# Database Administration (ORACLE DBA Track)

**Introduction & objectives of the course**

- Course Introduction & objectives
- Course Applications
- Institute/work ethics
- Job Market & career opportunities
- Basic Select Statements
- Selecting All Columns
- Selecting Specific Columns
- Writing SQL Statements
- Column Heading Defaults
- Arithmetic Expressions
- Using Arithmetic Operators
- Operator Precedence
- Using Parentheses
- Defining a Null Value
- Using Column Aliases
- Using the Concatenation Operator
- Duplicate Rows
- Eliminating Duplicate Rows
- SQL and iSQL*Plus Interaction
- SQL Statements versus iSQL*Plus Commands
- Logging In to iSQL*Plus
- The iSQL*Plus Environment
- Displaying Table Structure
- Interacting with Script Files
- Using the WHERE Clause
- Using Comparison Conditions
- Using the between, IN, LIKE, NULL Conditions
- Logical Conditions Using the AND, OR, NOT Operators
- Rules of Precedence
- ORDER BY Clause
- Sorting in Descending Order
- Sorting by Column Alias

- Sorting by Multiple Columns
- Tables in the Oracle Database
- Creating Tables
- Adding a Column
- Modifying a Column
- Dropping a Column
- Data Types
- Creating a Table by Using a Subquery
- The ALTER TABLE Statement
- The SET UNUSED Option
- Dropping a Table
- Truncating a Table
- Adding Comments to a Table
- What Are Constraints?
- Defining Constraints
- The NOT NULL, UNIQUE, PRIMARY KEY and FOREIGN KEY Constraints
- The CHECK Constraint
- Adding a Constraint
- Dropping a Constraint
- Disabling Constraints
- Enabling Constraints
- Cascading Constraints
- Viewing Constraints
- Viewing columns associated with constraints

**Single row functions Displaying data from multiple tables**

- SQL Functions & types
- Single-Row Functions
- Character Functions
- Using Case Manipulation Functions
- Using the Character- Manipulation Functions
- Number Functions
- Using the ROUND, TRUNC, MOD Functions
- Working with Dates
- Using Arithmetic Operators with Dates

- Using Date Functions
- Conversion Functions
- Implicit Data-Type Conversion
- Explicit Data-Type Conversion
- Elements of the Date Format Model
- Using the TO_CHAR Function with Dates
- Using the TO_CHAR Function with Numbers
- Using the TO_NUMBER and TO_DATE Functions
- RR Date Format
- Nesting Functions
- General Functions
- Using the NVL, NVL2 Functions
- Using the NULLIF Function
- Using the COALESCE Function
- Conditional Expressions
- Using the CASE Expression
- Using the DECODE Function
- Obtaining Data from multiple Tables
- Generating a Cartesian Product
- Types of Joins
- Joining Tables Using Oracle Syntax
- What Is an Equijoin?
- Retrieving Records with Equijoins
- Additional Search Conditions using AND Operator
- Qualifying Ambiguous Column Names
- Using Table Aliases
- Joining More than Two Tables
- Non equijoins
- Retrieving Records with Non equijoins
- Outer Joins and its Syntax
- Using Outer Joins
- Self Joins
- Joining a Table to Itself
- Joining Tables Using SQL: 1999 Syntax

- Creating Cross Joins
- Creating Natural Joins
- Retrieving Records with Natural Joins
- Creating Joins with the USING Clause
- Retrieving Records with the USING Clause
- Creating Joins with the ON Clause
- Retrieving Records with the ON Clause
- Creating Three-Way Joins with the ON Clause
- INNER versus OUTER Joins
- LEFT OUTER JOIN
- RIGHT OUTER JOIN
- FULL OUTER JOIN
- Additional Conditions

**Data aggregation using Group functions Subqueries**

- What Are Group Functions?
- Types of Group Functions
- Group Functions Syntax
- Using the AVG, SUM, MIN, MAX, COUNT Functions
- Using the DISTINCT Keyword
- Using the NVL Function with Group Functions
- Creating Groups of Data
- Using the GROUP BY Clause
- Grouping by More Than One Column
- Using GROUP BY Clause on Multiple Columns
- Illegal Queries Using Group Functions
- Excluding Group Results: The HAVING Clause
- Using the HAVING Clause
- Nesting Group Functions
- Using a Subquery to Solve a Problem
- Guidelines for Using Subqueries
- Types of Subqueries
- Single-Row Subqueries
- Executing Single-Row Subqueries
- Using Group Functions in a Subquery

- The HAVING Clause with Subqueries
- Multiple-Row Subqueries
- Using the ANY Operator in Multiple-Row Subqueries
- Using the ALL Operator in Multiple-Row Subqueries
- Null Values in a Subquery

