Lahore University of Management Sciences

CS 340: Databases
Fall 2023

Instructor	Dr. Maryam Abdul Ghafoor
Room No.	SBASSE 9-G51A
Class Timings	11:00-12:15 MW - 12:30-1:45 (TR)
Office Hours	2:30-3:45 on Thursdays or by Appointment
Email	maryam.ghafoor@lums.edu.pk
Telephone	3337
TA	TBA
TA Office Hours	To be Announced on LMS
Course URL (if any)	https://lms.lums.edu.pk

Course Teaching Methodology
• **Teaching Methodology**: In-Class Lectures

Course Basics				
Credit Hours	3			
Lectures	Nbr of Lec(s) Per Week	2	Duration	75 mins
Labs	Nbr of Lec(s) Per Week	None	Duration	
Tutorials	Nbr of Lec(s) Per Week	TBA	Duration	

Course Distribution	
Core	For CS Majors
Elective	No
Open for Student Category	All (whoever satisfies the course prerequisite)
Close for Student Category	None

Course Description
This course covers the fundamental concepts of databases and discusses their practical applications and design issues. The following topics will be covered in the class: • Data modeling (Relational, ER) • Query Languages (relational algebra, SQL etc.) • Implementation and Operational Techniques of Database Management Systems • Storage and Indexing • Query Evaluation and Optimization • Transaction Management • Schema Refinement, Database Tuning • Advanced topics (Security, Distributed Databases, NoSQL databases)

Course Prerequisite(s)	
	CS 202 Data Structures

Program Educational Objectives (PEOs)	
PEO-01	Demonstrate excellence in the profession through in-depth knowledge and skills in the field of Computing.
PEO-02	Engage in continuous professional development and exhibit a quest for learning.
PEO-03	Show professional integrity and commitment to societal responsibilities.

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Course Objectives
• Study the fundamental concepts necessary for designing, using, and implementing database systems and database applications. • Develop a thorough understanding of the Database Management System (DBMS) architecture, data models, and database languages. • Provide practical exposure to database programming techniques.

Course Learning Outcomes (CLOs)

CLO	CLO Statement	Bloom's Cognitive Level	PLOs/Graduate Attributes (Seoul Accord)
CLO1	Knowledge of the fundamental concepts of database design, including conceptual model, relational model, relational algebra, Structured Query Language (SQL), and data normalization.	C2, C3	PLO2
CLO2	Understanding of the DBMS architecture, database implementation, query processing & optimization, transaction processing & concurrency control.	C2, C3	PLO2, PLO3, PLO4
CLO3	Practical exposure to database programming techniques.	C5, C6	PLO5

Grading Breakup and Policy

Assessment	Weightage	Related CLOs
Assignments (Project Deliverables)	35%	CLO1 - CLO3
Quizzes	20%	CLO1 - CLO3
Mid Term	20%	CLO1 – CLO3
Final	25%	CLO1 – CLO3

Lectures

- There will be 2 lectures per week over the course of the semester.
- Each lecture will also have a Slack thread for students to ask questions.

Assignments

Assignments are designed to help students develop an in-depth understanding of the practical aspects of ideas and concepts presented in the lectures. Their aim is to integrate these ideas into actual working code.

- There will be 4 assignments in the course.
- The primary form of support the students will have for assignments are the office hours we'll host, and Slack.
- You are allowed 5 "free" late days during the semester (that can be applied to one or more assignments).
- If you submit your work late for any assignment once your 5 "free" late days are used, the following penalty will be applied:
    - 10% for work submitted up to 24 hours late
    - 20% for work submitted up to 2 days late
    - 30% for work submitted up to 3 days late
    - 100% for work submitted after 3 days (i.e., you cannot submit an assignment more than 3 days late after you have used your 5 free late days.

Quizzes/In-class Activities

- We will have n in-class activities (Pre/Post lecture) in the course but only the best n-2activities will be counted towards your grade. An important purpose of having N-2 policy is to account for all issues (e.g., Internet connectivity, electricity outage, sickness, etc.) that may prevent you from taking part in the activity. No request for a makeup activity will be entertained if you miss up to 2 activities irrespective of the reason. In the exceptional situation in which you end up missing more than 2 in-class activities, we will consider a makeup assessment item *only* if there is a valid justification. In that case, we reserve the right to determine the mode of the assessment, which may be oral or textual.
- All in-class activities will take place during class timings and will be 10-15 mins in duration
- The syllabus for in-class activities will include everything covered before the lecture in which the activity will be performed.

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Ungraded Homework

- There will be ungraded homeworks to help you practice with the course material.

Office Hours

- We'll be dividing the class into groups, each of size ~20-25 students. Each group will be assigned one primary TA, who will be responsible for guiding and helping students, especially during office hours, and one secondary TA, who should only be contacted if the primary TA is not available.

Exam

There will be a midterm as well as final term exam in the course.

Academic Honesty

We believe that most students can distinguish between helping other students understand course material and cheating (if in doubt ask the course staff!). Explaining a subtle point from the lecture or discussing course topics is an interaction that we encourage. However, all coursework must be completed individually and independently unless explicitly stated otherwise. We have various methods of detecting cheating – so please don't do it! We also ask that you do not post your assignment solutions publicly.

