the Continue Statement

### Composite Data Types

Use PL/SQL Records  
The %ROWTYPE Attribute  
Insert and Update with PL/SQL Records  
INDEX BY Tables  
Examine INDEX BY Table Methods  
Use INDEX BY Table of Records

### Explicit Cursors

What are Explicit Cursors?  
Declare the Cursor  
Open the Cursor  
Fetch data from the Cursor  
Close the Cursor  
Cursor FOR loop  
The %NOTFOUND and %ROWCOUNT Attributes  
Describe the FOR UPDATE Clause and WHERE CURRENT Clause

### Exception Handling

Understand Exceptions  
Handle Exceptions with PL/SQL  
Trap Predefined Oracle Server Errors  
Trap Non-Predefined Oracle Server Errors  
Trap User-Defined Exceptions  
Propagate Exceptions  
RAISE\_APPLICATION\_ERROR Procedure

### Stored Procedures

Create a Modularized and Layered Subprogram Design  
Modularize Development With PL/SQL Blocks  
Understand the PL/SQL Execution Environment  
List the benefits of using PL/SQL Subprograms  
List the differences between Anonymous Blocks and Subprograms  
Create, Call, and Remove Stored Procedures  
Implement Procedures Parameters and Parameters Modes  
View Procedure Information

### Stored Functions and Debugging Subprograms

Create, Call, and Remove a Stored Function  
Identify the advantages of using Stored Functions  
Identify the steps to create a stored function  
Invoke User-Defined Functions in SQL Statements  
Restrictions when calling Functions  
Control side effects when calling Functions  
View Functions Information  
How to debug Functions and Procedures?

### Packages

Listing the advantages of Packages  
Describe Packages  
What are the components of a Package?  
Develop a Package  
How to enable visibility of a Package's Components?  
Create the Package Specification and Body using the SQL CREATE Statement and SQL Developer  
Invoke the Package Constructs  
View the PL/SQL Source Code using the Data Dictionary

### Deploying Packages

Overloading Subprograms in PL/SQL  
Use the STANDARD Package  
Use Forward Declarations to solve Illegal Procedure Reference  
Implement Package Functions in SQL and Restrictions  
Persistent State of Packages  
Persistent State of a Package Cursor  
Control side effects of PL/SQL Subprograms  
Invoke PL/SQL Tables of Records in Packages

### Implement Oracle-Supplied Packages in Application Development

What are Oracle-Supplied Packages?  
Examples of some of the Oracle-Supplied Packages  
How does the DBMS\_OUTPUT Package work?  
Use the UTL\_FILE Package to Interact with Operating System Files  
Invoke the UTL\_MAIL Package

Write UTL\_MAIL Subprograms

### Dynamic SQL

The Execution Flow of SQL  
What is Dynamic SQL?  
Declare Cursor Variables  
Dynamically Executing a PL/SQL Block  
Configure Native Dynamic SQL to Compile PL/SQL Code  
How to invoke DBMS\_SQL Package?  
Implement DBMS\_SQL with a Parameterized DML Statement  
Dynamic SQL Functional Completeness

### Design Considerations for PL/SQL Code

Standardize Constants and Exceptions  
Understand Local Subprograms  
Write Autonomous Transactions  
Implement the NOCOPY Compiler Hint  
Invoke the PARALLEL\_ENABLE Hint  
The Cross-Session PL/SQL Function Result Cache  
The DETERMINISTIC Clause with Functions  
Usage of Bulk Binding to Improve Performance

### Triggers

Describe Triggers  
Identify the Trigger Event Types and Body  
Business Application Scenarios for Implementing Triggers  
Create DML Triggers using the CREATE TRIGGER Statement and SQL Developer  
Identify the Trigger Event Types, Body, and Firing (Timing)  
Differences between Statement Level Triggers and Row Level Triggers  
Create Instead of and Disabled Triggers  
How to Manage, Test and Remove Triggers?

### Creating Compound, DDL, and Event Database Triggers

What are Compound Triggers?  
Identify the Timing-Point Sections of a Table Compound Trigger  
Understand the Compound Trigger Structure for Tables and Views  
Implement a Compound Trigger to Resolve the Mutating Table Error  
Comparison of Database Triggers to Stored

Procedures  
Create Triggers on DDL Statements  
Create Database-Event and System-Events Triggers  
System Privileges Required to Manage Triggers

### PL/SQL Compiler

What is the PL/SQL Compiler?  
Describe the Initialization Parameters for PL/SQL Compilation  
List the new PL/SQL Compile Time Warnings  
Overview of PL/SQL Compile Time Warnings for Subprograms  
List the benefits of Compiler Warnings  
List the PL/SQL Compile Time Warning Messages Categories  
Setting the Warning Messages Levels: Using SQL Developer, PLSQL\_WARNINGS Initialization Parameter, and the DBMS\_WARNING Package Subprograms  
View Compiler Warnings: Using SQL Developer, SQL Plus, or the Data Dictionary Views

### Manage PL/SQL Code

What is Conditional Compilation?  
Implement Selection Directives  
Invoke Predefined and User-Defined Inquiry Directives  
The PLSQL\_CFLAGS Parameter and the Inquiry Directive  
Conditional Compilation Error Directives to Raise User-Defined Errors  
The DBMS\_DB\_VERSION Package  
Write DBMS\_PREPROCESSOR Procedures to Print or Retrieve Source Text  
Obfuscation and Wrapping PL/SQL Code

### Manage Dependencies

Overview of Schema Object Dependencies  
Query Direct Object Dependencies using the USER\_DEPENDENCIES View  
Query an Object's Status  
Invalidation of Dependent Objects  
Display the Direct and Indirect Dependencies  
Fine-Grained Dependency Management in Oracle Database 11g  
Understand Remote Dependencies  
Recompile a PL/SQL Program Unit

**Course Description:** In this course students learn the concepts of relational databases. This course provides the essential SQL skills that allow developers to write queries against single and multiple tables, manipulate data in tables, and create database objects. Students learn to control privileges at the object and system level.

This course covers creating indexes and constraints, and altering existing schema objects. Students also learn how to create and query external tables. Students learn to use the advanced features of SQL in order to query and manipulate data within the database, use the dictionary views to retrieve metadata and create reports about their schema objects. Students also learn some of the date-time functions available in the Oracle Database. This course discusses how to use the regular expression support in SQL.

In this course, students use Oracle SQL Developer as the main development tool. SQL\*Plus is introduced as an optional development tool.

**Who Should Attend:** This course is for Forms Developers, Data Warehouse Administrators, Business Analysts, Developers, System Analysts, Application Developers, and PL/SQL Developers.

