RV COLLEGE OF ENGINEERING®, Bengaluru

Lesson Plan

Cover Page: Course Overview

Semester: **V** Year: 2023-2024

Course Title: Introduction To Data Base Systems **(Theory and Practice)**	*Course Code*: **21CS52**
L:T:P:S 3:0:1:1	*Duration of SEE*: **3Hrs**
SEE Marks: ***150***	*CIE Marks*: ***150***
Lesson Plan Author: Dr. Shobha G, Dr.Sowmyarani, Dr. D.Pratiba.	*Date*: 03-12-2023
Checked By:	*Date*:

Pre-requisites: Programming Fundamentals, Data Structures, Discrete Mathematical Structures, and Operating Systems.

Course Overview:

The course introduces the need for database systems and its relevance in the current day applications. The course focuses on different levels of design of database systems viz conceptual level, user level, system level etc. It deals with specialized language for database creation, maintenance and use of databases. Database system components like concurrency subsystem, recovery system presented in the course gives the student an overall idea of database application design as well as system design. Students are made to design, implement and present the technical skills they have learnt in the miniproject.

Course Learning Objectives (CLO):

- Explore the evolution of the database systems from traditional file systems.
- Describe the major components of relational and NoSQL database system.
- Describe the functionality provided by languages such as SQL and NoSQL.
- Investigate the usage of transaction, concurrency control and recovery techniques.

Course Outcome (CO):

At the end of the course, the students should be able to:

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand and explore the needs and concepts of relational, NoSQL database and Distributed Architecture
CO2:	Apply the knowledge of logical database design principles to real time issues.
CO3:	Analyze and design data base systems using relational, NoSQL and Big Data concepts
CO4:	Develop applications using relational and NoSQL database
CO5:	Demonstrate database applications using various technologies.

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Course Content

Course Code: 21CS52

Course Title: Introduction To Data Base Systems **(Theory and Practice)** **CIE: 150**

Teaching Hours: 45 **Hrs** **SEE: 150**

Unit 1	
Introduction to Database Systems -Databases and Database users: Introduction, An example, Characteristics of Database Approach, Data Models, Schemas and Instances, Three-schema Architecture and Data Independence, The Database System Environment. **Data Modeling Using the Entity-Relationship Model-** High-Level Conceptual Data Models for Database Design; A Sample Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types.	**9 hrs**
Unit 2	
Refining the ER Design for the COMPANY Database; ER Diagrams, Naming Conventions and Design Issues, ER- to-Relational Mapping. **Relational Model and Relational Algebra-**Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations and Dealing with Constraint Violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION ; Examples of Queries in Relational Algebra.	**10 hrs**
Unit 3	
Introduction to SQL- SQL Data Definition, Specifying Constraints in SQL, Basic Queries in SQL; Insert, Delete and Update Statements in SQL More Complex SQL Retrieval Queries. **Relational Database Design -** Functional Dependencies – Definition, Inference Rules, Equivalence of sets of FD's, Minimal Set of FD's ; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Properties of Relational Decompositions.	**9 hrs**
Unit 4	
Transaction Processing Concepts- Introduction to transaction processing, Transaction states and additional operations, Desirable properties of transaction, Schedules of transactions. Characterizing schedules based on Serializability: Serial, Non serial and Conflict- Serializable schedules, Testing for Conflict serializability of schedule, **Concurrency Control Techniques:** Two phase locking techniques for concurrency control, types of locks and system lock tables.	**9 hrs**
Unit 5	
Introduction to NoSQL: Aggregate data models: aggregates, key-value and document data models. Distribution models: sharding , master-slave replication, peer-peer replication – combining sharding and replication. Big Data : Types of data: Structured, semi structured, unstructured. Distributed Architectures : Hadoop, spark.	**8 hrs**

Reference Books	
1.	Elmasri and Navathe: Fundamentals of Database Systems, 6 th Edition, Pearson Education, 2011, ISBN-13: 978-0136086208.
2.	Pramod J Sdalage, Martin Fowler: NoSQL A brief guide to the emerging world of Polyglot Persistence, Addison-Wesley, 2012, ISBN 978-0-321-82662-6,
3.	Raghu Ramakrishnan and Johannes Gehrke : Database Management Systems, 3thEdition, McGraw-Hill, 2003 ISBN : 978-0072465631.
4.	Hadoop – Additional Reading