**Producing Readable Output with iSQL*Plus Manipulating Data**

- Using the Substitution Variable
- Character and Date Values with Substitution Variables
- Specifying Column Names, Expressions, and Text
- DEFINE and UNDEFINE Commands
- Using the DEFINE Command with &
- Substitution Variable
- Using the VERIFY Command
- Customizing the iSQL*Plus Environment
- SET Command Variables
- iSQL*Plus Format Commands
- Using the COLUMN Command
- COLUMN Format Models
- Using the BREAK Command
- Using the TTITLE and BTITLE Commands
- Data Manipulation Language (DML)
- Adding a New Row to a Table
- The INSERT Statement Syntax
- Inserting New Rows
- Inserting Rows with Null Values
- Inserting Special Values
- Inserting Specific Date Values
- Creating a Script
- Copying Rows from Another Table
- Changing Data in a Table
- The UPDATE Statement Syntax
- Updating Rows in a Table
- Updating Two Columns with a Subquery
- Updating Rows Based on Another Table

- Updating Rows: Integrity Constraint Error
- Removing a Row from a Table
- The DELETE Statement
- Deleting Rows from a Table
- Deleting Rows Based on Another Table
- Deleting Rows: Integrity Constraint Error
- Using a Subquery in an INSERT Statement
- Using the WITH CHECK OPTION Keyword on DML Statements
- Using Explicit Default Values
- The MERGE Statement
- Database Transactions
- Advantages of COMMIT and ROLLBACK Statements
- Controlling Transactions
- Rolling Back Changes to a Marker
- Implicit Transaction Processing
- State of the Data Before and after COMMIT and ROLLBACK
- Statement-Level Rollback
- Read Consistency
- Implementation of Read Consistency
- Locking
- Implicit Locking

**Database Objects Views, Sequence, Index**

- Database Objects
- What Is a View?
- Why Use Views?
- Simple Views and Complex Views
- Creating a View
- Retrieving Data from a View
- Querying a View
- Modifying a View
- Creating a Complex View
- Rules for Performing DML Operations on a View
- Using the WITH CHECK OPTION

- Denying DML Operations
- Removing a View
- Inline Views
- Institute/Work ethics
- What Is a Sequence?
- The CREATE SEQUENCE Statement
- Confirming Sequences
- NEXTVAL and CURRVAL Pseudo columns
- Using & Modifying a Sequence
- Removing a Sequence
- What is an Index?
- How Are Indexes Created?
- Creating an Index
- When to Create an Index
- When Not to Create an Index
- Confirming Indexes
- Function-Based Indexes
- Removing an Index
- Synonyms
- Creating and Removing Synonyms

**Controlling User Access Enhancement s to the GROUP BY Clause Freelancing concepts**

- Understanding User Access
- Privileges
- System Privileges
- Controlling user access
- Creating Users
- User System Privileges
- Granting System Privileges
- What Is a Role?
- Creating and Granting Privileges to a Role
- Changing Your Password
- Object Privileges
- Granting Object Privileges
- Using the WITH GRANT OPTION and PUBLIC

- Keywords
- Confirming Privileges Granted
- How to Revoke Object Privileges
- Revoking Object Privileges
- Database Links
- Review of Group Functions
- Review of the GROUP BY Clause
- Review of the HAVING Clause
- GROUP BY with ROLLUP and CUBE

**Freelancing concepts**

- how to start, step by step process from account opening to taking orders and contract signing etc.
- Freelancing platforms
- Tips for how to increase earning

**Overview of the previous weeks Administration (Introduction)**

**Midterm Exam in last two days on the pattern of Oracle OCP examination**

- Overview, queries, and questions from participants
- Install, create, and administer Oracle Database - latest version
- Configuring database
- Employ basic monitoring procedures
- Implement a backup and recovery strategy
- Move data between databases and files
- Role of database administrator (DBA)
- Plan an Oracle database installation
- Optimal Flexible Architecture
- Install the Oracle software Oracle Universal Installer
- Create a database with the Database Configuration Assistant (DBCA)

**Administering User Security Managing Schema Objects Managing the Oracle Instance Managing Database Storage Structures Employable project / assignments**

- Create and manage database user accounts
- Authenticate users
- Assign default storage areas (tablespaces)
- Access dynamic performance views
- Table row data storage
- Purpose of tablespaces and data files

- Create and manage tablespaces
- Obtain tablespace information
- Concepts and functionality of Automatic Storage Management (ASM)
- Grant and revoke privileges
- Create and manage roles
- Create and manage profiles
- Implement standard password security features
- Control resource usage by users
- Explain the use of temporary tables
- Use the data dictionary
- Identify and administer PL/SQL objects
- Describe triggers and triggering events
- Monitor and resolve locking conflicts
- Start and stop the Oracle database and components
- Use Enterprise Manager (EM)
- Access a database with SQL*Plus and iSQL*Plus
- Modify database initialization parameters
- Describe the stages of database startup
- Describe the database shutdown options
- View the alert log
- Guidelines to the Trainees for selection of students' employable project like final year project (FYP)
- Assign Independent project to each Trainee
- A project based on trainee's aptitude and acquired skills and emerging trends in the local market as well as across the globe.
- The project idea may be based on Entrepreneur that may lead to successful employment.

