Course Plan

A. Course Handout

Institute Name	Chitkara University Institute of Engineering & Technology		
Department Name	Department of Computer Science & Engineering		
Programme Name	Bachelor of Engineering -Computer Science & Engineering (Artificial Intelligence)		
Course Name	Database Management System	**Session**	2024-2025
Course Code	22CS007	**Semester/Batch**	4th/2023
Lecture/Tutorial (Per Week)	2-0-4	**Course Credit**	4
Course Coordinator Name	Dr.Shruti Arora		

1. Objective of the Course:

The main objectives of the course are:

- To provide a comprehensive foundation for designing and implementing database systems by using RDBMS and analyse its need for real life applications.
- To enable the students to participate in the development process by implementing SQL commands and be able to describe relational algebra & tuple relation expression from queries.
- To recognize and identify the use of normalization and functional dependency used in database design.
- To apply and relate the concept of transaction, concurrency control, security and recovery in database.
- To provide knowledge about the concepts of procedures, functions, cursors and triggers
- To put into practice PL/SQL programming.
- To use concepts of distributed databases and query optimization techniques.

2. Course Learning Outcome:

On completion of the course, students will be able to:

	Course Outcome	POs	CL	KC	Sessions
CLO01	Design and implement database system by implementing SQL commands for RDBMS and analyze database requirements to determine the entities involved in the system and their relationship to one another.	PO1, PO4	K3	Procedural	**10**
CLO02	Implement the concept of normalization and functional dependency while designing the databases.	PO10, PO11	K3	Factual, Procedural	**20**
CLO03	Apply the concept of transaction, concurrency control, security and recovery in database.	PO5, PO10	K4	Conceptual	**10**
CLO04	Implement procedures, functions, cursors and triggers and become proficient in PL/SQL programming.	PO1,PO2	K3	Conceptual, Procedural	**10**
CLO05	Explain and evaluate the fundamental theories and requirements that influence the design of distributed database systems.	PO7, PO10	K5	Conceptual, Procedural	**16**
Total Contact Hours					**66**

CLO-PO-PSO Mapping grid |Program outcomes (POs) and Program Specific Outcomes (PSOs) are available as a part of Academic Program Guide

Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	H	L	L	M	L		H		H		H	L		L	
CLO2	M	H	M		L		H	H			L	H			M
CLO3	L	H	M	H	M					H	L	M		H	
CLO4	L	M	H	M	L			H			L	L	H		L
CLO5	H		M	M	L				H			M	H		L

H=High, M=Medium, L=Low

3. ERISE Grid Mapping

Feature Enablement	Level (1-5, 5 being highest)
Entrepreneurship	3
Research	4
Innovation	4
Skills	5
Employability	4

4. Recommended Books (Reference Books/Textbooks):

B01:	'Database System Concepts', Abraham Silberscatz, Henry F.Korth, Sudharsan , Fifth Edition, McGraw-Hill.
B02:	'An Introduction to Database Systems', C.J.Date ,Eighth Edition, O'Reilly Media.
B03:	'An Introduction to Database Systems', Bipin.C.Desai, Eleventh Edition, West Group Division, 1990.
B04:	'Database Systems', Ramez.Z.Elmasri, ShamkantB.Navathe, Seventh Edition, Pearson Education.
B05:	Fundamentals of Database Design by Ramez Elmasri, Shamkant B. Navathe, Addison Wesley Publications, Seventh Edition.
B06:	Introduction to SQL by Oracle Press.
B07:	Database System Concepts by Henry F. Korth, Sixth Edition.
B08:	Principles of Distributed Database Systems by M. Tamer Özsu, Third Edition

5. Other readings & relevant websites:

S.No.	Link of Journals, Magazines, websites and Research Papers
1.	https://www.tutorialspoint.com/dbms/index.htm
2.	http://freevideolectures.com/Course/2668/Database-Management-System
3.	http://www.help2engg.com/dbms/dbms-introduction
4.	http://dbms-tutorials.blogspot.in/
5.	www.oracle.com
6.	https://www.tutorialspoint.com/distributed_dbms/distributed_dbms_databases.html
7.	http://www.exploredatabase.com/2014/09/query-processing-in-database.html
8.	https://onlinecourses.nptel.ac.in/noc15_cs14/preview
9.	https://www.tutorialspoint.com/dbms/pdf/database_normalization
10.	https://www.tutorialspoint.com/dbms/dbms_transaction.htm
11.	https://www.tutorialspoint.com/dbms/dbms_concurrency_control.htm
12.	https://www.tutorialspoint.com/dbms/er_diagram_representation.htm
13.	http://docs.oracle.com/cd/B10501_01/appdev.920/a96624/a_samps.htm