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Unit and Chapter wise Plan

Unit 1

Course Code and Title: Introduction to Database Systems **(Theory and Practice)**	
Chapter Number and Title: **1. Introduction to Database Systems**	*Planned Hours: **4*** **hrs**

Learning Objectives:

Sl. No.	Objectives
1	Understand the fundamentals of database technology.
2	Identify the roles and responsibilities of different users involved in the design of database.
3	Discuss the concept of DBMS Three-schema Architecture.
4	Explains about various models to conceptualize and depict a database system.

Lesson Schedule

Class No. Portion covered per hour

1. Definition of database and Characteristics of Database Approach
2. Actors on the scene, Workers behind the scene
3. Data Models, Schemas and Instances
4. Database Languages , Interfaces and Database System Environment

Model Questions

1. What are the different types of database end users? Discuss the main activities of each.
2. Discuss the main characteristics of the database approach and how it differs from traditional file systems.
3. Consider an example such as management of data in a real estate application. Show the different elements of data that would need to be stored and explain the factors such as inconsistency and protection in that context.
4. Explain the various functional components of a DBMS with the help of suitable diagram.

Course Code and Title: **Introduction to Database Systems** **(Theory and Practice)**	
Chapter Number and Title: 2. **Data Modeling Using the Entity-Relationship Model**	*Planned Hours: **3*** **hrs**

Learning Objectives:

Sl. No.	Objectives
1	Understand the categories of data models.
2	Define Entity Types and Entity Sets
3	Identify the Attributes , Keys and Relationship types
4	Discuss about Strong and Weak entity types.

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Lesson Schedule

Class No. Portion covered per hour

1. Design of database using High-Level Conceptual Data Models.
2. Entity Types, Entity Sets, Attributes and Keys.
3. Relationship Types, Relationship Sets, Roles and Structural Constraints and an example database application.

Model Questions

1. What is Weak Entity set?
2. What is an entity type? What is an entity set? Explain the differences among an entity, an entity type and an entity set.
3. Differentiate between Intension and Extension of entity type.
4. What is meant by a recursive relationship type?

Unit 2

Course Code and Title: Introduction to Database Systems **(Theory and Practice)**	
Chapter Number and Title: **3. Refining the ER Design for the COMPANY Database**	*Planned Hours: **3*** **hrs**

Learning Objectives:

Sl. No.	Objectives
1	Understand the ER Diagrams, Naming Conventions and its Design Issues
2	Discuss the concept of ER- to-Relational Mapping.

Lesson Schedule

Class No. Portion covered per hour

1. ER Schema for different databases.
2. Different steps involved in the mapping of ER to Relational.
3. Different examples for converting the ER diagram to Relational model.

Model Questions

1. Consider the requirements for a Blood Bank Management System and draw an ER diagram for this application.
2. Discuss the naming conventions used for ER schema diagrams.

Course Code and Title: Introduction to Database Systems **(Theory and Practice)**	
Chapter Number and Title: ***4.* Relational Model and Relational Algebra**	*Planned Hours: **5*** **hrs**

Learning Objectives:

Sl. No.	Objectives
1	Understand the concept of Relational Model and its Constraints
2	Discuss the different Relational Operations with examples of queries in Relational Algebra

3	Identify the Relational Algebra Operations from Set Theory
4	Design of a relational database

Lesson Schedule

Class No. Portion covered per hour

1. Relational Model, contraints and Relational Database Schemas
2. Unary Relational Operations: SELECT and PROJECT
3. Relational Algebra Operations from Set Theory
4. Binary Relational Operations: JOIN and DIVISION
5. Examples of Queries in Relational Algebra

Model Questions

1. What is Relational Algebra?
2. Generate the relational algebra for the following queries considering the following tables of a database.