**Managing Undo Data Implementing Oracle Database Security & Audit Configuring the Oracle Network**

- Explain DML and undo data generation
- Monitor and administer undo data
- Describe the difference between undo data and redo data
- Configure undo retention
- Guarantee undo retention
- Use the Undo Advisor
- DBA responsibilities for security

- Apply the principle of least privilege
- Enable standard database auditing
- Specify audit options
- Review audit information
- Maintain the audit
- Use Enterprise Manager to:
  - Create additional listeners
  - Create Oracle Net Service aliases
  - Configure connect-time failover.
  - Control the Oracle Net Listener
- Use tnsping to test Oracle Net connectivity
- Identify when to use shared servers versus dedicated servers
- Use statistics
- Manage the Automatic Workload Repository (AWR)
- Use the Automatic Database Diagnostic Monitor (ADDM)
- Describe the advisory framework
- Set alert thresholds
- Use server-generated alerts
- Use automated tasks

**Job market & job search**

- Job related skills.
- Interpersonal skills
- Communication skills

**Performance management Database backup concepts Job Search & entrepreneurial skills (CV creating)**

- Use Enterprise Manager to monitor performance
- Tune SQL by using the SQL Tuning Advisor
- Tune SQL by using the SQL Access Advisor
- Use Automatic Shared Memory Management (ASSM)
- exporting projects into playable
- Use the Memory Advisor to size memory buffers
- View performance-related dynamic views
- Troubleshoot invalid and unusable objects.
- Identify the types of failure that may occur in an Oracle database

- Describe ways to tune instance recovery
- Identify the importance of checkpoints, redo log files, and archive log files
- Configure ARCHIVELOG mode
- Create consistent database backups
- Back up your database without shutting it down
- Create incremental backups
- Automate database backups
- Monitor the flash recovery area
- Session on CV Building
- How to make notable CV
- Dos and Don’ts of CV making

**Performing Database Recovery Performing Flashback Moving Data Configuring Recovery Manager**

- Redo log file & data file
- Describe Flashback Database
- Restore the table content to a specific point in the past with Flashback Table
- Recover from a dropped table
- View the contents of the database as of any single point in time with Flashback Query
- See versions of a row over time with Flashback Versions Query
- View transaction history or a row with Flashback Transaction Query
- Institute/Work ethics
- Describe available ways for moving data
- Create and using directory objects
- Use SQL*Loader to load data from a non-Oracle database (or user files)
- Explain the general architecture of Data Pump
- Use Data Pump Export and Import to move data between Oracle databases
- Use external tables to move data via platform-independent files
- Describe the RMAN repository and recovery catalog
- Describe the Media Management Library interface
- Configure database parameters that affects RMAN operations
- Connect to the three different types of databases by using RMAN
- Configure two types of retention policies
- Change RMAN default settings with CONFIGURE
- Session on Self-Employment
- How to start a Business

- Requirements (Capital, Physical and Human requirements etc.)
- Benefits/Advantages of self- employment

**Memory Management Overseas Employment (General Employment) Preparation for Oracle OCP**

- Describe the memory components in the SGA
- Implement Automatic Shared Memory Management
- Diagnose database performance issues
- Configure the Automatic Workload Repository
- Use the SQL Access Advisor to improve database performance
- Use asynchronous COMMIT effectively
- Estimating the size of new tables
- Analyzing growth trends
- Managing optimizer statistics
- Reorganizing schema objects online
- Reclaim wasted space from tables and indexes
- Configure the Database Resource Manager
- Access and create resource plans
- Create consumer groups
- Monitor the Resource Manager
- Session on General Overseas Employment opportunities.
- Job search Avenues.
- Visa Processes and other necessary requirements.
- Immigration Information (Legal age requirements, Health Certificate, Police clearance &Travel Insurance)
- Preparation of trainees for Oracle OCP Examination
- Registration of Trainees for Oracle OCP Examination.
- Mock exercises for Oracle OCP Examination.
- Final Project Demonstration / Examination
- **Final Assessment**

