Academic Year: 2022-23	Semester:5th
Course Name: DBMS	Course Code:18CS53
Total Contact hours: 50	Credits:3
SEE Marks: 60; CIE:40	Total Marks: 100
Course Plan Author: Prema C	Date: 23/09/22

Course Prerequisites: basics of mathematics

Course Objectives:

This course (18CS53) will enable students to:

- Provide a strong foundation in database concepts, technology, and practice.
- Practice SQL programming through a variety of database problems.
- Demonstrate the use of concurrency and transactions in database
- Design and build database applications for real world problems.

Course Outcomes:

CO Number	Course Outcome At the end of the course, student should be able to . . .	Blooms' Level
CO1	Identify, analyze and define database objects,	L2
CO2	Enforce integrity constraints on a database using RDBMS.	L3
CO3	Use Structured Query Language (SQL) for database manipulation.	L3
CO4	Design and build simple database systems and to Develop application to interact with databases.	L3
CO5	Apply Transaction Processing ,Concurrency Control and Database Recovery in database Applications	L3

2. CO – PO Mapping

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	0	0	0	0	2	2	2	2	2	1	1
CO2	3	3	3	3	2	1	0	0	2	2	2	2	2	1	1
CO3	3	3	3	3	2	0	0	0	2	2	2	2	2	1	1
CO4	3	3	3	3	2	2	1	0	2	1	2	2	2	1	1
CO5	3	3	3	3	1	2	2	1	2	1	2	2	2	1	1

Program Outcome and Program Specific Outcome:

PO1	Engineering Knowledge;
PO2	Problem Analysis;
PO3	Design / Development of Solutions;
PO4	Conduct Investigations of Complex Problems;
PO5	Modern Tool Usage;
PO6	The Engineer and Society;
PO7	Environment and Sustainability;
PO8	Ethics;
PO9	Individual and Teamwork;
PO10	Communication;
PO11	Project Management and Finance;
PO12	Life-long Learning;
PSO1	Graduates will have the ability to adapt, contribute and innovate ideas in the field of Artificial Intelligence and Machine Learning
PSO2	To provide a concrete foundation and enrich their abilities to qualify for Employment, Higher studies and Research in various domains of Artificial Intelligence and Machine Learning such as Data Science, Computer Vision, Natural Language Processing with ethical values
PSO3	Graduates will acquire the practical proficiency with niche technologies and open source platforms and to become Entrepreneur in the domain of Artificial Intelligence and Machine Learning

Course Content (Syllabus) :

DATABASE MANAGEMENT SYSTEM (Effective from the academic year 2018 -2019) SEMESTER – V			
Subject Code	18CS53	**CIE Marks**	40
Number of Contact Hours/Week	3:2:0	**SEE Marks**	60
Total Number of Contact Hours	50	**Exam Hours**	3 Hrs
CREDITS –4			
Course Learning Objectives: This course will enable students to:			
• Provide a strong foundation in database concepts, technology, and practice. • Practice SQL programming through a variety of database problems. • Demonstrate the use of concurrency and transactions in database • Design and build database applications for real world problems.			
Module 1			**Contact Hours**

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. **Overview of Database Languages and Architectures:** Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. **Conceptual Data Modelling using Entities and Relationships:** Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples, Specialization and Generalization. **Textbook 1:Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10** **RBT: L1, L2, L3**	10
Module 2	
Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. **Relational Algebra:** Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. **Mapping Conceptual Design into a Logical Design:** Relational Database Design using ER-to-Relational mapping. **SQL:** SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL. **Textbook 1: Ch4.1 to 4.5, 5.1 to 5.3, 6.1 to 6.5, 8.1; Textbook 2: 3.5** **RBT: L1, L2, L3**	10
Module 3	
SQL: Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. **Database Application Development:** Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop. **Internet Applications:** The three-Tier application architecture, The presentation layer, The Middle Tier **Textbook 1: Ch7.1 to 7.4; Textbook 2: 6.1 to 6.6, 7.5 to 7.7.** **RBT: L1, L2, L3**	10
Module 4	
Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. **Normalization Algorithms:** Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms **Textbook 1: Ch14.1 to 14.7, 15.1 to 15.6**	10