   Hotel(hotelNo,hotelName,city)

   Room(roomNo,hotelNo,type,price)

   Booking(hotelNo,guestNo,dateFrom,dateTo,roomNo)

   Guest(guestNo,guestName,guestAddress)

   - List all single rooms with a price below Rs.2000 per night.
   - List the names and address of all guests.
   - List the price and type of all rooms at the Sagar hotel.
   - List all guests currently staying at the Sagar hotel.
3. Discuss the DIVISION operation. How is it represented, and what are the requirements of the numerator and denominator relations? Explain with an example.
4. Differentiate between Left Outer Join and Right Outer Join operations with an example.

Unit 3

Course Code and Title: **Introduction to Database Systems(Theory and Practice)**	
Chapter Number and Title: **5. SQL Schema Definition, Basic Constraints and Queries**	*Planned Hours: **4*** **hrs**

Learning Objectives:

Sl. No.	Objectives
1	Gives an introduction to SQL and Constraints in SQL
2	Understand the basic and complex Queries in SQL.
3	Discuss the different statements in SQL to perform various operations.

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Lesson Schedule

Class No. Portion covered per hour

1. SQL Data Definition and Schema Change Statements in SQL.
2. Simple and complex Queries in SQL.
3. Different operations in SQL.
4. Perform different operations by writing queries considering database applications.

Model Questions

1. What are the basic data types available for attributes in SQL?
2. Explain how the GROUP BY clause works? What is the difference between WHERE and HAVING clause?
3. Discuss the DROP and ALTER command in SQL.

Course Code and Title Introduction to Database Systems **(Theory and Practice)**	
Chapter Number and Title: **6. Relational Database Design**	*Planned Hours: **4*** **hrs**

Learning Objectives:

Sl. No.	Objectives
1	Understand the Concept of Functional Dependency
2	Gives an idea about normalization of relational database
3	Apply the concept of 1^{st},2^{nd},3^{rd}, Boyce-Codd
4	Identify the Properties of Relational Decompositions.

Lesson Schedule

Class No. Portion covered per hour

1. Definition of Functional Dependency.
2. Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms.
3. Concept of Multivalued Dependencies and Boyce-Codd Normal Form.
4. Fifth Normal Form and Properties of Relational Decompositions.

Model Questions

1. What is normalization and Functional Dependency?
2. Differentiate between 2NF and 3NF with examples.
3. What is BCNF (Boyce-Codd Normal Form)?
4. What is Lossless join property?

Unit 4

Course Code and Title: **Introduction to Database Systems(Theory and Practice)**	
Chapter Number and Title: **7. Transaction Processing Concepts**	*Planned Hours: **4*** **hrs**

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Learning Objectives:

Sl. No.	Objectives
1	Gives an Introduction to transaction processing.
2	Understand the desirable properties and schedules of transaction.
3	Explains about Characterizing schedules based on Recoverability and Serializability.
4	Identify the advantages of serializability.

Lesson Schedule

Class No. Portion covered per hour

1. Definition of Transaction, its states and properties of Transaction
2. Characterizing schedules based on Recoverability and Serializability
3. Testing for Conflict serializability of schedule
4. Uses of serializability.

Model Questions

1. List out the desirable properties of transactions.
2. Differentiate between serial and nonserial schedules.
3. Draw the precedence graph for the following schedule. Show whether the given schedule is conflict serializable or not.

T1	T2	T3
R(A)		
	W(A)	
	Commit	
W(A)		
Commit		
		W(A)
		Commit

Course Code and Title: Introduction to Database Systems **(Theory and Practice)**	
Chapter Number and Title: **8. Concurrency Control Techniques**	*Planned Hours: **4*** **hrs**

Learning Objectives:

Sl. No.	Objectives
1	Understand the Two phase locking techniques for concurrency control.
2	Discuss the types of locks and system lock tables.
3	Apply two-phase locking to guarantee serializability.
4	Describe the concept of Deadlock and Starvation.

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Lesson Schedule

Class No. Portion covered per hour

1. Two phase locking techniques for concurrency control, types of locks and system lock tables
2. Guaranteeing serializability by two-phase locking
3. Dealing with Deadlock and starvation.
4. Concurrency control based on timestamp ordering.

