



LEHMAN
COLLEGE

Department of Computer Science
Lehman College, City University of New York
Fall 2022

CMP 420-F401 /CMP 758-F401: Database Systems

Lecture Schedule: Mondays and Wednesdays, 11:00 am - 12:40 pm

Lecture Location: GI 231

Instructor: Steven Fulakeza

Email: steven.fulakeza@lehman.cuny.edu

Phone: N/A

Office Hours: Please check the Course Website and Blackboard for updated information

Office Location: GI 232

Course webpage: <http://comet.lehman.cuny.edu/sfulakeza/>

CMP 426 Course Description: 4 hours, 4 credits

Introduction to theory of database systems and database management: theory of relational, hierarchical, and network database organization, with emphasis on the first; views of data, data organization, data dependency and redundancy, normal forms, and query language.

CMP 758 Course Description: 4 hours, 4 credits

Introduction to use and design of database systems. Topics include levels of extraction and views of data; data models, entity relationship, hierarchical, network, and relational data organization; data dependencies, normal forms; design algorithms; distributed databases; query languages.

Prerequisite:

- CMP 338 (Data Structures and Algorithms).

Course Objectives:

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

1. Understand fundamental concepts of modern database systems.
2. Describe database systems concepts and architecture
3. Perform conceptual data modeling by ER/EER.
4. Understand the relational model.

5. Work with Structured Query Language (SQL).
6. Explain functional dependencies and normalization as database design process.
7. Understand File/index structures.
8. Explain physical database design decisions, transaction processing concepts and theory, concurrency control techniques.
9. Discuss database recovery techniques

Textbook:

- R. Elmasri and S. Navathe, Fundamentals of Database Systems, Pearson, Edition 7, 2016. ISBN:0-13-397077-9

References:

- Lecture Notes, Blackboard, and Course Website
- J. Murach, MySQL, Edition 2, Mike Murach & Associates, 2015
- P. Dubois, MySQL, Edition 5, Addison-Wesley, 2013
- R.F. van Der Lans, SQL for MySQL Developers, Addison Wesley, 2007
- MySQL 8.0 manual: <https://dev.mysql.com/doc/refman/8.0/en/preface.html>

Grade Policy:

Your grades will be computed based on the following:

CMP 420

Activity	Percentages
Projects	50%
Midterm Exam	25%
Final Exam	25%

CMP 758

Activity	Percentages
Projects	50%
Midterm Exam	20%
Final Exam	20%
Research Paper and Presentation (for graduate students only)	10%

A Make-up exam might be given only when a student's absence is unavoidable. In such a case, the student must file a formal written request.

Projects

Several projects will be given during lectures and some work will be posted on Blackboard and the course website. Students must work on their own projects unless stated otherwise. Students handing in similar work will all receive a 0 and face

possible disciplinary actions. **No late projects will be accepted.** Projects must be submitted on Blackboard. No emailed work will be accepted.

Exam Schedule:

- Midterm Exam date: Please check the Course Website and Blackboard for updated information
- Final Exam date: Please check the Course Website and Blackboard for updated information

Academic Integrity and Plagiarism Policy

Statement may be found in the student handbook. For more information, refer to <http://www.lehman.cuny.edu/student-affairs/documents/Final-Student-Handbook-Lehman-College-9-19-18.pdf>

Note: All incidents of cheating will be reported to the Vice President of Student Affairs.

Attendance

Students are expected to attend lectures regularly and promptly. In the event of illness, or injury, students should notify me. Students who miss a class are responsible for learning materials presented in class and reading relevant textbook portions. If you need help, please do not hesitate to contact me.

Accommodating Disabilities

Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more information, please contact the Office of Student Disability Services in Shuster Hall, Room 238, phone number, 718-960-8441.

Technology, Blackboard and Email

We will be using Blackboard and Github sites for much of the class activities. It can be accessed through the Lehman website at www.lehman.cuny.edu. You will also need to have access to your Blackboard account. You can contact the IT Center if you have any problems accessing your account.

I will be communicating with you regularly throughout the semester using your email address that is available on Blackboard. Make sure you have access to your email. If you have any questions about your Lehman email address or your password, or if you have any problems accessing the site please call the computer helpdesk at 718-960-1111.