**Prerequisites:** Students must have familiarity with data processing concepts and techniques and data processing.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Retrieve row and column data from tables with the SELECT statement
- Create reports of sorted and restricted data
- Employ SQL functions to generate and retrieve customized data
- Display data from multiple tables using the ANSI SQL 99 JOIN syntax
- Identify the major structural components of the Oracle Database 11g
- Create reports of aggregated data
- Write SELECT statements that include queries
- Run data manipulation statements (DML) to update data in the Oracle Database 11g
- Create tables to store data
- Utilize views to display and retrieve data
- Control database access to specific objects
- Manage schema objects
- Manage objects with data dictionary views
- Write multiple-column sub-queries
- Use scalar and correlated sub-queries
- Use the regular expression support in SQL
- Retrieve row and column data from tables with the SELECT statement
- Create reports of sorted and restricted data
- Employ SQL functions to generate and retrieve customized data
- Display data from multiple tables using the ANSI SQL 99 JOIN syntax
- Identify the major structural components of the Oracle Database 11g
- Create reports of aggregated data
- Write SELECT statements that include queries

## Course Outline:

### Introducing Oracle Database 11g

List the features of Oracle Database 11g  
Discuss the basic design, theoretical and physical aspects of a relational database

Categorize the different types of SQL statements  
Describe the data set used by the course  
Log onto the database using the SQL Developer environment  
Save queries to files and use script files in SQL Developer

### Retrieving Data Using the SQL SELECT Statement

List the capabilities of SQL SELECT statements  
Generate a report of data from the output of a basic SELECT statement  
Select All Columns  
Select Specific Columns  
Use Column Heading Defaults  
Use Arithmetic Operators  
Understand Operator Precedence  
Learn the DESCRIBE command to display the table structure

### Restricting and Sorting Data

Write queries that contain a WHERE clause to limit the output retrieved  
List the comparison operators and logical operators that are used in a WHERE clause  
Describe the rules of precedence for comparison and logical operators  
Use character string literals in the WHERE clause  
Write queries that contain an ORDER BY clause sort the output of a SELECT statement  
Sort output in descending and ascending order

### Using Single-Row Functions to Customize Output

Describe the differences between single row and multiple row functions  
Manipulate strings with character function in the SELECT and WHERE clauses  
Manipulate numbers with the ROUND, TRUNC and MOD

functions  
Perform arithmetic with date data  
Manipulate dates with the date functions

### Using Conversion Functions and Conditional Expressions

Describe implicit and explicit data type conversion  
Use the TO\_CHAR, TO\_NUMBER, and TO\_DATE conversion functions  
Nest multiple functions  
Apply the NVL, NULLIF, and COALESCE functions to data  
Use conditional IF THEN ELSE logic in a SELECT statement

### Reporting Aggregated Data Using the Group Functions

Use the aggregation functions in SELECT statements to produce meaningful reports  
Create queries that divide the data in groups by using the GROUP BY clause  
Create queries that exclude groups of data by using the HAVING clause

### Displaying Data From Multiple Tables

Write SELECT statements to access data from more than one table  
View data that generally does not meet a join condition by using outer joins  
Join a table by using a self join

### Using Sub-queries to Solve Queries

Describe the types of problem that sub-queries can solve  
Define sub-queries  
List the types of sub-queries  
Write single-row and multiple-row sub-queries

### Using the SET Operators

Describe the SET operators  
Use a SET operator to combine multiple queries into a single query  
Control the order of rows returned when using the SET operators

### Manipulating Data

Describe each DML statement  
Insert rows into a table with the INSERT statement  
Use the UPDATE statement to change rows in a table  
Delete rows from a table with the DELETE statement  
Save and discard changes with the COMMIT and ROLLBACK statements  
Explain read consistency

### Using DDL Statements to Create and Manage Tables

Categorize the main database objects  
Review the table structure  
List the data types available for columns  
Create a simple table  
Decipher how constraints can be created at table creation  
Describe how schema objects work

### Creating Other Schema Objects

Create a simple and complex view  
Retrieve data from views  
Create, maintain, and use sequences  
Create and maintain indexes  
Create private and public synonyms

### Controlling User Access

Differentiate system privileges from object privileges  
Grant privileges on tables  
View privileges in the data dictionary  
Grant roles  
Distinguish between privileges and roles

### Managing Schema Objects

Add constraints  
Create indexes  
Create indexes using the CREATE TABLE statement  
Create function-based indexes  
Drop columns and set column UNUSED  
Perform FLASHBACK operations  
Create and use external tables

### Managing Objects with Data Dictionary Views

Explain the data dictionary  
Find table information  
Report on column information  
View constraint information  
Find view information  
Verify sequence information  
Understand synonyms  
Add comments

### Manipulating Large Data Sets

Manipulate data using sub-queries  
Describe the features of multi-table inserts  
Use the different types of multi-table inserts  
Merge rows in a table  
Track the changes to data over a period of time

### Managing Data in Different Time Zones

Use data types similar to DATE that store fractional seconds and track time zones  
Use data types that store the difference between two date-time values  
Practice using the multiple date-time functions for globalize applications

### Retrieving Data Using Sub-queries

Write a multiple-column sub-query  
Use scalar sub-queries in SQL  
Solve problems with correlated sub-queries  
Update and delete rows using correlated sub-queries  
Use the EXISTS and NOT EXISTS operators  
Use the WITH clause

### Regular Expression Support

List the benefits of using regular expressions  
Use regular expressions to search for, match, and replace strings

**Course Description:** The SQL Tuning Workshop class covers investigative methods that reveal varying levels of detail about how the Oracle database executes a SQL statement. Students learn the different ways in which data can be accessed, which ones are most efficient under specific circumstances, and how to ensure that the best method is used. Partitioning topics are covered, in addition to taking advantage of hints, bind variables, and different types of indexes.

**Who Should Attend:** This course is for Application Developers, Data Warehouse Developers, Technical Consultants, and Support Engineers.

**Prerequisites:** Students must have taken Oracle Database: Introduction to SQL.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Identify problem SQL statements
- Modify a SQL statement to perform at its best
- Trace an application
- Understand how the Query Optimizer makes decisions about how to access data
- Interpret execution plans
- Use optimizer hints effectively
- Generate a load test

### Course Outline:

#### Exploring the Oracle Database Architecture

Oracle Database Server Architecture: Overview  
 Oracle Database Memory Structures: Overview  
 Background Process Roles  
 Automatic Shared Memory Management  
 Automated SQL Execution Memory Management  
 Automatic Memory Management  
 Database Storage Architecture  
 Logical and Physical Database Structures

#### Introduction to SQL Tuning

Reasons for Inefficient SQL Performance  
 Performance Monitoring Solutions  
 Monitoring and Tuning Tools: Overview  
 EM Performance Pages for Reactive Tuning  
 CPU and Wait Time Tuning Dimensions  
 Scalability with Application Design, Implementation, and Configuration  
 Common Mistakes on Customer Systems  
 Proactive Tuning Methodology

