KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY (KIIT)
(Deemed to be University)

SCHOOL OF COMPUTER ENGINEERING

SPRING SEMESTER 2024

Course Handout

1. **Course Code: CS20006**
2. **Course title: Database Management System**
3. **L-T-P Structure: 3-0-0**
4. **Course Coordinator: Mr. Vishal Meena**
5. **Course Co-Coordinator: Dr. Pradeep Kumar Mallick**
6. **Course Instructor: Mr. Kunal Anand**
7. **Contact hours per week : 3**
8. **Course Objective(s):** Databases are fundamental to much of business and commerce. Database management systems control access to databases. Some people design and build databases. Other people design and build database management systems. People in a third category use database management systems to access the data in databases. The purpose of a database management system is to store and transform data into information to support making decisions.

9. **Course (learning) outcomes:** At the end of the course, the students will get:

	Course Outcomes	Modules
CO1	Ability to apply database systems and its applications	Module#1
CO2	Ability to conceptualize a database system using ER and EER diagrams.	Module#1
CO3	Ability to construct the Database using relational algebra, and SQL.	Module#2
CO4	Ability to identify Primary key and other keys using functional dependencies and design the database using normalization.	Module#3
CO5	Ability to implement Transaction processing for controlling the concurrent data access and data recovery schemes	Module#4
CO6	Ability to use database storage access techniques including indexing methods	Module#5

10. Course Contents

Unit	Name	Details
1	Introduction and E/R Model	Purpose of Database System, Views of data, Data Models, Database Languages, Database System Architecture, Components of DBMS, Entity Relationship model (E-R model), E-R Diagram notation, EER notations, Examples.
2	Relational Model	Relational Data Model, Concept of relations, Schema-instance distinction, keys, integrity rules, Relational algebra operators, SQL: Data definition, Data manipulation, Aggregate function, Null Values, Nested sub queries, Joined relations.
3	Database Design	Dependencies and Normal forms, Dependency theory, Functional dependencies, Armstrong's axioms for FD's, Closure of a set of FD's, minimal covers, Definitions of 1NF, 2NF, 3NF and BCNF, 4NF, 5NF, Decompositions and desirable properties of them.
4	Transaction Management	ACID properties, Serializability and concurrency control, Lock based concurrency control (2PL), Timestamp ordering protocol, Database recovery management.
5	Implementation Techniques	Overview of Physical Storage Media, RAID, Ordered Indices, primary, Secondary index structures, Multi-level indexes, B trees and B+ trees.

11. Day-wise Lesson Plan

Unit	Module	Topics	Days
1	Introduction and E/R Model	- General introduction to database systems - Database- DBMS distinction, Approaches to building a database - Data models - Three-schema architecture of a database - Challenges in building a DBMS, Various components of a DBMS - Conceptual data modeling – motivation - Entities, Entity sets, Various types of attributes - Relationships, Relationship types - Types of Entity sets, Participation Constraints - E/R diagram notation, Examples - Extended E/R Model, Examples - Converting the database specification in E/R and extended E/R notation to the relational schema **Activity-1**	13

2	Relational Data Model	- Relational Data Model, Concept of relations, Schema-instance distinction, - keys, integrity rules, Relational algebra operators, - SQL: Data definition, Data manipulation - Aggregate function, Null Values, Nested sub queries, join relations. **Activity-2**	5
3	Relational Database Design	- Dependencies and Normal Forms, Importance of a good schema design, Problems encountered with bad schema designs, - Dependency theory – functional dependencies, Armstrong's axioms for FD's, - Closure of a set of FD's - Minimal covers and example **----------MID Term -----------** - Motivation for normal forms 1NF, 2NF, 3NF - BCNF - Decompositions and desirable properties of them, Multi-valued dependencies and 4NF, - Join dependencies and definition of 5NF, denormalization **Activity-3**	10
4	Transaction Processing and Error Recovery	- Concepts of transaction processing - ACID properties - Concurrency control - Serializability and types of serializability and practicing problems - Locking based protocols(2PL) - Time stamp based protocol - Error recovery and logging - Undo, Redo, Undo-redo logging and recovery methods **Activity-4**	9
5	Data Storage and Indexes	- Overview of Physical Storage Media, RAID - Primary, Secondary Index structures - Multi-level indexes, B trees, B+ trees **Activity-5**	5

12. Text books

- T1: Fundamentals of Database System By R. Elmasari & S.B. Navathe, 7th Edition, 2018, Pearson Education.

- T2: Database System Concepts by A. Silberschatz, H.F. Korth & S. Sudarshan, 7th Edition, 2019, McGraw- Hill Education.

13. Reference books

R1: Database Management Systems by R. RamaKrishna & J. Gehrke, 3rd Edition, 2018, McGraw-Hill Education.

R2: Database System Concepts by P. Rob & C. M. Coronel, Indian Edition, 2011, Cengage Learning.

R3: Fundamentals of Relational Database management Systems by S. Sumathi & S. Esakkirajan, 2007, Springer.

14. Assessment components:

S No.	Internal/Sessional	Assessment Component	Weightage / Marks
1	Internal (50 Marks)	Activity based Learning	30
		Mid Semester Exam	20
2	End Semester (50 Marks)	End Semester Exam	50

15. Activity Components (Internal Assessment) and Activity CO Mapping

Act#	Details	CO#
1	MCQ Test on Fundamentals of Database	1, 2
2	E/R Diagram Design Question	2
3	MCQ Test on Querying Languages	3
4	Problem solving on Normalization	4
5	MCQ Test on Normalization, Transaction Processing & Indexing	4, 5, 6
6	Group Projects	2, 3, 4

16. **Attendance:** Every student is expected to be regular (in attendance) in all lecture classes, tutorials, labs, tests, quizzes, seminars etc and in fulfilling all tasks assigned to him / her. Attendance will be recorded and 75% attendance is compulsory.

17. **Additional consultation hour for doubts clarification:**

Tuesday to Saturday (6 PM to 6:30 PM);

F14, Block-A, Campus-15

18. **Notices:** All notices regarding the course will be communicated through online systems (email and WhatsApp etc).