Model Questions

1. How does a DBMS detect and resolve deadlocks?
2. Briefly explain the three main principles of the ARIES recovery algorithm.
3. Explain the concept of Concurrency control based on timestamp ordering
4. Discuss the techniques of Two phase locking.

Unit 5

Course Code and Title: Introduction to Database Systems **(Theory and Practice)**	
Chapter Number and Title: **9 Introduction to NoSQL**: Aggregate data models: aggregates, key-value and document data models. Distribution models: sharding , master-slave replication, peer-peer replication – combining sharding and replication. Big Data : Types of data: Structured, semi structured, unstructured. Distributed Architectures : Hadoop, spark.	*Planned Hours: **3*** **hrs**

Learning Objectives:

Sl. No.	Objectives
1	Understand the necessity of NoSql.
2	Describe the Distributed Architectures

Lesson Schedule

Class No. Portion covered per hour

1. Necessity of NoSql.
2. Different types of data
3. Hadoop, Spark

Model Questions

1. Briefly explain with examples different types of data
2. Differentiate between parallel and distributed architectures
3. Demonstrate Hadoop Architecture

Course Code and Title: Introduction to Database Systems **(Theory and Practice)**	
Chapter Number and Title: **10. Introduction to NoSQL**	*Planned Hours: **5*** **hrs**

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Learning Objectives:

Sl. No.	Objectives
1	Understand the concept of different data models(Aggregate and Document Data Models)
2	Describe the concept of Graph databases and Schema less databases.
3	Explain different distribution Design of Document-oriented Data models.

Lesson Schedule

Class No. Portion covered per hour

1. Aggregate and Document Data Models.
2. Concept of Graph databases with an example graph structure.
3. Schema less databases.
4. Sharding and Master-Slave Replication.
5. Peer-Peer Replication and combining Sharding & Replication.

Model Questions

1. List and explain the key features of NO SQL database.
2. Explain the concept of Sharding for distribution model.
3. Illustrate with a neat diagram the concept of master-slave replication in distribution model.
4. How combining Sharding and Replication help in achieving resilience and scalability in distribution models.
5. List out the key features of schema less databases.

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LESSON PLAN

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Sl. No	Main Topic	Sub Topic	No.of Hrs	Activity & Materials to be used	Book Referred
1.	**Introduction to Database Systems**	Databases and Database users: Introduction, An example, Characteristics of Database Approach,	01	Lecture(Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:3
		Actors on the scene, Workers behind the scene	01	Lecture(Black Board) ROLE PLAY (AL)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:14
		Database System-Concepts and Architecture: Data Models, Schemas and Instances	01	Lecture(Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:29
		Three-schema Architecture and Data Independence, The Database System Environment.	01	Lecture(Black Board	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:33
2.	**Data Modeling Using the Entity-Relationship Model**	Using High-Level Conceptual Data Models for Database Design; An Example Database Application.	01	Blended Learning(Video) https://www.youtube.com/watch?v=c0_9Y8QAstg	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:59
		Entity Types, Entity Sets	01	Blended Learning(Video) https://www.youtube.com/watch?v=c0_9Y8QAstg	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:61
		Attributes and Keys Relationship types, Relationship Sets, Roles and structural constraints, Weak Entity Types	01	Blended Learning(Video) https://www.youtube.com/watch?v=c0_9Y8QAstg Blended Learning(Video) https://www.youtube.com/watch?v=c0_9Y8QAstg	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page Nos:61,70,76
3.	**Refining the ER Design for the COMPANY Database**	ER Diagrams, Naming Conventions and Design Issues	01	THINK-PAIR-SHARE (TPS)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:79
		Using ER- to-Relational Mapping	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:79

