DATABASE SYSTEMS (SEDB-226)

I. Course Details

Credit Hours	4 (3+1)
Pre-requisites	-
Course Leader	Dr. Nargis Fatima
Recommended Textbook(s)	1. Modern database management, Jeffrey A. Hoffer, 12th Edition, Pearson, 2016. 2. Database systems: A practical approach to design, implementation, and management, Thomas Connolly and Carolyn Begg, 6th Edition, Pearson, 2015.
Recommended Reference (Books/Websites/Articles)	1. Database system concepts, Avi Silberschatz, Henry F. Korth and S. Sudarshan, 6th Edition, McGraw-Hill, 2010. 2. Database systems: Design, implementation and management, Carlos M. Coronel, 13th Edition, Cengage Learning, 2018.

II. Course Learning Outcomes (CLO)

CLOs	Description	Domain	Taxonomy Level	PLOs	Assessment Artifact
CLO-1	**Explain** fundamental database concepts, core principles and significance to state its main idea	Cognitive	2	2	Q1, A1, Midterm, Presentation, Final Term
CLO-2	**Construct** logical conceptual and physical data schema using data models to organize and structure data , ensure data integrity and facilitate effective data management	Cognitive	3	3	Q2, A2. Midterm, Final Term, Project
CLO-3	**Make use of** relational and logical database design concepts to identify anamolies in database by performing normalization techniques	Cognitive	3	3	Q3, A3, Final Term

III. Course Assessment

Evaluation Methods	Weight (%)
Quizzes	10
Assignments	10
Presentation/Project	5
Midterm	25
Final Term	50
Total	**100**

IV. Grading Policy

For students admitted in Fall 2021 and onwards

Grade	A+	A	B+	B	C+	C	D+	D	F
%age	>=90	80-89	75-79	70-74	65-69	60-64	55-59	50-54	<50
GPA	4.00	4.00	3.50-3.99	3.00-3.49	2.50-2.99	2.00-2.49	1.50-1.99	1.00-1.49	0.00

V. Course Contents

Fundamental database concepts, Database approach vs file based system, database architecture, three level schema architecture, data independence, types of data model(relational data model, entity relationship model), Entity Relationship diagram, entity sets, attributes, relationship, attributes, schemas, tuples, domains Enhanced entity relationship model(EER diagram),relational   and logical database design, , relation instances, keys of relations, integrity constraints, types of joins, functional dependencies, normal forms, Structured Query Language (SQL), data definition languages , sub-queries in SQL, Transaction Management ,data mining, data warehousing, NoSQL.

VI. Weekly Breakdown

Week No.	CLO	Topics	Reference
1	CLO-1	Course introduction, Fundamental database concepts: Data, data versus information, data, manual file processing, traditional file processing, disadvantages of manual and traditional file processing systems.	Chapter 1 [Textbook 1]
2		Database approach vs file-based system, Advantages and disadvantages of database management system, components of DBMS environment.	Chapter 1 [Textbook 1]
3		Data Models (Relational Data Model, ER Data Model) Three level schema architecture (ANSI SPARC), external level, conceptual level, internal level, data independence, data dependence database languages overview	Chapter 2, 4 [Textbook 2]
4	CLO-2	Modeling rules process in organization (overview of business rules, scope of business rules) types of business rules structure of business rules, constraints, types of keys (primary key, composite key, surrogate key and foreign key)	Chapter 2 [Textbook 1]
5		ERD vs business rules, modelling entities and attributes (entity and entity type, Strong vs weak entity, associative entity attributes and types of attributes) relationship type. Degree of relationship (unary/recursive, binary and ternary relationship) structural constraints (one to one, one to many, many to many), minimum and maximum cardinality.	Chapter 2 [Textbook 1]
6		Enhanced Entity–Relationship Modeling (EERD), data modeling concepts of the Enhanced Entity–Relationship model (super type, sub type, specialization and generalization	Chapter 3 [Textbook 1]

7		Specifying constraints in super type and sub type in Enhanced Entity–Relationship Modeling (EERD)	Chapter 3 [Textbook 1]
8	CLO-3	Logical database design and relational model (relations, relation keys, integrity constraints (domain constraint, entity integrity and referential integrity), transforming ERD and EERD into relations.	Chapter 4 [Textbook 1]
9		**Midterm Exams**	
10	CLO-3	Functional dependencies (Full functional dependency, partial functional dependency, transitive dependency)	Chapter 13 [Textbook 2]
11		Normalization process- 1NF, 2NF, 3NF, Denormalization, BCNF(optional), 4NF (optional)	Chapter 13, 14 [Textbook 2]
12	CLO-1	Relational Algebra selection, Project Cartesian product, Union, Set difference, Join operation	Chapter 4 [Textbook 2]
13		Database recovery and security OR Introduction to data mining	Internet Resource
14		Introduction to data mining (data ware housing, OLAP, OLTP)	Chapter 9 [Textbook 1]
15		NoSQL OR Database life cycle	Internet Resource
16		Transaction management (optional), Concurrency control (optional)	Chapter 20 [Textbook 2]

DATABASE SYSTEMS (SEDB-226) – LAB

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II. Lab Learning Outcomes (CLO)

CLOs	Description	Domain	Taxonomy level	PLOs	Assessment Artifacts
CLO-1	**Demonstrate** the task by interpreting, summarizing, and explaining key concepts/ principles / relationships within the domain, enabling them to apply acquired knowledge effectively in diverse contexts.	Cognitive	2	2	Lab Task, Lab Report, Final Exam, Semester Project
CLO-2	**Practice** theoretical concepts for conducting the experiments / projects of varying complexities to achieve desired outcomes.	Psychomotor	3	4	Lab Task, Lab Report, Final Exam, Semester Project
CLO-3	**Practice** underlying theoretical concepts through modern tool usage to achieve desired outcomes.	Psychomotor	3	5	Lab Task, Final Exam, Semester Project
CLO-4	**Contribute** actively and responsibly individually or in teams during laboratory activities, demonstrating a positive attitude and willingness to participate.	Affective	2	6	Lab Task, Final Exam, Semester Project

III. Lab Assessment

Evaluation Methods	Weight (%)
Internal Evaluation (Lab Report/Lab Task/Lab Project)	60
Open Ended Lab	15
Final Term Exam	25
Total	**100**

IV. Weekly Breakdown (All CLOs shall be assessed in every lab)

Week No.	Topics
1	Introduction OF Relational DBMS (Mysql or SQL Server) installation guidelines
2	Retrieving data using the SQL SELECT statement
3	Restricting using where and sorting data using order by
4	Using DDL statements to create , and manage tables
5	Creating others schema objects like table level and column level constraints
6	Using single-row character functions to customize output
7	Using single-row date functions to customize output & type conversion
8	Constructing ERD using VISIO or Draw.io
9	**Midterm Exam**
10	Constructing Enhanced ERD using VISIO or Draw.io
11	Aggregating data using SQL aggregate function and group functions
12	Use of Joins for displaying data from multiple tables
13	Use of subqueries
14	Open Ended Lab
15	Normalization
16	Final term assessment