Integrated MCA II Semester 3

Subject Name: Advanced Relational Database Management System

Subject Code: IMCA13303

Type of course: Professional Core Course

Prerequisite (if any):

- Basic knowledge of database concepts such as tables, rows, columns, primary keys, foreign keys, and relationships.

List of Courses where this course will be prerequisite:

- Big Data and Analytics
- Distributed Database Systems

Rationale:

Advanced Relational Database Management System helps students to learn structured data management, transaction management, Concurrency Control, Normalization, Query Optimization, advanced SQL covering all aspects of PL/SQL and Database Security preparing learners for developing scalable, high-performance applications in data-driven industries.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks		Practical Marks		Total
L	T	P	C	TEE	CAT	TEP	CAP	
3	0	0	3	60	40	-	-	100

CAT: Continuous Assessment Theory comprised of CA1 and CA2 **CA1:** Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CAP:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Content	Teaching Hrs.	Module Weightage
1	**Introduction to Data Models:** Introduction to Data Models, Types of Data Models (Hierarchical, Network, Relational, Object-oriented), Importance of Data Models in DBMS. **Relational Model:** Introduction to ER Diagram, Relational Database design by ER and EER to Relational Mapping, Mapping EER model constructs to Relations. Introduction to Relational Algebra.	5	11%
2	**Transaction Management:** ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control, Performance of Locking, Transaction Support in SQL, Introduction to Crash Recovery. **Concurrency Control:** 2PL, Serializability, and Recoverability, Introduction to Lock Management, Dealing with Deadlocks.	12	26%
3	**Normalization and Database Design:** Functional Dependencies: Armstrong's Axioms, Definition, Properties (Reflexivity, Augmentation, Transitivity), Types (Trivial, Non-Trivial, Partial and Full Functional Dependency), Closure of Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF), Denormalization.	7	16%
4	**Introduction to Query Optimization:** Query Evaluation Plans, Multi-operator Queries, The Iterator Interface.	5	11%
5	**Advanced SQL:** Analytical queries, Hierarchical queries, Recursive queries, Views, Cursors, Stored Procedures and Functions, Packages, Triggers, Dynamic SQL.	11	25%
6	**Database Security:** Introduction to Database Security, Access Control, Discretionary Access Control.	5	11%

Suggested Specification table with Marks (Theory):

%Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
34	30	20	16	0	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

Sr. no.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Database System Concepts	Korth, Silbertz, Sudarshan	McGraw Hill	2019	7th edition
2	Database management Systems	R. P. Mahapatra, GovindVerma	Khanna Publishing House	2016	1st edition
3	Database Management Systems	Raghu Ramakrishnan, Johannes Gehrke	McGraw Hill	2018	3rd edition
4	Oracle PL/SQL by Example	Benjamin Rosenzweig, Elena Rakhimov	Prentice Hall	2015	5th edition
5	NoSQL with MongoDB in 24 Hours	Brad Dayley	Sams Publishing	2024	1st edition

Course Outcomes:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % Weightage
CO-1	Describe the fundamental concepts and components of the Data models and Relational models	11
CO-2	Describe the concepts to manage database transactions and ensure data consistency through effective concurrency control	26
CO-3	Design efficient, normalized relational databases to minimize redundancy and maintain data integrity	16
CO-4	Understand Query Evaluation Plans and Optimize database queries using indexing, query optimization techniques and utilize the Iterator Interface	11
CO-5	Understand skills to write complex SQL queries and optimize database performance using advanced SQL techniques	25
CO-6	Understand the techniques for securing databases against unauthorized access, breaches and vulnerabilities	11

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13
CO-1	3	2	3	3	1	2	2	1	1	2	0	0	0
CO-2	3	2	3	3	2	3	3	1	1	3	0	0	0
CO-3	3	2	3	3	1	2	2	1	1	1	1	0	0
CO-4	3	2	3	3	2	3	3	3	1	3	0	0	0
CO-5	3	2	3	3	2	3	3	3	1	3	1	0	0
CO-6	3	2	3	3	3	3	1	3	3	3	0	0	0
Rationale*													

Rationale*: Explaining why it is matching this particular program outcome

List of Open learning website:

1. https://oracle-base.com/articles
2. https://forums.oracle.com/ords/apexds/domain/devcommunity/category/sql_and_pl_sql
3. https://asktom.oracle.com/ords/f?p=100:1:0

List of Open-Source Software: NA

Major Equipment Needed: NA