		Different Examples for converting the ER diagram to Relational Model.	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:79
4.	**Relational Model and Relational Algebra**	Relational Model Concepts; Relational Model Constraints and Relational Database Schemas	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:146
		Update Operations and Dealing with Constraint Violations; Unary Relational Operations: SELECT and PROJECT;	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:161
		Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION	01	Blended Learning(Video) https://www.youtube.com/watch?v=TbQnH-RC1S4	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:180
		Additional Relational Operations; Examples of Queries in Relational Algebra	01	Blended Learning(Video) https://www.youtube.com/watch?v=TbQnH-RC1S4	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:192
		Relational Database Design Using ER- to-Relational Mapping.	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:199
5.	**SQL Schema Definition, Basic Constraints and Queries**	SQL Data Definition, Specifying Basic Constraints in SQL, Schema Change Statements in SQL.	01	PBL (Project Based Learning)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:245
		Basic Queries in SQL; More Complex SQL Queries	01	PBL(Project Based Learning)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:255
		Insert, Delete and Update Statements in SQL.	01	PBL (Project Based Learning)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:281
		Examples of Queries by considering some database applications.	01	PBL (Project Based Learning)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:281

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6.	**Relational Database Design**	Functional Dependencies; Normal Forms Based on Primary Keys.	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:349
		General Definitions of Second and Third Normal Forms.	01	Tool Based Learning http://www.ict.griffith.edu.au/~jw/normalization/index.html	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:367
		Properties of Relational Decompositions.	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:382
		Multivalued Dependencies and Boyce-Codd Normal Form; and Fifth Normal Form	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:398
	Transaction Processing Concepts	Introduction to transaction processing, Transaction states and additional operations, Desirable properties of transaction, Schedules of transactions	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:612
		Characterizing schedules based on Recoverability, Characterizing schedules based on Serializability: Serial, Nonserial and Conflict-Serializable schedules	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:623
		Testing for Conflict serializability of schedule	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:630
		Uses of serializability.	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:633
	Concurrency Control	Two phase locking techniques for concurrency control, types of locks and system lock tables	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:644
		Guaranteeing serializability by two-phase locking.	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:648

		Dealing with Deadlock and starvation	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:651
		Concurrency control based on timestamp ordering	01	Lecture (PPT, Black Board)	**Elmasri and Navathe**: *Fundamentals of Database Systems* Page No:654
9.	**Introduction to NoSql**	Aggregate and Document Data Models	01	Lecture (PPT, Black Board)	**Pramod J.Sadalage:** *NoSQL A brief guide to the Emerging World of Polygot Persistence* Page No:26
		Concept of Graph databases with an example graph structure	01	Lecture (PPT, Black Board)	**Pramod J.Sadalage:** *NoSQL A brief guide to the Emerging World of Polygot Persistence* Page No:26
		Schema less databases	01	Lecture (PPT, Black Board)	**Pramod J.Sadalage:** *NoSQL A brief guide to the Emerging World of Polygot Persistence* Page No:26
10.	**Distributed Architectures / Big data**	Different types of data	01	Lecture (PPT, Black Board)	Additional reading
		Distributed Architectures	01	Lecture (PPT, Black Board)	Additional reading
		Hadoop	01	Lecture (PPT, Black Board)	Additional reading

Evaluation Scheme

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. **TWO QUIZZES** will be conducted & Each Quiz will be evaluated for 10 Marks adding up to 20 Marks. **THE SUM OF TWO QUIZZES WILL BE CONSIDERED AS FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test consisting of descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). **TWO TESTS** will be conducted. Each test will be evaluated for 50 Marks, adding up to 100 Marks. **FINAL TEST MARKS**	**40**

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	WILL BE REDUCED TO 40 MARKS.	
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (20) & Phase II (20) ADDING UPTO 40 MARKS**.	**40**
4.	**LAB:** Conduction of laboratory exercises, lab report, observation, and analysis (30 Marks),lab test (10 Marks) and Innovative Experiment/ Concept Design and Implementation (10 Marks) adding up to 50 Marks**. THE FINAL MARKS WILL BE 50 MARKS**	**50**
	MAXIMUM MARKS FOR THE CIE THEORY	**150**

