SCHOOL OF COMPUTER ENGINEERING
KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY (KIIT)
(Deemed to be University)
SPRING SEMESTER 2025
DBMS Course Handout

Course Details

Program(s)	Subject Name	Academic Session, Semester	Subject Code & Credit		L-T-P
B.Tech.	**Database Management System (DBMS)**	Spring, 2025 , 4th Semester	**CS20006**	**Cr-3**	**3-0-0**

Faculty

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Course Objectives

The objective of the course is to introduce the core principles and techniques required for the design and development of database systems. This course focuses on design of relational database system starting from the analysis to the design using ER model and normalization techniques. It also covers accessing data using query languages. In addition to this it covers the essential DBMS concepts such as transaction processing, concurrency control and recovery to the storage structure and the indexing techniques used.

Syllabus

Module#	Module 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.

Course (Learning) Outcomes

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

CO#	Course Outcomes	Modules	Cognitive Learning Level
CO1	Demonstrate basic elements of database management systems.	Module #1	Learning Level-3 (Apply)
CO2	Conceptualize a relational database system of simple database application scenarios using ER & EER model.	Module #1	Learning Level-4 (Analyse)
CO3	Construct relational database and solve database queries using relational algebra and SQL.	Module #2	Learning Level-3 (Apply)
CO4	Solve problems on functional dependencies and design database systems using normalization.	Module #3	Learning Level-6 (Create)
CO5	Assess transaction processing for controlling the concurrent data access and data recovery schemes.	Module #4	Learning Level-5 (Evaluate)
CO6	Use database storage access techniques including indexing methods.	Module #5	Learning Level-3 (Apply)

Day wise Lesson Plan

Unit#	Module Name	Topics	Number of 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	13
	CO-1: Able to demonstrate basic elements of database management systems.		
	ACTIVITY-1		
		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	
	CO-2: Able to conceptualize a relational database system of simple database application scenarios using ER model.		
	ACTIVITY-2		
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.	5
	CO-3: Ability to construct relational database and solve database queries using relational algebra and SQL.		
	ACTIVITY-3		

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	10
MID SEMESTER EXAMINATION (17-2-2025 to 22-2-2025)			
		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, De-Normalization	
	CO-4: Able to solve problems on functional dependencies and design database systems using normalization.		
	ACTIVITY-4		
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 Activity4	9
	CO-5: Able to assess transaction processing for controlling the concurrent data access and data recovery schemes.		
	ACTIVITY-5		
5	Data Storage and Indexes	Overview of Physical Storage Media, RAID Primary, Secondary Index structures Multi-level indexes, B trees, B+ trees	5
	CO-6: Able to use database storage access techniques including indexing methods.		
	ACTIVITY-6		
END SEMESTER EXAMINATION (12-4-2025 to 22-4-2025)			

Text Book

1. T1: Fundamentals of Database System By R. Elmasari & S.B. Navathe, 7th Edition, 2018, Pearson Education.
2. T2: Database System Concepts by A. Silberschatz, H.F. Korth & S. Sudarshan, 7th Edition, 2019, McGraw- Hill Education.

Reference Book

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

2. R2: Database System Concepts by P. Rob & C. M. Coronel, Indian Edition, 2011, Cengage Learning.
3. R3: Fundamentals of Relational Database management Systems by S. Sumathi & S. Esakkirajan, 2007, Springer.

Assessment Components

Serial#	Internal / Sessional	Assessment Component	Weightage / Marks
1	**Internal (50 Marks)**	Activity-1	05
		Activity-2	05
		Activity-3	05
		Activity-4	05
		Activity-5	05
		Activity-6	05
		Continuous Evaluation	**30**
		Mid Semester Exam	**20**
2	**End Semester (50 Marks)**	**End Semester Exam**	**50**

Activity Components & CO Mapping

Activity Number	Details	CO#
1	MCQ/Class-Test/Assignments on Fundamentals of Database	1
2	MCQ/Class-Test/Assignments on E/R Diagram Design Questions	2
3	MCQ/Class-Test/Assignments on Querying Languages	3
4	MCQ/Class-Test/Assignments(Problem Solving) on Normalization	4
2,3,4	Group Project on the design and development of database of simple database application scenarios.	2,3,4
5	MCQ/Class-Test/Assignments on Transaction Processing	5
6	MCQ/Class-Test/Assignments on data storages and indexes	6

The activity evaluation will be based on the following 6 different types of evaluations pattern (minimum 3 types):

1. Problem Solving (Individual)
2. Critical Thinking (Individual/Group)
3. Creation (Info-graphic, Written summary, Physical model/ mathematical model, soft model)
4. Interactivity Focus (Group based evaluation)
5. Quiz
6. Reflection (Self Assessment, Reflection on learning)

Attendance

Some of the activities will be conducted in the regular classes. 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.

Communication & LMS

All notices regarding the course and activities will be communicated using Email and **Google Classroom**. The Google Classroom will be used for uploading class materials along with assigning, conducting and displaying activities and marks scored by students in each activity.