14.	http://www.acs.utah.edu/acs/qa_standards/psstd07g.htm
15.	http://infolab.stanford.edu/~ullman/fcdb/oracle/or-plsql.html
16.	http://sql-plsql- manual.blogspot.in/
17.	http://freevideolectures.com/Course/3179/MySQL-Database#
18.	http://www.w3schools.com/sql/default.asp

6. Recommended Tools and Platforms

Oracle, MYSQL

7. Course Plan:

Lecture Number	Topics	Recommended Books
1	Introduction to database and characteristics of database approach.	B01, B02, B03
2	Advantages and disadvantages of DBMS approach. File system V/s Database system. DBMS three schema Architecture.	B01, B04
3-4	Introduction to Data Models: Hierarchical Model, Network Model, ER Model, Relational Model.	B01, B02, B03, B04
5-6	Schemas, Instances, Schema architecture and Data Independence.	B01, B03, B04
7	Client Server Architecture for DBMS, ACID Properties in DBMS.	B01, B03, B04
8-9	ER Model: Database design process, Entity Types, Entity sets, Attributes, keys and their types, Weak entity types	B01, B03, B04
10-11	ER diagrams, naming convention and design issues, E.F Codd Rules.	B01, B03, B04
12-13	Overview of the MySQL Query Language: Basic Structure of SQL Queries, Data types, and variables.	B06
14	MySQL database – create, select, show, drop.	B06
15-16	MySQL table – create, alter, show, rename, truncate, describe, drop.	B06
17-18	MySQL queries - insert records, update records, delete and select records.	B06
19	Set Operations.	B06
20-21	SQL clauses - WHERE, ORDER BY, GROUP BY, HAVING.	B06
22-23	MySQL conditions – AND, OR, NOT, Like, etc.,	B06
Formative Assessment-1 (1-23 Lectures)		
24-25	Aggregate Functions	B06
26	Relational Data Model: Rational model concept, Characteristics of relations.	B01, 004
27	Relational Algebra	B02, B06
28-29	Types of Relational operation – select, project, union, set intersection, set difference, Cartesian product, rename operation.	B02, B05
30-33	Join Operations – natural, outer, and equi join.	B06
34	Integrity Constraint, Relational Calculus – Tuple relational calculus and Domain relational calculus.	B06
Sessional Test-1 (24-34 Lectures)		
35	Introduction to DBMS Normalization, Functional Dependencies (Fully, Transitive, Multi-valued, Join Dependencies).	B05
36	1st Normal Form, 2nd Normal Form.	B05, B06
37-40	3rd Normal Form, Boyce Codd Normal Form (BCNF).	B05, B06
41-42	4th Normal Form, 5th Normal Form & 6th Normal Form.	B05, B06

43-44	Introduction to Transaction and its desirable properties, Transaction State.	B05, B06
45-46	Testing of Serializability, Recoverability of Schedule.	B05, B06
47-48	DBMS Backup and Recovery, Log-Based Recovery, DBMS Checkpoint, and Deadlock in DBMS.	B05, B06
Formative Assessment-2 (36-48 Lectures)		
49	Introduction to Database Security.	B07
50	Discretionary access control based on granting and revoking privileges.	B07
51-53	Introduction to Concurrency Control Techniques, Lock-Based Protocol.	B06, B07
54	Timestamp Ordering Protocol, Validation-Based Protocol.	B07
Sessional Test-2 (49-54 Lectures)		
55	Introduction to distributed databases, Advantages, and Functions of distributed databases.	B08
56-57	Types of distributed databases Systems (Homogeneous and Heterogeneous), Parallel DBMS VS Distributed DBMS.	B08
58-59	NoSQL Databases: The CAP Theorem, NoSQL Data Models, MongoDB Overview.	B08
60-61	MongoDB Datatypes, Data Modelling in MongoDB.	B08
62-63	MongoDB - Create Database, Drop Database, Create Collection, Drop Collection, Insert Document, Query Document, Update Document, Delete Document.	B08
64-66	MongoDB ─ Projection, Limit Records, Sort Records, Indexing and Aggregation.	B08
END-TERM EXAM (FULL SYLLABUS)		

8. Delivery/Instructional Resources

Lecture No.	**Topics**	**PPT** *(Link of ppts on the central server)*	**Industry Expert Session** *(If **yes**: link of ppts on the central server)*	**Web References**	**Audio-Video**
1–3	Introduction to database and characteristics of database approach			https://www.geeksforgeeks.org/introduction-to-database-systems/	https://youtu.be/HhxRQKjOJkY
4–6	Advantages and disadvantages of DBMS approach, File system vs Database system			https://www.javatpoint.com/dbms-vs-file-system	https://youtu.be/pgcWV6bbDw8
7–9	DBMS Three Schema Architecture			https://www.geeksforgeeks.org/dbms-three-schema-architecture/	https://youtu.be/GxFZqJxGuQ0
10–12	Introduction to Data Models: Hierarchical, Network, ER, and Relational Models			https://www.javatpoint.com/dbms-data-models	https://youtu.be/_nHgXYtdgpA
13–15	Schemas, Instances, Schema Architecture, and Data Independence			https://www.tutorialspoint.com/dbms/dbms_schemas.htm	https://youtu.be/Io