Course Outline: (Tentative)

Part 1 - Introduction to Databases

- Chapter 1: Databases and Database Users
- Chapter 2: Database System Concepts and Architecture

Part 2 - Conceptual Data Modeling and Database Design

- Chapter 3: Data Modeling Using the Entity – Relationship (ER) Model
- Chapter 4: The Enhanced Entity–Relationship (EER) Model

Part 3 - The Relational Data Model and SQL

- Chapter 5: The Relational Data Model and Relational Database Constraints
- Chapter 6: Basic SQL
- Chapter 7: More SQL
- Chapter 9: Relational Database Design by ER- and EER-to-Relational Mapping

Part 6 - Database Design Theory and Normalization

- Chapter 14: Basics of Functional Dependencies and Normalization for Relational Databases
- Chapter 15: Relational Database Design Algorithms and Further Dependencies

Part 7 - File Structures, Hashing, Indexing, and Physical Database Design

- Chapter 16: Disk Storage, Basic File Structures, Hashing, and Modern Storage Architectures
- Chapter 17: Indexing Structures for Files and Physical Database Design

Part 9 - Transaction Processing, Concurrency Control, and Recovery

- Chapter 20: Introduction to Transaction Processing Concepts and Theory
- Chapter 21: Concurrency Control Techniques

Software Used For the Course:

- MySQL Community Server 8 (or 5.6.x or 5.7.x,)
- MySQL Workbench 8.x

Research Survey Paper Assignment (for graduate students only):

- Read papers in a specific research topic of database and write a survey-type research paper (around 12 pages). Each paper must have a detailed bibliography and each paper must consult at least 5 references.
- The ACM Computing Survey defines a survey paper as a paper that summarizes and organizes recent research results in a novel way that integrates and adds understanding to work in the field. A survey article assumes a general knowledge of the area; it emphasizes the classification of the existing literature, developing a perspective on the area, and evaluating trends."
- You can visit [ACM Computing Survey](#) to see examples on survey papers
- Paper Proposal Due (November 07, 2022): 1-2 pages including extended abstract with at least 5 references.

- The Research Paper due date: 12/12/2022 by 11:59 pm.

List of Sources for Research Topics and Papers:

- Database Performance Measurement and Tuning
- Database mining, data warehousing and OLAP (On-line analytical processing), DSS (decision-support systems): refer to the chapters 28, 29
- Knowledge Management (Knowledge representation, recursive query processing, rule processing and optimization), expert databases
- Concurrency Control and/or recovery algorithms
- Database Security - security models, security implementation: refer to the chapter 23
- Search Engine design issues and strategies on the web (DBMS + Information retrieval technologies)
- Specific topics under Distributed Databases (query processing, concurrency control, recovery, distribution design)
- In memory (main memory) DBMS
- Physical database issues: including physical DB system issues using solid state drives
- Large scale document-oriented databases (such as MongoDB, MySQL8 document store)
- Big Data Mining and Tools such as Hadoop

List of Sources for Research Topics and Papers:

- Proceedings of SIGMOD Conference (SIGMOD): ACM-Special Interest Group on Mgmt. of Data (1974- present)
- Proceedings of the Very Large Database(VLDB) Conference. (recent publisher: Morgan Kaufmann). (1975-present)
- Knowledge Management (Knowledge representation, recursive query processing, rule processing and optimization), expert databases
- Proceedings of IEEE Data Engineering Conference (1984-present)
- ACM Transactions on Database Systems.(1976-present)
- IEEE /TKDE: IEEE Transactions on Knowledge and Data Engineering (1990-present)
- TOIS: ACM Transactions on Information Systems
- CiteSeer search engine
- Google Scholar search engine

Research Survey Paper Structure:

1. Title, name, date, course number
2. Abstract: This is a brief summary that describes your entire paper. Your abstract should contain 150 - 300 words. You have to write this last.
3. Introduction: Your introduction should provide the background problem you are researching.

4. Body of the paper and discussion
5. Conclusion that summarizes the paper and describes future work for the research
6. Acknowledgement (If necessary)
7. References: ACM = Association of Computing Machinery

Classroom Policies

- Take responsibility for your education and grades – Students have a common myth that because they pay tuition, they deserve to receive a passing credit. Students earn grades in accordance with course grading policies.
- Attend every class and get to class on time
- Submit all your work on time
- When having any academic difficulties, always seek assistance from your instructor