#### Introduction to the Optimizer

Structured Query Language  
 SQL Statement Representation, Implementation & Processing: Overview  
 SQL Statement Parsing: Overview  
 Why Do You Need an Optimizer?  
 Optimization During Hard Parse Operation  
 Cost-Based Optimizer  
 Controlling the Behavior of the Optimizer  
 Optimizer Features and Oracle Database Releases

#### Optimizer Operators

Row Source Operations  
 Main Structures and Access Paths  
 Full Table Scan  
 Indexes: Overview  
 Using Indexes: Considering Nullable Columns  
 Bitmap Indexes, Composite Indexes & Invisible Index  
 Guidelines for Managing Indexes  
 Clusters

#### Interpreting Execution Plans

Execution Plan  
 Links Between Important Dynamic Performance Views  
 Automatic Workload Repository (AWR)  
 Generating SQL Reports from AWR Data  
 SQL Monitoring: Overview  
 Reading More Complex Execution Plans  
 Reviewing the Execution Plan  
 Looking Beyond Execution Plans

#### Case Study: Star Transformation

The Star & Snowflake Schema Model  
 Execution Plan Without Star Transformation  
 Retrieving Fact Rows from One Dimension All Dimensions  
 Joining the Intermediate Result Set with Dimensions  
 Using Bitmap Join Indexes  
 Star Transformation  
 Bitmap Join Indexes

#### Optimizer Statistics

Optimizer Statistics & Types of Optimizer Statistics  
 Multicolumn Statistics: Overview  
 Expression Statistics: Overview  
 Gathering System Statistics  
 Statistic Preferences: Overview  
 Optimizer Dynamic Sampling: Overview  
 Locking Statistics

#### Using Bind Variables

Cursor Sharing and Different Literal Values  
 Cursor Sharing and Bind Variables  
 Bind Variables in SQL\*Plus & Enterprise Manager  
 Cursor Sharing Enhancements  
 Adaptive Cursor Sharing: Overview  
 Interacting with Adaptive Cursor Sharing

#### Using Optimizer Hints

Optimizer Hints: Overview  
 Types of Hints  
 Specifying Hints  
 Rules for Hints  
 Hint Recommendations  
 Hint Categories  
 Optimization Goals and Approaches  
 Additional Hints

#### Application Tracing

End-to-End Application Tracing Challenge  
 Location for Diagnostic Traces  
 What Is a Service?  
 Use Services with Client Applications  
 Trace Your Own Session  
 SQL Trace File Contents  
 Formatting SQL Trace Files: Overview  
 Invoking the tkprof Utility

#### Automating SQL Tuning

Tuning SQL Statements Automatically  
 Application Tuning Challenges  
 SQL Tuning Advisor: Overview  
 Stale or Missing Object Statistics  
 SQL Statement Profiling  
 Plan Tuning Flow and SQL Profile Creation  
 Database Control and SQL Tuning Advisor  
 Implementing Recommendations

**Course Description:** This course is designed to give students a firm foundation in basic administration of Oracle Database 11g. In this class, students learn how to install and maintain Oracle Database 11g. Students gain a conceptual understanding of the Oracle database architecture and how its components work and interact with one another. Students learn how to create an operational database and properly manage the various structures in an effective and efficient manner including performance monitoring, database security, user management, and backup/recovery techniques. The lesson topics are reinforced with structured hands-on practices.

**Who Should Attend:** This course is for Database Administrators, Support Engineers, Developers, Technical Administrators, and Database Designers.

**Prerequisites:** Students must have working knowledge of SQL. It is also recommended that students have taken Oracle Database 11g: Introduction to SQL.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Describe Oracle Database Architecture
- Install and configure Oracle Database 11g
- Configure Oracle Net services
- Manage the database storage structures
- Create and administer user accounts
- Perform basic backup and recovery of a database
- Manage users and schemas
- Manage data and concurrency
- Monitor and administer undo data
- Backup and recover a database
- Monitor performance
- Use the database diagnostic monitor

## Course Outline:

### Exploring the Oracle Database Architecture

Oracle Database Architecture Overview  
Interacting with an Oracle Database  
Process Architecture  
Database Storage Architecture  
Logical and Physical Database Structures  
Tablespaces and Data Files  
SYSTEM and SYSAUX Tablespaces  
Segments, Extents, and Blocks

### Preparing the Database Environment

Tasks of an Oracle Database Administrator  
Tools Used to Administer an Oracle Database  
Installation: System Requirements  
Optimal Flexible Architecture (OFA)  
Setting Environment Variables  
Oracle Universal Installer (OUI)  
Database Configuration Options  
Advanced Installation Options

### Creating an Oracle Database

Planning the Database  
Configuring the Listener  
Using the DBCA to Create a Database  
Password Management  
Creating a Database Design Template  
Using the DBCA to Delete a Database  
Using DBCA For Additional Tasks

### Managing the Oracle Instance

Management Framework  
Oracle Enterprise Manager  
Initialization Parameter  
Database Startup and Shutdown  
Shutdown Modes  
Viewing the Alert History  
Using Trace Files  
Data Dictionary: Overview

### Configuring the Oracle Network Environment

Oracle Net Services & Listener  
Establishing Net Connections  
Tools for Configuring and Managing the Oracle Network  
Net Services Administration Pages  
Naming Methods  
Directory Naming  
SGA and PGA  
When Not to Use a Shared Server

### Managing Database Storage Structures

Storage Structures  
How Table Data Is Stored  
Anatomy of a Database Block  
Space Management in Tablespaces  
Tablespaces in the Preconfigured Database  
Actions with Tablespaces  
Oracle Managed Files (OMF)  
ASM: Concepts

### Administering User Security

Database User Accounts  
Predefined Accounts: SYS and SYSTEM  
Administrator Authentication  
Benefits of Roles  
Predefined Roles  
Implementing Password Security Features  
Assigning Quota to Users

### Managing Schema Objects

What Is a Schema?  
Accessing Schema Objects  
Specifying Data Types in Tables  
Creating and Modifying Tables  
Understanding Data Integrity  
Indexes & Views  
Sequences  
Temporary Tables

### Managing Data and Concurrency

Manipulating Data Through SQL  
PL/SQL  
Administering PL/SQL Objects  
Functions, Procedures, Packages & Triggers  
Data Concurrency  
Enqueue Mechanism  
Resolving Lock Conflicts Using SQL  
Deadlocks

### Managing Undo Data

Data Manipulation  
Transactions and Undo Data  
Undo Data Versus Redo Data  
Configuring Undo Retention  
Guaranteeing Undo Retention  
Using the Undo Advisor  
Viewing System Activity

### Implementing Oracle Database Security

Industry Security Requirements  
Principle of Least Privilege

Monitoring for Compliance  
Value-Based Auditing  
Fine-Grained Auditing  
DBA Auditing  
Security Updates  
Applying Security Patches