					E1S6tEYkA
16–18	Client-Server Architecture for DBMS, ACID Properties in DBMS			https://www.geeksforgeeks.org/acid-properties-in-dbms/	https://youtu.be/1j9X9JPC7BQ
19–23	ER Model: Database design process, Entity Types, Keys, ER diagrams, E.F. Codd Rules			https://www.javatpoint.com/er-model-in-dbms	https://youtu.be/ix45OaM3K08
24–26	Overview of MySQL Query Language: SQL Basics, Data types, Variables			https://www.mysqltutorial.org/mysql-basics/	https://youtu.be/oALmfjRzdlA
27–28	MySQL Database and Table Operations: Create, Alter, Drop			https://www.w3schools.com/sql/sql_intro.asp	https://youtu.be/MH52Xfw9OGk
29–30	MySQL Queries: Insert, Update, Delete, Select			https://www.sqlshack.com/sql-queries/	https://youtu.be/kBlt1A6FfIQ
31–33	SQL Clauses and Conditions: WHERE, ORDER BY, GROUP BY, HAVING, AND, OR, NOT			https://www.w3schools.com/sql/sql_where.asp	https://youtu.be/KLxnrc7kAzk
34–36	Aggregate Functions, Relational Data Model, and Characteristics			https://www.geeksforgeeks.org/sql-aggregate-functions/	https://youtu.be/Wgi4Tx9WPHo
37–39	Relational Algebra and Types of Operations: Select, Project, Join, Union			https://www.javatpoint.com/dbms-relational-algebra	https://youtu.be/2NpOYn4krCM
40–42	Relational Calculus and Integrity Constraints			https://www.tutorialspoint.com/dbms/relational_calculus.htm	https://youtu.be/bQF7HWhs5RY
43–47	DBMS Normalization: Functional Dependencies, 1NF, 2NF, 3NF, BCNF			https://www.geeksforgeeks.org/normalization-in-dbms/	https://youtu.be/FGMdRT8-GCk
48–49	Higher Normal Forms: 4NF, 5NF, and 6NF			https://www.javatpoint.com/normalization-in-dbms	https://youtu.be/MLiXVbF7VOY
50-52	Transactions, Properties, Serializability, and Recoverability			https://www.tutorialspoint.com/dbms/dbms_transaction.htm	https://youtu.be/DROBlklLbyE

53-54	Backup, Recovery, and Deadlock in DBMS			https://www.geeksforgeeks.org/recovery-in-dbms/	https://youtu.be/qOJZTfd34PA
55–56	Database Security and Discretionary Access Control			https://www.tutorialspoint.com/dbms/dbms_data_security.htm	https://youtu.be/MAZ9v6CEGQw
57	Concurrency Control Techniques: Lock-Based, Timestamp, Validation-Based Protocols			https://www.geeksforgeeks.org/dbms-concurrency-control/	https://youtu.be/U29vpGI2XDY
58	Introduction to Distributed Databases and Their Advantages			https://www.javatpoint.com/distributed-database	https://youtu.be/5sk4DCkvpHk
59-60	Types of Distributed Databases: Homogeneous, Heterogeneous, Parallel DBMS			https://www.geeksforgeeks.org/distributed-database-system/	https://youtu.be/1cHIUvDUEko
61-62	NoSQL Databases: CAP Theorem, Data Models, MongoDB Overview			https://www.mongodb.com/nosql-explained	https://youtu.be/Wcu29zE1LCs
63-64	MongoDB Database and Collection Operations			https://www.mongodb.com/docs/manual/introduction/	https://youtu.be/h4f5mNZJbM0
65-66	MongoDB Queries: Insert, Update, Delete, Projection, Aggregation			https://www.w3schools.com/mongodb/	https://youtu.be/nmrj64wxjcA

9. Action plan for different types of learners

Slow Learners	Average Learners	Fast Learners
• Multiple Remedial Extra Classes • Encouragement for improvement using Peer Tutoring	• Doubt-sessions • Pre-coded algorithms to illustrate concepts and notions • E-notes and E-exercises to read in addition to pedagogic material	• More Practice assignments on real life problems • Engaging students to hold hands of slow learners by creating a Peer Tutoring Group • Participation in Hackathons, competitions.