# Tasks For Database Administrator (DBA) Track

| Task No. | Task | Description |
|---|---|---|
| 1 | **Installation / Uninstallation** | Install and uninstall Oracle 21c |
| 2 | **Use of Select command** | Select all data from the table. Display the last name concatenated with the job ID, separated by a comma and space. Name this column Employee and Title. |
| 3 | **Use of Select command with parameters** | Show the structure of the EMPLOYEES table. Create a query to display the last name, job code, hire date, and employee number for each employee, with employee number appearing first. Save your SQL statement to a file named lab1_7.sql. |
| 4 | **Use of Select & Unique commands together** | Create a query to display unique job codes from the EMPLOYEES table. |
| 5 | **Use of Select & greater than commands together** | Create a query to display the last name and salary of employees earning more than $12,000. Place your SQL statement in a text file named lab2_1.sql. Run your query. |
| 6 | **Automatically calculate increase in salary by 15% and display new salary** | For each employee, display the employee ID number, last-named, salary, and salary increased by 15%and expressed as a whole number. Label the column New Salary. Place your SQL statement in a text file named lab32.sql. |
| 7 | **Display the name of only those employees whose names start with J, A, or M with first letter capitalized. Also calculate the length of their names** | Write a query that displays the employee's last names with the first letter capitalized and all other letters lowercase and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names. |

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| 8 | **Calculate the total months of employment** | For each employee, display the employee's last name, and calculate the number of months between today and the date the employee was hired. Label the column MONTHS_WORKED. Order your results by the number of months employed. Round the number of months up to the closest whole number. |
| **9** | **Display the highest, lowest, sum, and average salary of all employees** | Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number. Place your SQL statement in a text file named lab5_6.sql. |
| **10** | **Display the minimum, maximum, sum, and average salary for each job type** | Modify the query in lab5_4.sql to display the minimum, maximum, sum, and average salary for each job type. Resave lab5_4.sql to lab5_5.sql.<br>Run the statement in lab5_5.sql. |
| **11** | **Display the record of employees who earn more than the average salary** | Create a query to display the employee numbers and last names of all employees who earn more than the average salary. Sort the results in ascending order of salary. |
| **12** | **Adding data in the first and second row of table** | Add the first row of data to the MY_EMPLOYEE table from the following sample data. Do not list the columns in the INSERT clause.<br>Populate the MY_EMPLOYEE table with the second row of sample data from the preceding list.<br>This time, list the columns explicitly in the INSERT clause. |
| **13** | **Use of Insert Command** | Populate the table with the next two rows of sample data by running the INSERT statement in the script that you created |
| **14** | **Delete all records from a table** | Empty the entire table. Confirm that the table is empty. |
| **15** | **Create a View** | Create a view called EMPLOYEES_VU based on the employee numbers, employee names, and department numbers from the EMPLOYEES table.<br>Change the heading for the employee's name to EMPLOYEE |

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| **16** | **Use of sequence and primary key constraint** | Create a sequence to be used with the primary key column of the DEPT table. The sequence should start at 200 and have a maximum value of 1000. Have your sequence increment by ten numbers. Name the sequence DEPT_ID_SEQ |
| **17** | **Define privileges** | You are the DBA. You are creating many users who require the same system privileges. What should you use to make your job easier? |
| **18** | **Grant access to another user** | Grant another user access to your DEPARTMENTS table. Have the user grant you query access to his or her DEPARTMENTS table. |
| **19** | **Use of Non-Unique index** | Create a nonunique index on the foreign key column (DEPT_ID) in the EMP table. |
| **20** | **Restricting query results using the HAVING clause** | Run a query to know employees who have been employed after 2020. |
| **21** | **Topping & Starting Database instances** | Viewing and modifying initialization parameters. Stopping and starting the database instance Viewing log files |
| **22** | **Obtain Tablespaces information** | Describe the storage of table row data in blocks. Create and manage tablespaces.<br>Obtain tablespace information |
| **23** | **Create a Profile to limit resources** | Creating a profile to limit resource consumption Creating two roles:<br>HRCLERK HRMANAGER<br>Creating four new users:<br>One manager and two clerks<br>One schema user for the next practice session |
| **24** | **Manage and Shrink Space** | Using threshold alerts to proactively manage |
| **25** | **Calculating and Modifying an undo tablespace to support a 48-hour retention interval** | Viewing system activity. Calculating undo tablespace sizing to support a 48- hour retention interval. Modifying an undo tablespace to support a 48-hour retention interval. |
| **26** | **Configuring Listener** | Configure new listener and Oracle Services |

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| **27** | **Tips to improve Performance** | What are some tips to improve the performance of SQL queries bottlenecks that affect the performance of a Database |
| **28** | **Archive Log of Database** | Configure database into Archive Log. Perform an Online backup. |
| **29** | **Configure RMAN** | Configure RMAN, perform complete database backup using RMAN. Perform Incremental backup using RMAN |
| **30** | **Detect corruption in RMAN** | Detect corruption of the block in the RMAN database, what are the steps to fix this? |