Any instance of academic dishonesty in this course (intentional or unintentional) will be dealt with swiftly and severely. Potential penalties include receiving a failing grade on the assignment in question or in the course overall and forwarding of the case to the disciplinary committee. For further information about this, please make yourself familiar with the relevant sections of the LUMS student handbook.

We understand that deadlines can be stressful, and when under severe pressure, it can become tempting to start rationalizing actions that you would otherwise consider clearly inappropriate. Perhaps you'll find yourself attempting an online quiz, or facing an assignment deadline, and under all this pressure you'll convince yourself that you're just going to cheat for the moment so you can get the points. This is a terrible idea! Obviously, it is important to learn how to deal with deadlines, but far more important than that, resorting to cheating is going to do some damage to your moral compass. Someday, when the consequences are higher than potentially losing a 1/5th of a letter grade, you may find yourself committing dishonest acts at the cost of someone else's livelihood or life.

Some general points

- You are encouraged to discuss problems and ideas, but the final solution must be yours
  - Never have someone else's code in your possession at any time
  - Never give anyone your code
  - Do not copy code from the Internet
  - If in doubt, talk to the course staff
- All programming assignments must be completed individually
  - May discuss the understanding of the problem statement and a general sketch of the approach
  - May not discuss details of the solution
  - May not show your solution to others (this year or in future years)
  - May not look at others' solutions (this year or from past years)
- We use code comparison software
  - Immune to obfuscation
  - Produces color-coded all-student-pairs code comparisons

Cheating besides being unethical also has many profound negative consequences:

- It takes away your opportunity for learning and lowers your confidence
- You'd never get this time back!
- Negatively impacts your colleagues

Rather than copying someone else's work, ask for help. The entire course staff is here to help you succeed. If you invest the time to learn the material and complete the assignments, you won't need to copy any answers.

We want you to succeed!

SSE, LUMS, and particularly this class is a harassment-free zone. There is absolutely zero tolerance for any behaviour that is intended or has the expected result of making anyone uncomfortable and negatively impacts the class environment, or any individual's ability to work to the best of their potential. In case a differently-abled student requires accommodations for fully participating in the course, students are advised to contact the instructor so that they can be facilitated accordingly.

If you think that you may be a victim of harassment, or if you have observed any harassment occurring in the purview of this class, please reach out and speak to me. If you are a victim, I strongly encourage you to reach out to the Office of Accessibility and Inclusion at oai@lums.edu.pk or the sexual harassment inquiry committee at harassment@lums.edu.pk for any queries, clarifications, or advice. You may choose to file an informal or a formal complaint to put an end of the offending behavior. You can find more details regarding the LUMS sexual harassment policy here. To file a complaint, please write to harassment@lums.edu.pk.

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SSE Council on Equity and Belonging
In addition to LUMS resources, SSE's Council on Belonging and Equity is committed to devising ways to provide a safe, inclusive, and respectful learning environment for students, faculty and staff. To seek counsel related to any issues, please feel free to approach either a member of the council or email at cbe.sse@lums.edu.pk

Makeup Policy
• Please refer to Student Handbook 2019-20, page 37, article 25, titled "Makeup Policy for Graded Instruments". • *"In case N-X policy is implemented for an instrument having multiple sub-instruments then petitions will not be accepted for that instrument".*

Examination Detail	
Midterm Exam	Yes/No: Yes
Final Exam	Yes/No: Yes Combine Separate: Duration: Exam Specifications:

Code of Conduct
All assessments will be timed. Make sure that you are able to start them on time.

Course Overview

Lecture	Topics	Book Chapters/ Recommended Reading	Related CLOs
1	Introduction to Database Systems	Chapter: 1	CLO1
2	Introduction to Relational Data Model	Chapter: 2	CLO1
3, 4, 5, 6, 7	Introduction to SQL	Chapters: 3, 4, 5	CLO2
8, 9, 10	Database Design and ER Model Functional Dependencies and Normalization	Chapters 6, 7	CLO2
11, 12, 13, 14	Storage Management and Indexing	Chapters 12, 13, 14	CLO2
15, 16, 17, 18	Query Processing and Query Optimization	Chapter 15, 16	CLO2
19, 20, 21, 22	Transaction Management	Chapter 17 Concurrency Control Theory Two-Phase Locking 18.1, 18.3, 18.9 Timestamp 18.4, 18.5 MVC 18.6, 18.7 Logging Protocol 19.1, 19.7 Crash Recovery Algorithms 19.1, 19.8	CLO2, CLO3
23, 24	Big Data and Data Analytics	Chapter 10, 11	CLO2, CLO3
25, 26	Advanced Topics and Catchup		CLO2, CLO3

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Textbook(s)/Supplementary Readings
The following are recommended readings: 1. Database System Concepts 7th Edition Avi Silberschatz, Henry F. Korth, S. Sudarshan McGraw-Hill. (The textbook for CS340) 2. Database Management Systems, 3rd Ed., by Ramakrishnan, Raghu & Gehrke, Johannes, McGraw-Hil Databases • MySQL • MongoDB

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Appendix A
Bloom's Taxonomy

BLOOM's TAXONOMY*	
1 - Remember 2 - Understand 3 - Apply 4 - Analyze 5 - Evaluate 6 - Create	• Recall facts and basic concepts • Explain ideas or concepts • Use information in new situations • Draw connection among ideas • Justify a stand or decision • Produce new or original work

https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/