

Kadi Sarva Vishwavidyalaya, Gandhinagar

MCA Semester II

MCA-24 (B) : Database Administration

Rationale:

The primary objective of this course is to provide in-depth knowledge of the administrative task of database management systems.

Prerequisites: Knowledge of DBMS, SQL & PL/SQL is desirable.

Learning Outcomes:

Students will learn Five components like basics of database administrations, Database user administration and security, Database backup and recovery ,Database Performance Management and data storage management, metadata management and different DBA tools at the end of this course, which are as under:

- In basics of DBA they will develop as skill to install database server, understands basic roles and responsibilities of DBA along with different current DBA trends.
- In database user administration, they will be able to create users, manage them by assigning roles and privileges. And in database security they will learn different ways to handle security through user administration, stored procedure, encryption etc.
- In database backup and recovery they will be able to take database backup and recovery using DBA tools with clarity of concepts like various backup and recovery types.
- In database performance they will be able to use and analyze DBMS statistics like SQL execution plan etc. and understand the concepts like system, database and application level performance tuning.
- In last section of the course they will be able to perform data pump utility for data storage movement, metadata management and different DBA tools vendors.
- All these concepts are important to build their career as Database Administrator, Data Manager, and Architecture/Data Engineers.

Teaching and Evaluation Scheme: The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				
	(per week)		MID	CEC	External		Total Marks
	Th	Pr	Th	Th	Th.	Pr.	
5	3	4	25	25	50	50	150

Course Contents:

Unit 1 Basics of Database Administration

[20%]

What Is a DBA? Why DBA?, Database, Data, and System Administration, **DBA Tasks**, The **Types of DBAs**, The Impact of Newer Technology on DBA: The Internet: From DBA to eDBA, The Personal DBA and the Cloud, NoSQL, Big Data, and the DBA, DBA Certification. **Creating the Database Environment**: Defining the Organization's DBMS Strategy, Choosing a DBMS, DBMS Architectures-ORACLE, DBMS Clustering, DBMS Proliferation, Hardware Issues, and Cloud Database Systems. **Installing the DBMS-ORACLE**: DBMS Installation Basics, Hardware Requirements, Storage Requirements, Memory Requirements, Configuring the DBMS, Connecting the DBMS to Supporting Infrastructure Software, Installation Verification, DBMS Environments, Database Standards and Procedures.

Unit 2 Database User Administration and Security

[20%]

Database Security Basics : Database Users ,Granting and Revoking Authority :Types of Privileges ,Granting to PUBLIC ,Revoking Privileges ,Label-Based Access Control, Security Reporting ,Authorization Roles and Groups, Other Database Security Mechanisms, Using Views for Security ,Using Stored Procedures for Security, Encryption ,Data at Rest Encryption: Data in Transit Encryption, Encryption Techniques ,SQL Injection: Prevention ,Auditing , External Security, Job Scheduling and Security , Database Authentication Methods(Database Authentication, Database Administrator Authentication, Operating System Authentication, Network Authentication, 3-tier Authentication, Client-Side Authentication, Oracle Identity Management, User Accounts), Database Authorization Methods (Profile Management, System Privileges, Object Privileges, Creating, Assigning, and Maintaining Roles), Non-DBMS DBA Security.

Unit 3 Database Backup & Recovery

[20%]

The Importance of Backup and Recovery: Preparing for Problems ,Backup :Full versus Incremental Backups, Database Objects and Backups, DBMS Control, Concurrent Access Issues ,Backup Consistency , Log Archiving and Backup ,Determining Your Backup Schedule, DBMS Instance Backup ,Designing the DBMS Environment for Recovery, Alternate Approaches to Database Backup, Document Your Backup Strategy ,Database Object Definition Backups ,Recovery :Determining Recovery Options ,General Steps for Database Object Recovery, Types of Recovery ,Index Recovery ,Testing Your Recovery Plan ,Recovering a Dropped Database Object, Recovering Broken Blocks and Pages, Populating Test Databases, Alternatives to Backup and Recovery: Standby Databases, Replication , Disk Mirroring.

