

THE UNIVERSITY OF LAHORE

Course Outline Fall 2021 Session 2021-22

CS-06301 Database Systems *Effective Date: 20 September, 2021*

SCU	4 Credit(s)
Co-requisite (s)	None
Pre-requisite(s)	Data structures and algorithm
Weekly tuition pattern	2 Class sessions (90 min) and 1 Lab session (120 min)
Course Mentor/Teacher	<i>Dr. Mehtab Afzal</i> <i>Assistant Professor</i> <i>Dept. of Computer Science & IT</i>

1- Course Description

This course emphasizes the importance of database design, use, and management to database systems. The module begins with a general description of databases and database management systems, including the relationships that exist among a database, a DBMS, and an application. Relational database tables, Entity-Relationship Models, and the role of metadata are discussed in detail. Finally, the module describes SQL, and explores the role of databases in data warehousing and Geographic Information Systems.

2- Objectives

The course mainly aims to achieve the following objectives:

1. Describe databases, concepts, terminology and architecture
2. Gives the brief comparison of traditional file system and database system
3. Describes ER diagrams are presented and used to illustrate conceptual database design.
4. Focus on data abstraction and semantic data modeling concepts, and extends the ER model to incorporate these ideas, leading to the enhanced-ER data model and EER diagrams.
5. Describes relational data model, its constraints
6. Gives comprehensive introduction about the techniques used to map ER/EER model into a relational model.
7. Describe operations of relational algebra
8. Describe the importance of functional dependencies and inference rules
9. List the three normal forms based on partial and transitive dependencies
10. Describe the role of SQL in databases and their use
11. Gives detailed knowledge to use database management system tools, creating database and managing data through these tools

3- Course Learning Outcomes

By the completion of this course, the students should able to:

1. Define a database, characteristics and functionalities of database management system
2. Distinguish between traditional file system and database system.
3. Describe the Entity-Relationship (ER) modeling tool
4. Model the real world database systems using Entity relationship (ER) or Enhanced entity relationship (EER) modeling.
5. Define relational data model, its constraints and schemas.
6. Convert a conceptual data model such as ER/EER diagram into a relational logical schema using various mapping techniques.
7. Design queries in relational algebra and relational calculus
8. Illustrate the Definition of Functional Dependencies, Inference Rules.
9. Apply normalization techniques to normalize database.
10. Demonstrate the use of SQL for database creation and maintenance.

11. Design and implement a full real size database system using Microsoft SQL server

4- Course Structure

1.	Presentation by lecturer
2.	Group discussion
3.	Group project
4.	Problem questions
5.	Case studies etc

5- Course Duration

This course will be held twice a week of 3 hours (each 90 min session) class duration.

6- Course style

The course will be delivered in a classroom environment.

7- Additional Course Requirement

In addition to the objectives of this course, students are expected to gain skills which would be needed in the professional work environment. These skills include but not limited to: Writing, Presentation, Decision Making and Teamwork.

8- Text and Other Resources

8.1 Text

<i>Ramez Almasri & Shamkant B. Navathe Fundamentals of Database Systems (Seventh Edition), Addison Wesley</i>

8.2 Other Resources

<i>Catherine Ricardo & Maxwell Macmillan, Database Systems Principles, Design and Implementation</i>
<i>James F. Kurose & Keith W. Rose, Modern Database Management (Fourth Edition)</i>
<i>Raghu Ramakrishnan & Johannes Gehrke, Database Management Systems (Third Edition), McGraw Hill</i>

9- Course Outline

The lecturers are supposed to complete the following topics/sub-topics before the mid/final term examination as prescribed in the course outline below:

Week	Lecture	Topics/Sub-Topics
1	1	Databases and Database Users Introduction about Database, Characteristics of the database approach.
	2	Actors on the scene, workers behind the scene. Advantages of using a DBMS. Implications of the database approach and when not to use a DBMS.
2	1	Databases System Concepts and Architecture Data models. Categories of Data Model, Concepts of Data Model. Abstraction Of Database--The Three Schema Architecture
	2	DBMS Architecture. Data Independence
3	1	Database language and Interfaces, The database system environment
	2	Classification of DBMSs, Data modeling using the Entity-relationship model(ER)
4	1	Data Modeling Using Entity Relationship Model Using high-level conceptual data models for DB design, An example database application
	2	Entity types and entity sets, Attributes and keys
5	1	Relationships and relationship types.
	2	Roles and structural constraints, Weak entity types
6	1	Refining the ER design for the company database, ER diagrams, naming conventions, ER diagrams and designs Issues.
	2	Enhanced Entity Relationship Model and UML Modeling Subclasses, super classes, and Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and

		generalization.
7	1	Modeling of Union Types using categories, An example University EER schema and formal definitions for the EER model
	2	Conceptual object modeling using UML class diagrams. Data abstraction and knowledge representation concepts
8		MIDTERM
9	1	The Relational Data Model and Relational Database Constraints
		Relational model concepts, Relational constraints
	2	Relational database schemas. Update operations. Referential Integrity Constraint
10	1	The Relational Database Design by ER- and EER-to-Relational Mapping
		Relational Database using ER to Relational Mapping
	2	Mapping EER Model Construct to Relations
11	1	The Relational Algebra and Relational Calculus
		Unary relational operations: SELECT and PROJECT, relational algebra operations, JOIN and DIVISION
	2	Additional relational operations, example of queries in relational algebra, tuple and domain relational calculus.
12	1	Basic SQL
		SQL data definition and data types, SQL constraints, basic retrieval queries, insert, delete and update statements.
	2	Joins
13	1	Basics of Functional Dependencies and Normalization for Relational Database
		Informal design guidelines for relational schema, Functional Dependencies