### Database Maintenance

Introducing Terminology  
Optimizer Statistics  
Automatic Workload Repository (AWR)  
Automatic Database Diagnostic Monitor (ADDM)  
Advisory Framework  
Automated Maintenance Tasks  
Server-Generated Alerts  
Reacting to Alerts

### Performance Management

Performance Monitoring  
Managing Memory Components  
Enabling Automatic Memory Management (AMM)  
Automatic Shared Memory Advisor  
Using Memory Advisors  
Dynamic Performance Statistics  
Troubleshooting and Tuning Views  
Invalid and Unusable Objects

### Backup and Recovery Concepts

Part of Your Job  
Statement Failure  
User Error  
Understanding Instance Recovery  
Phases of Instance Recovery  
Using the MTTR Advisor  
Media Failure  
Archive Log Files

### Performing Database Backups

Backup Solutions: Overview  
Oracle Secure Backup  
User-Managed Backup  
Terminology  
Recovery Manager (RMAN)  
Configuring Backup Settings  
Backing Up the Control File to a Trace File  
Monitoring the Flash Recovery Area

### Performing Database Recovery

Opening a Database  
Data Recovery Advisor  
Loss of a Control File

Loss of a Redo Log File  
Data Recovery Advisor  
Data Failures  
Listing Data Failures  
Data Recovery Advisor Views

### Moving Data

Moving Data: General Architecture  
Directory Object: Overview  
SQL\*Loader: Overview  
Data Pump: Overview  
Performance Initialization Parameters  
Using Enterprise Manager to Monitor Data Pump Jobs  
Data Dictionary

### Enhancing Database Capabilities

Using EM Support Workbench  
Create a Service Request  
Package and upload diagnostic data to Oracle Support  
Track the SR and Implement Repairs  
Incident Packaging Configuration  
Working with Oracle Support  
Metalink Integration  
Managing Patches

**Course Description:** In this course, the concepts and architecture that support backup and recovery, along with the steps of how to carry it out in various ways and situations, are covered in detail. This includes how to define and test your own backup and recovery scenarios.

Also, the students learn to manage memory effectively and to perform some performance evaluation and tuning tasks, including using some of the advisors. All types of flashback technologies, scheduling jobs inside and outside of the database, and controlling system resource usage are covered. Topics are reinforced with hands-on practices.

**Who Should Attend:** This course is for Database Administrators, Support Engineers, Data Warehouse Administrators, and Technical Consultants.

**Prerequisites:** Students should have taken Oracle Database 11g: Administration Workshop I.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Back up and recover a database
- Configure Oracle Database for optimal recovery
- Administer ASM disk groups
- Use an RMAN backup to duplicate a database
- Automating Tasks with the Scheduler

### Course Outline:

#### Database Architecture and ASM

Oracle Database Architecture Overview  
ASM General Architecture  
Creating an ASM Instance  
Using Enterprise Manager to Manage ASM Users  
ASM Storage Concepts  
The ASMCMD Utility  
ASM Scalability and Performance

#### Configuring for Recoverability

Purpose of Backup and Recovery Functionality  
Typical Backup and Recovery Tasks  
Oracle Backup and Recovery Solutions  
Using Recovery Manager (RMAN)  
Using a Flash Recovery Area  
Flash Recovery Area Space Management

#### Using the RMAN Recovery Catalog

RMAN Repository Data Storage: Comparison of Options  
Storing Information in the Recovery Catalog  
Registering a Database in the Recovery Catalog  
Recovery Catalog Resynchronization: Concepts  
Using RMAN Stored Scripts  
Backing Up and Recovering the Recovery Catalog  
Using a Virtual Private Catalog

#### Configuring Backup Specifications

Using RMAN to Create Backups  
Configuring Persistent Settings for RMAN  
Using Enterprise Manager to Configure RMAN Settings  
Control File Auto-backups  
Managing Persistent Settings  
Configuring Devices for Backup  
Configuring and Allocating Channels for Use in Backups  
Configuring Backup Optimization

#### Creating Backups

Creating an Oracle-Suggested Backup  
Creating Backup Sets & Image Copies  
Creating a Whole Database Backup  
RMAN Backup Types  
Monitoring Block Change Tracking  
Creating Duplex Backup Sets  
Archival Backups: Concepts  
Encrypting Backups

#### Performing User-Managed Backup and Recovery

Restoring and Recovering  
Causes of File Loss  
Critical Versus Non-critical  
Recovering from a TEMPFILE Loss  
Re-creating Indexes  
Recovering from a Lost Index Tablespace  
Authentication Methods for Database Administrators  
Recovering a Read-Only Tablespace

#### Using RMAN to Perform Recovery

Using RMAN RESTORE and RECOVER Commands  
Performing Recovery Using Enterprise Manager  
Recovery Using Incrementally Updated Backups  
Perform a Fast Switch to Image Copies  
Restoring and Recovering the Database on a New Host  
Performing Disaster Recovery

#### Using RMAN to Duplicate a Database

Using RMAN to Create a Duplicate Database  
Creating a Duplicate Database  
Creating an Initialization Parameter File for the Auxiliary Instance  
Allocating Auxiliary Channels  
Understanding the RMAN Duplication Operation  
Using EM to Clone a Database  
Cloning a Running Database

#### Performing Tablespace Point-in-time Recovery

Tablespace Point-in-Time Recovery (TSPITR) Concepts  
Tablespace Point-in-Time Recovery: Architecture  
Understanding When to Use TSPITR  
Determining the Tablespaces for the Recovery Set  
Using Enterprise Manager to Perform TSPITR  
Understanding TSPITR Processing  
Troubleshooting RMAN TSPITR

#### Monitoring and Tuning RMAN

Parallelization of Backup Sets  
Monitoring RMAN Sessions  
Interpreting RMAN Message Output  
Using the DEBUG Option  
Tuning RMAN  
RMAN Multiplexing  
Comparing Synchronous and Asynchronous I/O  
Tape Subsystem Performance Rules

#### Using Flashback Technology

Flashback Technology  
Transactions and Undo  
Guaranteeing Undo Retention  
Preparing Your Database for Flashback  
Flashback Drop and the Recycle Bin  
Using Flashback Technology to Query Data  
Possible Workflow  
Flashback Transaction Wizard

#### Using Flashback Database

Flashback Table  
Enabling Row Movement on a Table  
Enabling Row Movement on a Table  
Flashback Database Architecture  
Configuring Flashback Database  
Performing Flashback Database Using EM  
Flashback Database Considerations  
Flashback Data Archive

#### Diagnosing the Database

Automatic Diagnostic Workflow & Repository  
Location for Diagnostic Traces  
Viewing the Alert Log Using Enterprise Manager  
The Support Workbench and Oracle Configuration Manager  
Create a Service Request  
Package and upload diagnostic data to Oracle Support  
Incident Packaging Configuration  
Health Monitor Overview & Data Recovery Advisor