Unit 4 Database Performance Management

[20%]

Defining Performance: A Basic Database Performance Road Map-Monitoring versus Management, Reactive versus Proactive, Types of Performance Tuning - System Tuning, Database Tuning, Application Tuning, Performance Tuning Tools. Memory Usage, Data Cache Details, "Open" Database Objects, Database Logs ,Locking and Contention, The System Catalog, Other Configuration Options, System Monitoring.

Database Performance: Techniques for Optimizing Databases, Partitioning ,Raw Partition versus File System, Indexing, Denormalization, Clustering, Interleaving Data, Free Space, Compression, File Placement and Allocation, Page Size (Block Size) ,Database Reorganization, Determining When to Reorganize, Automation.

Application Performance: Designing Applications for Relational Access -Relational Optimization, CPU and I/O Costs ,Database Statistics-Query Analysis, Joins ,Access Path Choices Additional Optimization Considerations ,View Access ,Query Rewrite, Rule-Based Optimization, Reviewing Access Paths, Forcing Access Paths, SQL Coding and Tuning for Efficiency, A Dozen SQL Rules of Thumb, Additional SQL Tuning Tips, Identifying Poorly Performing SQL.

Unit 5 Data Storage Management, Metadata Management & DBA Tools [20%]

Storage Management Basics: Files and Data Sets, File Placement on Disk ,Raw Partitions versus File Systems, Temporary Database Files ,Space Management ,Data Page Layouts ,Index Page Layouts, Transaction Logs, Fragmentation and Storage ,Storage Options, Storage Area Networks, Data Movement and Distribution using Export and Import data pump utility.

Metadata Management: What Is Metadata?, From Data to Knowledge and Beyond ,Metadata Strategy, Data Warehousing and Metadata ,Types of Metadata ,Repositories and Data Dictionaries ,Repository Benefits, Repository Challenges, Data Dictionaries

DBA Tools: Types and Benefits of DBA Tools, Native DBA Tools, Evaluating DBA Tool Vendors.

Text Books:

1. Database Administration The Complete Guide to DBA Practices and Procedures, Second Edition Craig S. Mullins, Addison Wesley.
2. Kevin Loney, Bob Bryla, "Oracle 10g/11g, DBA Handbook", Oracle Press, TMGH Publications
Ramesh Elmasari, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education, 5th Edition

Reference Books:

1. Oracle 10g/11g/onwards Administration in Simple Steps by Dreamtech
2. Oracle Administration & Management by Wiley
3. Oracle Applications DBA Field Guide by Apress
4. MySQL Cookbook by O'reilly
5. MySQL Database Design & Tuning by MySQL Press
6. MySQL in a Nutshell by O'reilly
7. SQL Server 2000 Administration Study Guide by Rick Sawtell, Lance Mortensen, Joseph L. Jorden

Unit wise coverage from text book(s):

UNIT 1: Book 1 Chp. 1, 2

UNIT 2: Book 1 Chp. 14

UNIT 3: Book 1 Chp. 16

UNIT 4: Book 1 Chp. . 9,10,11,12

UNIT 5: Book 1 Chp. 18,19(pg 662), 22(pg 685-695),23(pg 699,728,729)

Practical List

1. Installation of Software
2. Create database using Oracle Configuration Assistant
3. Predefined Administrative Accounts Predefined
Non-Administrative User Accounts Predefined
Sample Schema User Accounts
 - a. Create User, Roles, Grant different objects and system privileges to users. Grant different roles to users.

4. Managing Table space
 - a. Creating a Table space
 - b. Modifying a Table space
 - c. Dropping a Table space
 - d. Reclaiming Unused Space
5. Add, Move, and Resize, Datafiles in different table spaces.
6. Managing Rollback Segments
7. Work on different backup & recovery options
8. Work on different Import/Export options.
9. Work of at least 5 tuning options.
 - a. Use of auto trace
 - b. Explain plan
 - c. SQL Tuning Advisory
 - d. Use Of Indexing
10. Workshop of DBA based on latest trends.

Note:

1. PROJECT Work OR CASE Study can be given based on other databases like MYSQL, MS-SQL (SQL SERVER), POSTGRES etc. to explore various domains of database systems.
2. For Practical Book#2