Course Unitization for Internals and Semester End Examination

Sl. NO	Chapter		Teaching Hours	No. of Questions in			No. of Questions in SEE
				Internals I	Internals II	Internals III	
1	UNIT I	Introduction to Database Systems	4	1			1
2		Entity-Relationship Model	3	2			
3	UNIT II	ER Diagrams	3	1			1
4		Relational Model and Relational Algebra	5	1	1		1
5	UNIT III	SQL: Schema Definition, Basic Constraints and Queries	4		1		1
6		Relational Database Design	4		2		1
7	UNIT IV	Transaction Processing Concepts	4		1		1
8		Concurrency Control	4			2	
9	UNIT V	Introduction to NoSQL	3			1	1
10			5			2	

Self Study Rubrics 2019-20

Student will design, develop and implement an application using the appropriate Database concepts. The Open-Ended learning in the course Introduction to Database Systems (18CS52) is demonstrated by development of a Database application with neat UI.

These Open-Ended experiments are evaluated using following Rubrics

RUBRIC for Self Study IDBS (21CS52) PHASE-I Presentation					
Sl no	**Criteria**	**Excellent**	**Good**	**Poor**	**Score**

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1	**Problem Formulation and Requirement Specification (2 Marks) CO1**	Identified the problem with clear insight of challenges involved	Identified the problem with clear insight of challenges involved with adequate insight and focus.	Identified the problem with clear insight of challenges involved with minimal insight and focus	
		(2)	(1-2)	(1)	
2	**Problem Objective Specification (2 Marks) CO2**	Through Identification of clear Objectives and its scope	Adequate Identification of clear Objectives and its scope	Inadequate Identification of clear Objectives and its scope	
		(2)	(1-2)	(1)	
3	**Architectural Design Formulation (4 marks) CO3**	Identification of the design goals and its scope in complete (Detailed design aspects must be presented)	Adequate design challenges are identified with limited scope	Adequate design challenges are identified with no scope	
		(4)	(2-3)	(1)	
4	**Design Documentation and Presentation (2 marks) CO2**	Exhibits skillful use of language, including effective word choice, clarity, complete references	Exhibits good use of language, including some mastery of word choice, clarity	Exhibits ineffective use of language, including weak word choice, limited clarity,	
		(2)	(1-2)	(1)	

RUBRIC for Self Study DBD (18CS53) PHASE-II Presentation				
Criteria	**Excellent**	**Good**	**Poor**	**Score**
Selection of appropriate tools, skills and techniques in solving the problem (2 Marks) CO1	Student exhibits thorough usage of appropriate tools, skills and techniques in solving the problem**.**	Student exhibits adequate usage of appropriate tools, skills and techniques in solving the problem**.**	Student exhibits inadequate usage of appropriate tools, skills and techniques in solving the problem**.**	
	(2)	(1-2)	(1)	
Application Implementation and Demonstration (4 Marks) CO4	Confident, clear, good demo of working prototype	Clear, good demo of working prototype	Only ideas but no practical aspect.	
	(4)	(2-3)	(1)	
Results and Documentation, Report (2 Marks) CO3	Clear, effective, and well organized presentation followed by individual report.	Generally effective presentation with some difficulty in explaining key points and neat report.	Inadequate presentation and moderate report.	
	(2)	(1-2)	(1)	
Team Work Dynamics (2 Marks) CO2	Team Members are actively involved and motivated	Team Members are participating but still needs co-ordination	Few Team Members are participating and others are passive	
	(2)	(1-2)	(1)	

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ASSESSMENT METHODS

	What		To whom	Frequency of conduction	Max Marks	Evidence	Contribution to Course Outcome		
Direct Assessment Methods	CIE	Quiz	Students	two	20	Answer Scripts	80%	100%	90%
		Test		two	50				
		Self-study		2 phases	40	Reports / Record Books			
		Laboratory		Weekly	50				
	SEE	Semester End Examination		End of every semester Consisting of Part-A and Part-B	100	Answer Scripts	20%		
		Semester End Laboratory		End of every semester laboratory	50				
Indirect Assessment methods	Course End Survey		Students	End of course		Questionnaire Based on COs	10%		

Note: Individual faculty may adopt various methods for conducting effective quizzes and evaluate the same. The frequency of quizzes may be more than three also.