#### Managing Memory

Oracle Memory Structures  
Automatic Memory Management Overview  
Oracle Database Memory Parameters  
Auto Memory Parameter Dependency  
Automatic Shared Memory Management: Overview  
Automatic PGA Memory Management  
Using the Memory Advisor to Size the SGA  
Memory Tuning Guidelines for the Library Cache

#### Managing Database Performance

Tuning Activities  
Performance Planning & Performance Tuning Methodology  
Instance Tuning  
Troubleshooting and Tuning Views  
Automatic Workload Repository  
SQL Tuning & SQL Advisors  
Using the SQL Tuning Advisor  
SQL Access Advisor: Overview

#### Using the Segment Advisor

Space Management: Overview

Proactive Tablespace Monitoring  
Thresholds and Resolving Space Problems  
Monitoring Tablespace Space Usage  
Shrinking Segments  
Space Reclamation with ASSM  
Automatic Segment Advisor  
Minimum Compatibility Level

#### Managing Resources

Database Resource Manager: Overview  
Database Resource Manager Concepts  
Accessing Resource Plans  
Default Maintenance Resource Manager Plan  
Creating Consumer Groups  
Resource Allocation Methods for Resource Plans  
Resource Allocation Methods for Resource Plans  
Monitoring the Resource Manager

#### Automating Tasks with the Scheduler

Simplifying Management Tasks  
Key Components and Steps  
Creating an Event-Based Schedule  
Creating Complex Schedules  
Creating Job Chains  
Creating Job Chains

#### Administering the Scheduler

Advanced Scheduler Concepts  
Job Classes  
Windows  
Prioritizing Jobs Within a Window  
Remote Jobs  
Installing the Scheduler Agent  
Dictionary Views Supporting Remote Jobs

#### Globalization

Globalization Support Features  
What Every DBA Needs to Know  
Understanding Unicode  
Database Character Sets and National Character Sets  
Language- and Territory-Dependent Parameters  
Linguistic Searching and Sorting  
Case- and Accent-Insensitive Search and Sort  
NLS Data Conversion with Oracle Utilities

**Course Description:** This course gives students the opportunity to learn about-and practice with the new change management features and other key enhancements in Oracle Database 11g Release 1. Students examine the benefits and use of the new features in managing change, diagnosing and recovering from problems, ensuring high availability, improving scalability and performance, strengthening security, and several other areas that concern database administrators. In addition, the hands-on practice sessions help reinforce students understanding of these new capabilities in Oracle Database 11g Release 1.

**Who Should Attend:** This course is for Data Warehouse Administrators, Technical Consultants, Support Engineers, and Database Administrators.

**Prerequisites:** Students must thoroughly understand Oracle Database 10g concepts and have taken Oracle Database 10g: New Features for Administrators Release 2 and Oracle Database 10g: Administration Workshop II Release 2 courses or have equivalent knowledge.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Use the SQL Performance Analyzer
- Upgrade your database to 11g Release 1
- Record and replay workloads
- Use the automatic database diagnostic monitor
- Explore advanced RMAN capabilities
- Manage a flashback data archive
- Use the data recovery advisor
- Setup and use ASM

## Course Outline:

### Installation and Upgrade Enhancements

Oracle Database 11g Installation: Changes  
Oracle Database 11g: Software Installation  
Oracle Database Upgrade Enhancements  
Upgrade Performance Enhancement  
Upgrade Process  
Oracle Database 11g Release 1: Upgrade Paths  
Database Upgrade Assistant (DBUA)  
Hot Patching: Overview

### Storage Enhancements

ASM Fast Mirror Resync: Overview  
ASM Preferred Mirror Read: Overview  
ASM Scalability and Performance Enhancements  
ASM Scalability in Oracle Database 11g  
ASM Disk Group Compatibility  
ASMCMD Extensions

### Change Management Unit Overview

Change Management in Oracle Database 11g  
Challenges Faced by DBAs When Performing Changes  
Lifecycle of Change Management  
Setting Up a Test Environment by Using the Snapshot Standby Database  
SQL Performance Analyzer: Overview  
Capturing the SQL Workload  
SQL Performance Analyzer: Data Dictionary Views

### SQL Plan Management

SQL Plan Management: Overview  
SQL Plan Baseline: Architecture  
Evolving SQL Plan Baselines  
SQL Plan Selection  
Possible SQL Plan Manageability Scenarios  
SQL Performance Analyzer and SQL Plan Baseline Scenario  
Loading a SQL Plan Baseline Automatically  
Purging SQL Management Base Policy

### Database Replay

System Architecture: Capture  
System Architecture: Processing the Workload  
System Architecture: Replay  
Pre-Change Production System  
Supported Workloads  
Database Replay Workflow in Enterprise Manager  
Using the Capture Wizard  
Packages and Procedures

### Automatic SQL Tuning

Automatic SQL Tuning in Oracle Database 11g  
Selecting Potential SQL Statements for Tuning  
Maintenance Window Timeline  
Automatic Tuning Process  
DBA Controls

Automatic SQL Tuning Task  
Automatic SQL Tuning: Fine Tune  
Automatic SQL Tuning Considerations

### Intelligent Infrastructure Enhancements

Automatic Workload Repository Baselines  
Performance Monitoring and Baselines  
Automated Maintenance Tasks  
Resource Manager: New EM Interface

### Performance Enhancements

ADDM Enhancements in Oracle Database 11g  
Oracle Database 11g: Automatic Database Diagnostic Monitor for RAC  
New ADDM Views  
Automatic Memory Management: Overview  
Oracle Database 11g Memory Parameters  
Automatic Memory Parameter Dependency  
Monitoring Automatic Memory Management

### Partitioning and Storage-Related Enhancements

Oracle Partitioning  
Partitioning Enhancements  
Interval Partitioning  
System Partitioning  
Virtual Column-Based Partitioning  
Reference Partitioning  
Table Compression: Overview  
SQL Access Advisor: Overview

### Using RMAN Enhancements

RMAN: New Features  
Optimized Backups  
Parallel Backup and Restore for Very Large Files  
Using RMAN Multisection Backups  
Duplicating a Database  
Managing Recovery Catalogs  
Creating and Using Virtual Private Catalogs  
Using RMAN Virtual Private Catalogs

### Using Flashback and LogMiner

New and Enhanced Features for Flashback and LogMiner  
Flashback Data Archive Overview: "Oracle Total Recall"  
Flashback Data Archive: Architecture  
Flashback Data Archive: Workflow  
Guidelines and Usage Tips  
Flashback Transaction Backout  
Flashback Transaction Wizard  
Using LogMiner

### Diagnosability Enhancements

Oracle Database 11g R1 Fault Management  
Ease Diagnosis: Automatic Diagnostic Workflow  
Automatic Diagnostic Repository  
Location for Diagnostic Traces