RBT: L1, L2, L3	
Module 5	
Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. **Concurrency Control in Databases:** Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. **Introduction to Database Recovery Protocols:** Recovery Concepts, NO-UNDO/REDO recovery based on Deferred update, Recovery techniques based on immediate update, Shadow paging, Database backup and recovery from catastrophic failures **Textbook 1: 20.1 to 20.6, 21.1 to 21.7, 22.1 to 22.4, 22.7.** **RBT: L1, L2, L3**	10
Course Outcomes: The student will be able to :	
• Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS. • Use Structured Query Language (SQL) for database manipulation. • Design and build simple database systems • Develop application to interact with databases.	
Question Paper Pattern:	
• The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module.	
Textbooks:	
1. Fundamentals of Database Systems, RamezElmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson. 2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill	
Reference Books:	
1. SilberschatzKorth and Sudharshan, Database System Concepts, 6th Edition, Mc-GrawHill, 2013. 2. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.	

Schedule of Instruction:

S.NO	Class No	Module	Topic planned	Reference& Text Book, (Page no.)	Course Outcome	Delivery mode
1.			Introduction to DBMS		C01	ICT
2.	1		Introduction to Module-1		C01	ICT

3.	2	**Module : 1**	Introduction to Databases: Introduction, Characteristics of database approach.,	T1-4	C01	ICT
4.	3		Advantages of using the DBMS approach, History of database applications.	T1-17	C01	ICT
5.	4		Overview of Database Languages and Architectures:	T2-31	C01	ICT
6.	5		Data Models, Schemas, and Instances. Three schema architecture and data independence	T1-33	C01	ICT
7.	6		Database languages, and interfaces, The Database System environment.	T1-38	C01	ICT
8.	7		Conceptual Data Modelling using Entities and Relationships:	T1-59	C01	ICT
9.	8		Entity types, Entity sets, attributes, roles, and	T1-63	C01	ICT
10.	9		Structural constraints. Weak entity types	T1-79	C01	ICT
11.	10		ER diagrams, examples, Specialization and Generalization.	T1-81	C01	ICT
12.	11		Important Questions Discussion			
13.	1	**Module 2:**	**Module 2: Introduction**		C02	Black board
14.			**Relational Model**: Relational Model Concepts.	T1-150	C02	ICT
15.	1		Relational Model Constraints and relational database schemas,	T2-157	C02	ICT
16.	2		Update operations, transactions, and dealing with constraint violations	T2-165	C02	ICT
17.	4		**Relational Algebra:** Unary and Binary relational operations,	T1-241,251	C02	ICT
18.	5		Additional relational operations (aggregate, grouping, etc.)	T2-259	C02	ICT
19.	6		Examples of Queries in relational algebra.	T1-265	C02	ICT
20.	7		**Mapping Conceptual Design into a Logical Design:**	T1-289	C02	ICT
21.	8		Relational Database Design using ER-to-Relational mapping	T1-290 T2-75	C02	ICT
22.	9		**SQL:** SQL data definition and data types	T1-179	C02	ICT
23.	10		Specifying constraints in SQL,	T1-184	C02	ICT

24.	11		Retrieval queries in SQL,	T1-187	C02	ICT
25.	12		INSERT, DELETE, and UPDATE statements in SQL,	T1-198	C02	ICT
26.	13		Additional features of SQL.	T1-201	C02	ICT
27.		**Module 3:**	**Module 3 -Introduction**		C03	ICT
28.	1		**SQL: Advances Queries:**, Views in SQL,		C03	ICT
29.	2		More complex SQL retrieval queries	T1-207	C03	ICT
30.	3		Specifying constraints as assertions and action triggers	T1-225	C03	ICT
31.	4		Schema change statements in SQL.	T2-232	C03	ICT
32.	5		**Database Application Development:**	T2-187	C03	ICT
33.	6		Accessing databases from applications	T2-190	C03	ICT
34.	7		An introduction to JDBC	T2-194	C03	ICT
35.	8		JDBC classes and interfaces	T2-197	C03	ICT
36.	9		SQLJ	T2-206	C03	ICT
37.	10		Stored procedures, Case study: The internet Bookshop.	T2-209	C03	ICT
38.	11		**Internet Applications:** The three-Tier application architecture,	T2-236	C03	ICT
39.	12		The presentation layer, The Middle Tier	T2-240	C03	ICT
40.	13		Important Questions Discussion			Black board
41.		**Module 4:**	**Module 4: Introduction**		C04	Black board
42.	1		**Normalization: Database Design Theory** – Introduction to Normalization using Functional and Multivalued Dependencies:,	T1-459	C04	ICT
43.	3		Informal design guidelines for relation schema	T1-461	C04	ICT
44.	4		Functional Dependencies,	T1-471	C04	ICT
45.	5		Normal Forms based on Primary Keys,	T1-474	C04	ICT
46.	6		Second and Third Normal Forms,	T1-483	C04	ICT
47.	7		Boyce-Codd Normal Form,	T1-487	C04	ICT