10. Evaluation Scheme & Components:

Evaluation Component	Type of Component	No. of Assessments	Weightage of Component	Mode of Assessment
Component 1	Formative Assessments (FAs)	02*	20%	Online
Component 2	Subjective Test/Sessional Tests (STs)	02**	30%	ST1: Online ST2: Online
Component 3	End Term Examinations	01	50%	Offline
Total		**100%**		

*Out of 02 FAs, the ERP system automatically picks best of the 02 FAs Marks for evaluation of the FAs as final marks.

**ST1 and ST2 have average weightage of 30%.

11. Details of Evaluation Components:

Evaluation Component	Description	Syllabus Covered (%)	Timeline of Examination	Weightage (%)
Component 01	FA1	Up to 28%	Week 4	20%
	FA2	29%-40%	Week 9	
Component 02	ST 01	Upto 40%	Week 6	30%
	ST 02	40% - 80%	Week 13	
Component 03	End Term Examination*	100%	To be notified by Dean Examination	50%
Total				100%

*As per Academic Guidelines minimum 75% attendance is required to become eligible for appearing in the End Semester Examination

12. <u>Evaluation Components</u>

Type of Assessment	Timeline of Conduct	Total Marks	Question Paper Format			
			1 Mark MCQ	2 Mark MCQ/2 Mark Question	5 Mark Coding Question	10 Mark Coding Question
Formative Assessment 1	Week 4	20	10	5	0	0
Formative Assessment 2	Week 9	20	10	5	0	0
Sessional Test 1	Week 6	30	10	5	2	0
Sessional Test 2	Week 13	30	10	5	2	0
End Term Examination		50	10	5	4	1

13. <u>Syllabus of the Course:</u>

Subject: Database Management System	Subject Code: 22CS007

S.N.	Topic (s)	No. of Lectures	Weightage %

1	Introduction: Introduction to database and Characteristics of Database approach, Advantages and Disadvantages of DBMS approach, File system V/s Database system. DBMS three schema Architecture. Introduction to Data Models: Hierarchical Model, Network Model, ER Model, Relational Model. Schemas, Instances, Schema architecture and Data Independence, Client Server Architecture for DBMS, ACID Properties in DBMS. ER Model: Database design process, Entity Types, Entity sets, Attributes, keys, and their types Weak entity types. ER diagrams, naming convention, and design issues, E.F Codd Rules.	15	15%
2	Overview of the MySQL Query Language: Basic Structure of SQL Queries, Data types, and variables, MySQL database – create, select, show, drop, MySQL table – create, alter, show, rename, truncate, describe, drop, MySQL queries - insert records, update records, delete and select records, Set Operations, SQL clauses - WHERE, ORDER BY, GROUP BY, HAVING, MySQL conditions – AND, OR, NOT, Like, etc., Aggregate Functions.	15	20%
3	Relational Data Model: Rational model concept, Characteristics of relations, Relational Algebra, Types of Relational operation – select, project, union, set intersection, set difference, Cartesian product, rename operation. Join Operations – natural, outer, and equi-join. Integrity Constraint, Relational Calculus – Tuple relational calculus and Domain relational calculus. Normalization: Introduction to DBMS Normalization, Functional Dependencies (Fully, Transitive, Multi-valued, Join Dependencies)1st Normal Form, 2nd Normal Form, 3rd Normal Form, Boyce Codd Normal Form (BCNF), 4th Normal Form, 5th Normal Form & 6th Normal Form.	20	25%
4	Transaction Processing: Introduction to Transaction and its desirable properties, Transaction States, Testing of Serializability, Recoverability of Schedule, DBMS Backup and Recovery, Log-Based Recovery, DBMS Checkpoint, and Deadlock in DBMS. Introduction to Database Security, Discretionary access control based on granting and revoking privileges. Concurrency Control: Introduction to Concurrency Control Techniques, Lock-Based Protocol, Timestamp Ordering Protocol, Validation-Based Protocol. Distributed Databases: Introduction to distributed databases, Advantages, and Functions of distributed databases, Types of distributed databases Systems (Homogeneous and Heterogeneous), Parallel DBMS VS Distributed DBMS.	7	20%
5	NoSQL Databases: The CAP Theorem, NoSQL Data Models, MongoDB Overview, MongoDB Datatypes, Data Modelling in MongoDB, MongoDB - Create Database, Drop Database, Create Collection, Drop Collection, Insert Document, Query Document, Update Document, Delete Document, MongoDB ─ Projection, Limit Records, Sort Records, Indexing and Aggregation.	5	20%

This Document is approved by:

Designation	Name	Signature
Course Coordinator	Dr. Shruti Arora	
Program Head	Dr. Kamal Deep Garg	
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Date		