Incident Packaging Service (IPS)  
EM Support Workbench: Overview  
Health Monitor: Overview  
Data Recovery Advisor

### Using the Data Recovery Advisor

Repairing Data Failures  
Data Recovery Advisor  
Data Recovery Advisor RMAN Command-Line Interface  
Best Practice: Proactive Checks  
Setting Parameters to Detect Corruption

### Security: New Features

Secure Password Support  
Automatic Secure Configuration  
Managing Default Audits  
Setting Database Administrator Authentication  
Transparent Data Encryption  
Hardware Security Module  
Using RMAN Security Enhancements

### Oracle SecureFiles

Managing Enterprise Information  
Problems with Existing LOB Implementation  
Oracle SecureFiles  
Shared I/O Pool  
Altering SecureFiles  
Accessing SecureFiles Metadata  
Migrating to SecureFiles  
SecureFiles Monitoring

### Miscellaneous New Features

Foreground Statistics  
Online Redefinition Enhancements  
Minimizing Dependent Recompilations  
Locking Enhancements  
Invisible Index: Overview  
SQL Query Result Cache: Overview  
Adaptive Cursor Sharing: Overview  
Temporary Tablespace Shrink

**Course Description:** Students learn how to use Oracle Database 11g automatic tuning features such as SQL Tuning Advisor, SQL Access Advisor, Automatic Workload Repository and Automatic Database Diagnostic Monitor, and practice these tuning methods. The course focuses on the tuning tasks expected of a DBA: reactive tuning of SQL statements, maintaining SQL statement performance, and tuning the Oracle Database Instance components. Throughout the course, students practice the art of tuning an Oracle Instance through a series of workshops. The methodology is practiced in the workshops rather than taught.

**Who Should Attend:** This course is for Database Administrators, Support Engineers, and Technical Consultants.

**Prerequisites:** Students should have taken Oracle Database 11g: Administration Workshop I and Oracle Database 11g: Administration Workshop II.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Use Database Statistics and Metrics to identify a performance problem
- Interpret Tuning diagnostics
- Identify and eliminate performance issues
- Set tuning priorities and strategies
- Identify problem SQL statements
- Influence the optimizer

### Course Outline:

#### Introduction

Tuning Questions  
Who tunes  
What to tune  
How to tune

#### Monitoring With Basic Tools

Monitoring tools overview  
Enterprise Manager  
V\$ views, Statistics and Metrics  
Wait Events  
Time Model: Overview

#### Using Automatic Workload Repository

Automatic Workload Repository: Overview  
Automatic Workload Repository Data  
Database Control and AWR  
Generating AWR Reports in SQL\*Plus

#### Identifying the Problem

Tuning Life Cycle Phases  
Identify a Tuning Issue  
Remedy one problem

#### Identifying Problem SQL Statements

Characteristics of a bad SQL statement  
Role of the Optimizer  
Generate explain plan  
Access Paths Choices  
Trace the execution

#### Influencing the Optimizer

Manage Optimizer Statistics  
Calibrate I/O  
Optimizer Cost  
Changing Optimizer Behavior

#### SQL Plan Management

Automatic Maintenance Tasks  
SQL Profiles  
SQL Access Advisor  
SQL Outlines  
SQL Plan Baselines

#### Change Management

Types of changes  
SQL Performance Analyzer  
DB Replay  
Server-Generated Alerts

#### Using Metrics and Alerts

Benefits of Metrics  
Database Control Usage Model  
User-Defined SQL Metrics

#### Using AWR Based Tools

Automatic Maintenance Tasks  
Using ADDM  
Using Active Session History  
Historical Data View

#### Monitoring an Application (Using Services)

Service Overview  
Managing Service  
Service Aggregation and Tracing  
Tracing Your Session

#### Baselines

Working with Metric Baselines  
Setting Adaptive Alert Thresholds  
Configuring Normalization Metrics

#### Tuning the Shared Pool

Shared Pool Operation  
Mutex  
Statspack/AWR Indicators  
Library Cache Activity  
Diagnostic Tools  
UGA and Oracle Shared Server  
Large Pool

#### Tuning the Buffer Cache

Architecture  
Tuning Goals and Techniques  
Symptoms  
Solutions

#### Tuning PGA and Temporary Space

Monitoring SQL Memory Usage  
Temporary Tablespace Management

#### Automatic Memory Management

Automatic Memory Management Architecture  
Dynamic SGA Feature  
Managing Automatic Memory Management

#### Tuning Block Space Usage

Space Management  
Extent Management  
Anatomy of a Database Block  
Block Space Management

#### Tuning I/O

I/O Architecture  
Striping and Mirroring  
Using RAID  
I/O Diagnostics  
Using Automatic Storage Management

#### Performance Tuning: Summary

Important Initialization Parameters with Performance Impact

Database High Availability: Best Practices  
Tablespace: Best Practices  
Statistics Gathering

#### Using Statspack

Introduction to Statspack  
Capturing Statspack Snapshots  
Reporting with Statspack  
Statspack considerations  
Statspack and AWR

**Course Description:** Oracle Database 11g: Backup and Recovery training teaches students how to backup and recover a portion or all of an Oracle 11g database.

**Who Should Attend:** This course is for students interested in safeguarding Oracle 11g databases.

**Prerequisites:** Students should have taken Oracle Database 11g: Administration Workshop I and Oracle Database 11g: Introduction to SQL or have equivalent real-world experience.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Use Oracle flashback technology to recover from user errors and from database failures, including flashback data archive and flashback transaction backout along with the Total Recall capability.
- Use advanced Enterprise Manager wizards and tools, including the integrated LogMiner, Flashback Transaction Backout wizard, database Recovery Wizard, Recovery Advisor interface, and others.
- Setup database instance recovery, tuning checkpoints, the Redo Log File Size Advisor, and the MTTR Advisor.
- Implement User-managed recovery scenarios, including recovery from temporary, read-only, and index tablespaces.
- Implement automatically managed backup strategies and database recovery operations using RMAN and other database facilities.
- Build upon basic RMAN capabilities with a centralized recovery catalog.
- Deploy standardized and consistent backup and recovery procedures throughout the enterprise by means of dynamic stored scripts and variable substitution.
- Optimize backups for faster performance and parallelization of operations, employing compression algorithms and other strategies for efficiency.
- Set up data preservation through archival backups.
- Implement security through transparent and explicit encryption features.
- Duplicate databases for regulatory compliance, Real Application Testing database replay, test configuration, and other purposes.