48.	8		Multivalued Dependency and Fourth Normal Form	T1-491	C04	ICT
49.	9		Join Dependencies and Fifth Normal Form.	T1-494	C04	ICT
50.	10		**Normalization Algorithms:** Inference Rules, Equivalence, and Minimal Cover,	T1-505	C04	ICT
51.	11		Properties of Relational Decompositions,	T1-513	C04	ICT
52.	12		Algorithms for Relational Database Schema Design, Nulls,	T1-519	C04	ICT
53.	13		Dangling tuples, and alternate Relational Designs,	T1-523	C04	ICT
54.	14		Further discussion of Multivalued dependencies and 4NF,	T1-527	C04	ICT
55.	15		Other dependencies and Normal Forms	T1-530	C04	ICT
56.		**Module :5**	**Module :5**		C05	Black board
57.	1		**Transaction Processing:** Introduction to Transaction Processing, Transaction and System concepts.	T1-746	C05	ICT
58.	2		Desirable properties of Transactions	T1-757	C05	ICT
59.	3		Characterizing schedules based on recoverability	T1-759	C05	ICT
60.	4		Characterizing schedules based on Serializability	T1-763	C05	ICT
61.	5		**Concurrency Control in Databases:** Two-phase locking techniques for Concurrency control.	T1-782	C05	ICT
62.	6		Concurrency control based on Timestamp ordering	T1-792	C05	ICT
63.	7		Multiversion Concurrency control techniques	T1-795	C05	ICT
64.	8		Validation Concurrency control techniques,	T1-798	C05	ICT
65.	9		Granularity of Data items and Multiple Granularity Locking.	T1-800	C05	ICT
66.	10		**Introduction to Database Recovery Protocols:** Recovery Concepts,	T1-814	C05	ICT

67.	11		NO-UNDO/REDO recovery based on Deferred update,	T1-821	C05	ICT
68.	12		Recovery techniques based on immediate update,	T1-823	C05	ICT
69.	13		Shadow paging,	T1-826	C05	ICT
70.	14		Database backup	T1-832	C05	ICT
71.	15		Recovery from catastrophic failures	T1-832	C05	ICT

**L – Lecture, V- Videos or any other mode*

Textbooks	
T1	Fundamentals of Database Systems, RamezElmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
T2	Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill
Reference books	
R1	SilberschatzKorth and Sudharshan, Database System Concepts, 6th Edition, Mc-GrawHill, 2013.
R2	Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.

Web links and Video Lectures (e-Resources):	
1	https://sites.google.com/skit.org.in/prema-c-dept-of-aiml/home
2	https://www.javatpoint.com/dbms-tutorial
3	https://www.w3schools.in/dbms/intro
4	
5	

Assessment Schedule:

Sl.No.	Assessment type	Contents	CO	Duration In Hours	Marks	Date & Time
1	**CIE Test 1**	Module 1,2	CO1,CO2	01:15	30	
2	**CIE Test 2**	Module 3,4	CO3,CO4	01:15	30	
	CIE Test 3	Module 5	CO5	01:15	30	
3	**Assignment 1**	Module 1,2	CO1,CO2	-	10	
4	**Assignment 2**	Module 3,4	CO3,CO4	-	10	
5	**Seminar *(or any planned activtiy)***	Module 5	CO5	-	10	
6	**Semester End Examination**					

Seminar: Group of 6-8 students
Module 1,2,3,4 & 5

****The sum of total marks of three tests, two assignments, and seminar will be out of 100 marks and will be scaled down to 50 marks.**

CIE + SEE = 40 + 60 = 100 marks

Faculty In-charge DAC Chairman

*** Please mention as per the scheme.*