	2	Inference Rules for FDs (Reflexive, Augmentation, Transitive, etc.,)
14	1	Normalization of Relations, Practical Use of Normal Forms, First Normal Form
	2	Second and Third normal forms (with one Key attribute and multiple key attributes)
15	1	Boyce-Codd Normal Form
	2	Examples with solutions on Normalization
16	1	Introduction to Transaction Processing Concepts and Theory
		Intro to Transaction Processing Transaction and System
	2	Desired properties of transactions
FINAL EXAMINATION		

10- Assessment Criteria

No.	Assessment	Percentage
1.	Mid Term Exam	20%
2.	Final Term Exam	40%
3.	Assignments	10%
4.	Quizzes	10%
5.	Lab + Projects	20%
Total		100%

11- Attendance Requirements

You are expected to attend all lectures, seminars, tutorials, and lab sessions or any other classroom activity. Where you fail to attend classes, you cannot expect the lecturer to brief you on what you have missed. You are responsible for your attendance, not the academic staff. Attendance at tutorials and lab sessions will be strictly monitored, and failure to attend will be taken into account.

12- Submission and Collection of Assignment

All assignments should be handed in at the beginning of the class sessions when they are due. All assignments may be handed back during scheduled classes.

13- General Information

Students are required to be familiar with the university code Conduct, and to abide by its terms and conditions.

13.1 Copying of Copyright Material by Student

A condition of acceptance as a student is the obligation to abide by the University's policy on the copying of copyright material. This obligation covers photocopying of any material using the University's photocopying machines, and the recording off air, and making subsequent copies, of radio or television broadcasts, and photocopying textbooks. Students who flagrantly disregard University policy and copyright requirements will be liable to disciplinary action under the Code of Conduct.

13.2 Academic Misconduct

Please refer to the Code of Conduct for definitions and penalties for Academic Misconduct, plagiarism, collusion, and other specific acts of academic dishonesty. Academic honesty is crucial to a student's credibility and self-esteem, and ultimately reflects the values and morals of the University as a whole. A student may work together with one or a group of students discussing assignment content, identifying relevant references, and debating issues relevant to the subject. Academic investigation is not limited to the views and opinions of one individual, but is built by forming opinion based on past and present work in the field. It is legitimate and appropriate to synthesize the work of others, provided that such work is clearly and accurately referenced. Plagiarism occurs when the work (including such things as text, figures, ideas, or conceptual structure, whether verbatim or not) created by another person or persons issued and presented as one's own creation, unless the source of each quotation or piece of borrowed material is acknowledged with an appropriate citation. Encouraging or assisting another person to commit plagiarism is a form of improper collusion and may attract the same penalties. To prevent Academic Misconduct occurring, students are expected to familiarize themselves with the University policy, the Subject Outline statements, and specific assignment guidelines.

13.3 Guidelines to Avoid Plagiarism

Whenever you copy more than a few words from any source, you must acknowledge that source by putting the quote in quotation marks and providing the name of the author. Full details must be provided in your bibliography. If you copy a diagram, statistical table, map, etc., you must acknowledge the source. The recommended way is to show this under the diagram. If you quote any statistics in your text, the source should be acknowledged. Again full details must be provided in your bibliography. Whenever you use the ideas of any other author you should acknowledge those, using the APA (American Psychological Association) style of referencing.

Students are encouraged to co-operate, but collusion is a form of cheating. Students may use any sources (acknowledged of course) other than the assignments of fellow students. Unless your Subject Leader informs you otherwise, the following guideline should be used: Students may work together in

obtaining references, discussing the content of the references and discussing the assignment, but when they write, they must write alone.

13.4 Referencing For Written Work

Referencing is necessary to acknowledge others' ideas, avoid plagiarism, and allow readers to access those others' ideas. Referencing should:

1. Acknowledge others' ideas
2. Allow readers to find the source
3. Be consistent in format and
4. Acknowledge the source of the referencing format

To attain these qualities, the school recommends use of either the Harvard or American Psychological Association style of referencing, both of which use the author/date.

13.5 Referencing Standards

APA style referencing

Approval

<p>Prepared By :</p> <p><i>Dr. Mehtab Afzal</i></p> <p><i>Assistant Professor</i> <i>Dept. of Computer Science & IT</i> <i>(The University Of Lahore)</i></p>	<p>Approved by,</p>
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