### Course Outline:

#### Recovery Concepts

About The Backup & Recovery Structures  
Managing Redo Data  
Managing Archived Redo Data  
Creating A Foundation For Sound Recovery

#### Oracle Flashback Technology

About Flashback Technology  
Flashback Query  
Select...As Of Timestamp  
Select...As Of SCN  
Configuring Undo Management For Flashback  
Undo\_Retention  
Flashback Table  
Flashback Drop  
Flashback Versions Query  
Flashback Transaction Query  
Flashback Transaction Backout

#### Flashback Database

About Flashback Database  
Configuring The Flash Recovery Area  
Performing Database Flashback  
Monitoring Flashback Performance  
Flashback Database Considerations  
Configure Flashback Data Archive

#### Instance Recovery

About Instance Recovery  
Instance Recovery Parallelism  
Mtrr Advisor & Tuning Checkpoints  
Log\_Checkpoints\_To\_Alert  
Redo Logfile Size Advisor  
Fast-Start On-Demand Parallelism

#### Configuring RMAN

RMAN Architecture  
Launch & Use RMAN  
Configure RMAN Settings  
Allocate RMAN Channels

#### Backup With RMAN

About Backup File Types  
Performing Full Backups  
Performing Incremental Backups

Establishing A Backup Retention Policy  
Generate Reports  
Report Unrecoverable  
Report Need Backup  
List Incarnation

#### RMAN Management With EM

Monitoring The Flash Recovery Area  
The EM Interface To RMAN  
Scheduling RMAN Backups  
Using The Oracle-Suggested Backup Strategy  
Manage Current Backups  
Backup Reports  
Manage Restore Points

#### User-Managed Recovery Operations

Recovery Concepts  
Recover Temporary Tablespaces  
Recover Read-Only Tablespaces  
Recover Index Tablespaces  
Recover Redo Log Group Member  
Recreate The Password File

#### Recovery With RMAN

Complete Media Recovery  
Incomplete Media Recovery  
Recovery Using EM

#### Using The RMAN Recovery Catalog

Understanding Catalog Concepts  
Create The Recovery Catalog  
Manage Virtual Private Catalogs  
Data Protection Of The Recovery Catalog  
Using RMAN Scripts

#### Database Duplication & Cloning

Why Perform Database Duplication?  
RMAN Duplicate Database  
RMAN Duplicate  
Database Cloning

#### Advanced RMAN Capabilities

Backup Optimization  
Enhancing Parallelism With Section Sizes  
Archival Backups

Backup Set Encryption  
Copying Files Between Databases

#### Transporting Tablespaces

About Tablespace Transportation  
Read-Only Tablespace Transportation  
Read-Write Tablespace Transportation  
Transport Tablespaces Using EM

#### Recovering From Corruption With Data Recovery Advisor

How Does Corruption Occur?  
Detecting Corruption  
Analyze  
V\$Database\_Block\_Corruption View  
Db\_Block\_Checking  
Db\_Block\_Checksum  
Db\_Lost\_Write\_Protect  
Db\_Ultra\_Safe  
Recovery Using The Data Recovery Advisor  
Block Media Recovery  
Isolating Corruption With Dbms\_Repair()

#### Conclusion

**Course Description:** In Oracle Database 11g: Security course students learn how they can use Oracle database features to meet the security, privacy and compliance requirements of their organization. The current regulatory environment of the Sarbanes-Oxley Act, HIPAA, the UK Data Protection Act, and others requires better security at the database level. Students learn how to secure their database and how to use the database features that enhance security. The course provides suggested architectures for common problems. This course covers the following security features of the database: auditing, encryption for Payment Card Industry Data Security Standard (PCI DSS ) including encryption at the column, tablespace and file levels, virtual private database, label security and enterprise user security. Some of the Oracle Network security topics covered are: securing the listener and restricting connections by IP address.

**Who Should Attend:** This course is for Security Compliance Professionals, Database Administrators, Security Administrators, and Security Compliance Auditors.

**Prerequisites:** Students must have taken Oracle Database 11g: Administration Workshop I.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Use database security features
- Secure the database and its listener
- Manage users using proxy authentication
- Manage secure application roles
- Implement fine-grain access control
- Implement fine-grain auditing
- Use Transparent Data Encryption

### Course Outline:

#### Security Requirements

Data Security Concerns  
Fundamental Data Security Requirements  
Components for enforcing security  
Security Risks: Internal, External, Sabotage, Recovery  
Principle of Least Privilege  
Defining a Security policy  
Implementing a Security Policy

#### Choosing Security Solutions

Maintaining data integrity  
Controlling data access  
Data Protection  
Database Vault overview  
Audit Vault overview  
Combining Optional Security Features  
Compliance Scanner  
Database Control: Policy Trend

#### Basic Database Security

Database Security Checklist  
Installing only what is required  
Applying Security Patches  
11g Default security settings  
Enforcing Password Management  
System and Object Privileges  
Restricting the Directories Accessible by the User  
Separation of Responsibilities

#### Database Auditing

Standard Database Auditing  
Monitoring for Suspicious Activity  
Audit Log Location Options  
Viewing Auditing Results  
Configure Auditing to syslog  
Value-Based Auditing  
Triggers and Autonomous Transactions

#### Auditing DML Statements (Fine-Grained Auditing)

Fine-Grained Auditing (FGA)  
Fine-Grained Auditing Policy  
Triggering Audit Events  
Data Dictionary Views  
Enabling and Disabling an FGA Policy  
FGA Policy Guidelines  
Maintaining the Audit Trail

#### Basic User Authentication

User Authentication  
User Identified by a Password

User Identified Externally  
Protecting Passwords  
Encrypted Database Link Passwords  
Audit with Database Links

#### Using Strong Authentication

Strong User Authentication  
Single Sign-On  
How to Use Certificates for Authentication  
Configuring SSL  
orapki Utility  
How to Use Kerberos for Authentication  
RADIUS Authentication: Overview  
External Secure Password Store

#### Enterprise User Security

Setting up Enterprise User Security  
Oracle Identity Management Infrastructure:  
Default Deployment  
Oracle Database: Enterprise User Security  
Architecture  
Authenticating Enterprise Users  
User Migration Utility  
Enterprise-User Auditing

#### Proxy Authentication

Security Challenges of Three-Tier Computing  
Common Implementations of Authentication  
Restrict the Privileges of the Middle Tier  
Using Proxy Authentication for Database Users  
Using Proxy Authentication for Enterprise Users  
Revoking Proxy Authentication  
Data Dictionary Views for Proxy Authentication

#### Authorization Methods

Authorization  
Assigning Privileges  
Using Enterprise roles  
Implementing a Secure Application Role

#### Using Application Context

Application Context Overview  
Implementing a Local Context  
Application Context Accessed Globally  
Guidelines

#### Implementing Virtual Private Database

Understanding Fine Grain Access Control

Virtual Private Database  
Implementing VPD Policies  
Manage VPD Policies  
Policy Performance  
Checking for Policies Applied to SQL Statements

#### Oracle Label Security Concepts

Access Control: Overview  
Discretionary Access Control  
Oracle Label Security  
Comparing Oracle Label Security and the VPD