Course Articulation Matrix

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CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	1	-	-	-	-	-	-	1	1	-	2
CO2	-	1	1	1	1	-	1	-	1	2	-	2
CO3	2	2	2	2	2	-	1	1	2	2	1	2
CO4	2	2	3	2	3	-	-	2	3	3	2	1

Course - PO Mapping												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
Course	1	2	2	1	2	-	1	1	2	2	1	2

CO –PSO Mapping		
CO/PSO	**PSO1**	**PSO2**
CO1	1	2
CO2	2	2
CO3	2	2
CO4	2	2

Course – PSO Mapping		
	PSO1	**PSO2**
Course	2	2

ONLINE QUIZ for ACTIVE LEARNING:

Objectives:

- To familiarize the students in electronic form of quizzing, and thereby making it as an assessment tool for teaching and learning.
- To test the finer analyzing skills of the students in the subject of Database design.
- To create awareness on attending the strictly time-bound quizzes, using the CMS (Course Management System) such as Moodle.
- To enable the students to do peer-discussions and learning, by asking aptitudinal strong questions in the present subject.

The quiz will be conducted for 10 marks for the duration of 20 minutes, without any negative marking, and the software-based evaluation was done immediately.

ACTIVE LEARNING ACTIVITY

Out_of_class Activity Design-1:

After watching the video, students should be able to understand

- Database design using High level Conceptual Data Models
- Entity Types, EntitySets, Attributes and Keys
- Relationship types, Releationship Sets
- Roles and Structural Constraints
- Weak Entity types
- Various Relational Algebra Operations
- Different Normal Forms for relational database design.

Note: All the video links are included in the lesson plan.

In_Class Activity Design-1:

Role Play Activity:

Topic: Actors on the Scene and Workers behind the scene

In this, students will form the group and they will act different roles of the database users, so that they will understand the responsibility of the different users involved in the design of database for real time applications.

In_Class Activity Design-2:

Think-Pair-Share (TPS) Activity:

Topic: ER Diagram for various databases

Think Phase - [3 minutes]

Question: Give real time database to draw ER Diagram

What Teacher does - Poses the question, asks students to think individually and write the answer

What students do - **Thinks individually and frame the design**

Pair Phase - [7 minutes]

Question: Discuss your answer with your neighbor

What Teacher does - Poses the question, asks students to pair up and discuss, goes around the class to check whether students are discussing, and provides clues to pairs who are in doubt.

What students does - Pairs up with neighbor, Checks each other's result by verifying that the design is proper or not.

Share Phase - [5 minutes]

What Student Does – Shares the result with whole class.

What Teacher Does - **Note down the correct answer in the board, summarizes the key concepts involved in the design.**

Out_of_class Activity Design-2:

Tool –Based Learning:

URL: http://www.ict.griffith.edu.au/~jw/normalization/index.html

Students will access the tool designed to work on with given schema/relation/FDs:

- Finding a minimal cover
- Finding all Candidate Keys
- Check normal form
- Normalize to 2NF
- Normalize to 3NF method 1
- Normalize to 3NF method 2
- Normalize to BCNF

Laboratory Component
PART-A
Open Ended Mini Project should be implemented and shall be carried out in a batch of two students. The students will finalize a topic in consultation with the faculty. The mini project must be carried out in the college only. The Mini Project tasks would involve: • Understand the complete domain knowledge of application and derive the complete data requirement specification of the Mini Project • Design of the project with Integrated database solution (SQL and NOSQL) • Normalization of the Relational design up to 3NF (Desirable 5NF). • Appreciate the importance of security for database systems. • Documentation and submission of report. • Recent Trends used (Blockchain, NLP, AI, ML, AR, VR etc) and Societal Concern issues addressed **General Guidelines :** • Database management for the project- MySQL, DB2, Oracle, SQL Server, MongoDB (Any NoSQL DB) server. • Front End for the project – Java , VC++, C#, Python , Web Interface (HTML, Java Script) • Use database Programming such as Embedded SQL,/Dynamic SQL/SQLJ, PL/SQL