Course Title: Database Administration **Credit: 3**
Course No: CSIT.415.2 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Seventh
Level: B. Sc. CSIT

1. Course Introduction

This course introduces the database administration techniques in Oracle. Most of the DBA's tasks are covered. Topics covered include principles of DBA Roles, Oracle Database Architecture and storage management, Database backup, restoration and recovery, connectivity and user management for database security, Tuning of database and overall DB administration which could be useful for administrator in the future.

2. Objectives

Upon completion of this course students should:

- → Understand the basic role, task and responsibilities of Database Administrator.
- → Understand the Oracle database architecture and how its components work and interact with one another
- → Be able to install and configure an Oracle Database.
- → Be able to administer the Oracle Database, create and manage storage structures and Create and manage the users.
- → Be able to perform backup and recovery, tuning the oracle database for the better performance.
- → Be able to create database objects like tables, views, indexes etc. and able to write PL/SQL Procedures

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand the different roles and responsibilities of DBA at different environment • Understand the Oracle database architecture and how its components work and interact with one another. • Understand the Oracle Automatic Storage Management • Understand the Oracle Client Application and its use • Use of oracle tools like SQL PLUS, OEM	**Unit I: Introduction (6 Hrs)** 1.1. Responsibilities and Role of Database Administrator 1.2. Oracle Database Architecture Overview 1.3. Process Architecture 1.4. Memory structures 1.5. Logical and physical storage structures 1.6. Oracle ASM 1.7. Oracle Database version 1.8. SQL*PLUS Overview 1.9. Oracle Enterprise Manager 1.10. iSQL*PLUS
• Install and configure an Oracle Database • Understand the startup and	**Unit II: Creating and Managing Oracle Database (4 Hrs)** 2.1. Create and Delete a Database 2.2. Password Management 2.3. Start and stop the Oracle database and components

shutdown options • Understand the basic database installation parameters and dynamic performance views	2.4. Modify database installation parameters 2.5. Describe the stages of database startup 2.6. Describe database shutdown options 2.7. View the alert log 2.8. Access dynamic performance views
• Creating tables, views, profiles, Sequences, Synonyms, Indexes • Use of PL/SQL Blocks, procedure, functions • Use of database links for accessing the remote database	**Unit III: Understanding Oracle Logical Database Structures(6 Hrs)** 3.1. Creating and managing tables, views, constraints 3.2. Use of DML operations on tables 3.3. Creating index 3.4. Creating users and schema 3.5. creating sequences, synonyms 3.6. Use of PL/SQL Blocks, functions, procedures, packages 3.7. External File Accesses, Database links and remote databases
• Create and manage storage structures • Understand how table data is stored and the storage structure of Oracle Database. • Creating Table spaces, data files and Space Management in Table spaces • Understand the importance of multiplexing • Understand the importance of database archiving • Understand the Concept of Oracle Managed Files	**Unit IV: Managing Database Storage Structures (6 Hrs)** 4.1. Storage Structures 4.2. Tablespace and Datafile management 4.3. Multiplexing Control files, Redo log files and Archive redo logs 4.4. Configure database in Archive log mode 4.5. Manage FRA(Flash Recovery Area) 4.6. Maintaining and monitoring redo log files, Archive logs 4.7. Oracle Managed Files (OMF)
• Create and administer user accounts • Understand importance of roles and apply it to users • Understand the concepts of system and object privileges • Understand the use of Virtual Private database concept on securing the database • Use of database auditing	**Unit V: Administering User Security (5 Hrs)** 5.1. Managing Database User Accounts 5.2. Predefined Administrative Accounts 5.3. Creating Roles and assigning Role 5.4. Predefined Roles 5.5. Implementing Profiles 5.6. managing privileges 5.7. Database Security and Auditing 5.8. Virtual Private Database
• Understand the Oracle Networking and database connectivity • Setting Up Networking Configuration Files • Managing the Oracle Listener • Understand the shared server and dedicated server environment	**Unit VI: Configuring the Oracle Network Environment(3 Hrs)** 6.1. How Oracle Networking works 6.2. create and configure the Listener 6.3. Enable Oracle Restart to monitor the listener 6.4. Use tnsping to test Oracle Net connectivity 6.5. Configure and editing the tnsnames.ora and listener.ora

	files using Oracle NET Manager 6.6. Identify when to use shared servers and when to use dedicated servers 6.7. The Oracle Client
• Perform basic backup and recovery of a database • Understand the concept of physical backup and logical backup • Understand cold backup and hot backup • Learn the recovery process in case of failure • Use of flashback technique to recover the database • Understanding the use of oracle data pump tool for export and import of database	**Unit VII: Backup and Recovery concept (6 Hrs)** 7.1. Backup Overview 7.2. Oracle Secure Backup 7.3. User-Managed Backup 7.4. Logical Backup, Physical Backup, Offline Backups, Online Backups 7.5. Data Pump Export and Import 7.6. SQL Loader 7.7. Types of Database Failure 7.8. Oracle Recovery Process 7.9. Understanding Instance Recovery 7.10. Flashback Techniques and Recovery 7.11. Database Corruption Detection
• Understand the RMAN environment and difference between RMAN and Traditional backup methods • Explain the RMAN backup and recovery concepts • Understand the power of RMAN	**Unit VIII: Recovery Manager (RMAN) (4 Hrs)** 8.1. RMAN Features and Configuring RMAN Backup Settings 8.2. RMAN vs. Traditional Backup Methods 8.3. Overview of RMAN Commands and Options 8.4. Backup Operations (Full Database Backups, tablespace, datafile,, control file and spfile backup, Archived Redo Logs, Incremental Backup) 8.5. Performing Recovery with RMAN
• Understand the concept of tuning • Learn the use of dynamic performance views to monitor the performance • Use of different tools like ADDM, SQL Tuning Advisor for the performance optimization • Understand the use of memory component for the best performance	**Unit IX: Performance Tuning (5 Hrs)** 9.1. Brief overview of Tuning methodology, general tuning concepts 9.2. Performance Monitoring 9.3. Managing Memory Components 9.4. Enabling Automatic Memory Management (AMM) 9.5. Automatic Shared Memory Advisor 9.6. Dynamic Performance Statistics 9.7. ADDM (Automatic Database Diagnostic Monitor) 9.8. SQL Tuning Advisor 9.9. Automatic Workload Repository (AWR)

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**	**Practical**	**Weightage**	**Mark**
End semester examination		Assignments	20%		Practical Report copy	25%	
(Details are given in the separate table at the end)	60	Quizzes	10%	20	Viva	25%	20

		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should prepare lab sheet for most of the units in the syllabus. They should practice design database and implementation of database administration activities that demonstrates different concepts discussed is class. However, nature of lab work can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

- Sam R. Alapati, Expert Oracle Database 11g Administration, Apress

References

- Bob Bryla, Kevin Loney, Oracle Database 11g DBA Handbook, Oracle Press
- Introduction to Database Administration, by O'reilly
- C.J. Date, Database Systems, Addison Wesley, 2000