#### Implementing Oracle Label Security

Policy Enforcement Options  
Managing levels, groups, compartments  
Administering Labels  
Trusted Stored Package Units  
Performance tips

#### Using the Data Masking Pack

Understanding Data Masking  
Identifying Sensitive Data for Masking  
Implementing Data Masking  
Data Masking Impact Report

#### Encryption Concepts

Understanding encryption  
Cost of encryption  
Encryption is not Access Control  
Data Encryption Challenges  
Encryption Key Management  
Solutions and examples

#### Using Application Based Encryption

Overview  
The DBMS\_CRYPT Package  
Generate Keys Using RANDOMBYTES  
Using ENCRYPT and DECRYPT  
Enhanced Security Using the Cipher Block Modes  
Hash and Message Authentication Code

#### Applying Transparent Data Encryption

Transparent Data Encryption overview  
Components of Data Encryption  
Using Data Encryption  
Using Hardware Security Modules

Tablespace Encryption

#### Use File Encryption

RMAN Encrypted Backups  
Oracle Secure Backup Encryption  
Using Transparent Mode Encryption  
Using Password Mode Encryption  
Using Dual Mode Encryption  
Restoring encrypted backups

#### Oracle Net Services Security Checklist

Security Checklists Overview  
Client Checklist  
Network Security Checklist  
Restricting Network IP Addresses  
Restricting Open Ports  
Encrypting Network Traffic  
Configure Checksumming  
Oracle Net Services Log Files

#### Securing the Listener

Listener Security Checklist  
Restricting the Privileges of the Listener  
Password Protect the Listener  
Administering the Listener Using TCP/IP with SSL  
Analyzing Listener Log Files

**Course Description:** This five day class is broken down into three sections: Part I - learning PHP syntax which weds well with HTML/XHTML; Part II - learning how to create MySQL databases and querying them with SQL; and Part III - applying this knowledge in the development of an application. The student will be able to run three tier applications by the end of the class. The core of the curriculum is focused on the Middle tier using the PHP scripting language to develop the application logic.

**Who Should Attend:** This course is designed for individuals who have been developing web pages with a GUI and want to progress to developing using a three tier architecture (Client, Middle, and Database).

**Prerequisites:** Students should have a firm understanding of HTML/XHTML tags and a programming background.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- develop three tier applications utilizing: a web browser to display HTML/XHTML code at the Client tier for input and output; PHP scripting language for the Middle tier to tie together the application, and SQL and MySQL for the Database tier. This skills set moves a company's web page from simple display and data gathering to a more personalized, structured, and automated application.

### Course Outline:

#### Discussion of Three Tier Architecture

Client tier  
Middle tier  
Database tier

#### Overview of the Case Study - The Winestore

Populating Web pages from a database  
User-driven queries/browse  
Data Entry and Validation  
User Authentication and Management  
Reporting

#### Learning PHP

PHP Basics  
Conditions and Branches  
Loops  
Variables and Arrays  
Strings  
Functions

#### MySQL databases

Database Basics  
Loading a Database  
MySQL command Interpreter  
Creating a database  
Modifying a database  
Administering a database

#### Developing an application using PHP and MySQL

The Winestore  
MySQL functions in PHP  
Querying a database  
User-Driven Querying  
Previous and Next Browsing  
Inserts, Updates, and Deletes  
User Authentication and Management  
Ordering and Shipping

**Course Description:** This course examines the issues associated with the development of a dynamic web page. Emphasis is placed on using the power of PHP to link to server side databases (MySQL), files, and directories for creating pages that mine data about past user interactions. Taking data from a user can be a security issue if your code is insecure. This course will examine functions and techniques essential for securing your system while providing a rich user experience. Best practices for development of the page are covered to provide guidelines while creating a dynamic web page. A web application is developed as the student progresses through each chapter.

**Who Should Attend:** This course is designed for the Web developer who is ready to take their web page up a notch. By tying the content of the page to a database, the user experiences a more personal and richly rewarding interaction, and the developer knows their data is secure during this interaction.

**Prerequisites:** Students should have taken Introduction to PHP Programming.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Design dynamic web pages linked to a database.
- Process and evaluate PHP error messages.
- Troubleshoot the design process.
- Secure their system.

**Course Outline:****Creating a User Interface**

Determine the purpose of your page  
Knowing your user  
Design and layout  
What tools you will use  
Helping users

Cleaning up after a Session

**Database Access with PHP**

Connecting to a database  
Creating a database query  
Displaying data  
Inserting, Deleting, and updating data  
Using transactions  
Closing database connections

**Error Handling and Debugging**

Sources of errors  
How errors are output  
PHP error codes  
Working with errors  
Php.ini settings for Error handling  
Exception error handling  
Debugging techniques

**Security**

Designing for security  
Identifying threats  
Securing PHP source code  
Securing SQL on input  
Securing server access

**Data validation**

PHP string cleaning functions  
Validation with Regular Expressions

**Accessing files and directories**

Opening files  
Reading files  
Writing to files  
Closing files  
Changing permissions  
Reading directory contents  
Security considerations

**Uploading/Downloading files**

How uploading works  
Configuring PHP for uploading  
Modifying Forms to allow uploading  
Error codes for file uploads  
Limiting upload file size  
Security considerations

**Cookies and Session Management**

How cookies work  
How Sessions work  
Controlling a Session  
Using a Named Session

**Course Description:** Databases aren't just for the IS group any more. You can build database-backed applications for the desktop, Web, embedded systems, or operating systems without linking to heavy-duty client-server databases such as Oracle and MySQL. This course teaches you how to use SQLite, a small and lightweight relational database engine that you can build directly into your application. With SQLite, you'll discover how to develop a database-backed application that remains manageable in size and complexity. You'll get a crash course in data modeling, become familiar with SQLite's dialect of the SQL database language, and much more.

**Who Should Attend:** This course is for developers who wish to learn SQLite.

**Prerequisites:** Students should be experienced developers.

**Benefits of Attendance:** Upon completion of this course, students will be able to:

- Maintain localized storage in a single file that requires no configuration
- Build a personalized SQLite library or use a precompiled distribution in applications
- Use several language functions and extensions
- Work with SQLite using a scripting language or a C-based language such as C# or Objective-C
- Understand the basics of database design, and learn how to transfer what you already know to SQLite
- Take advantage of virtual tables and modules

### Course Outline:

#### What is SQLite?

Self-Contained, No Server Required  
Single File Database  
Zero Configuration  
Embedded Device Support  
Unique Features  
Compatible License  
Highly Reliable  
Uses of SQLite  
Building and Installing SQLite  
The SQL Language  
The SELECT Command  
Database Design  
C Programming Interface  
Additional Features and APIs  
SQL Functions and Extensions  
Virtual Tables and Modules