

CECS 535-01: Databases Systems

Fall 2024

- **Course Title and Number**

CSE 535, Database Systems. This syllabus covers section 01. This section is only for face-to-face instruction for graduate students.

- **Credit Hours 3**

- **Course Meeting Time and Location**

Tuesday and Thursdays, 4 pm to 5:15 pm, Sacket Hall 208.

- **Instructors**

Instructor: Antonio Badia. Email: abadia@louisville.edu. Office: Duthie Center for Engineering, 207. Phone: 502-852-0478.

- **Prerequisites**

Graduate standing. Note: this course is a fast-paced introduction to database systems for Computer Science and Computer Engineering majors. It assumes basic knowledge of computer organization and data structures (memory management, files, trees, hash tables).

- **Technology Requirements**

This class relies on material shared with the students through face-to-face lectures and Blackboard. To participate, students must have a UofL account, a computer and Internet access. The software required is: a pdf reader, a word processor (capable of producing files in text, pdf, .doc or .docx). The class project will require students to download and install MySQL, a free database system. This system is available for Macs, Windows and Linux.

If we need to transition to online, a browser capable of playing Panopto videos (these use HTML5 and support most formats, so most browsers are fine for this) and working with Blackboard Collaborate for virtual office hours will be needed.

The class does not require any work in groups; all the coursework can be completed individually.

- **Class Procedures**

This is what students need to know about how the class is going to work:

- We will follow the semester calendar at the University of Louisville. Lectures start on Monday, August 19th and end on Tuesday, December 3rd. There is a midterm break on September 30 and October 1st, and a Thanksgiving break from November 27 to December 1st.
- we will have a midterm and a final exam on precise dates (see below for details).
- there will be office hours each week at a fixed time, Mondays at 2 pm. In addition, students can ask questions directly to the instructor at any time using email (see below for more detail).
- Several weekly quizzes will be posted on Blackboard. Each quiz will be very short (2-5 questions) and self-graded. The solution(s) will be posted after 4-5 days, also on Blackboard.

To take maximum advantage of the course, students should schedule enough time each week to work on the quizzes and study the material (depending on your familiarity with the material and your background, I would estimate a low of 3 and a high of 6 additional hours per week. This is just an estimate and some individuals may fall outside this range due to their personal circumstances). Steady effort throughout the semester is highly recommended. In particular, as we progress through the material, you should contact the instructor with any questions or issues as soon as possible and not leave them for the last minute (i.e. one or two days before the exam). If your current situation does not allow you to devote this amount of time and effort during the whole semester, you may want to rethink your participation on this course.

- **Textbook**

Fundamentals of Database Systems, 7th or 8th Edition, Elmasri and Navathe, Addison-Wesley. The Campus Store no longer stocks most textbooks in the store. All students will be directed to purchase from the Campus Store website, where they can find their book list using their student ID number. Copies of each adopted textbook will be held at a warehouse for UofL students, and orders will be filled there and shipped to the store for free in-store pickup or shipped to the student's address.

Buying the textbook is not mandatory. However, it is highly recommended, since I do use the textbook slides in the video lectures. Ebooks are fine; you can buy it directly at <https://www.vitalsource.com>; search for "Elmasri Navathe" (the EPUB format is cheaper). The 6th edition of this book is also fine. Used textbooks, or textbooks from other sources, are fine too.

- **Web Page**

Throughout the semester, I will use a mix of the textbook's and my own slides in lectures. The slides and all other material used in class will be made available to students on Blackboard (<https://blackboard.louisville.edu>). **It is your responsibility to look up the course's page on Blackboard often; information will be posted there periodically.** Updates will be ongoing throughout the semester. You are responsible for reading all the material and any supplementary material that is posted to Blackboard. Any such material may be covered on the exam. You are encouraged to ask any questions you may have to the instructor.

- **Course Topics**

The following is a summary of the topics that we will cover in this semester.

1. Introduction and Overview of Database Management Systems
2. The Relational Data Model: relations, schemas and extension. Keys, foreign keys, integrity constraints.
3. SQL I: Data Definition Language (CREATE TABLE, INSERT, DELETE, UPDATE).
4. Query Languages: Relational Algebra.
5. SQL II: Data Manipulation Language (SELECT). Basic operations, aggregation and grouping, subqueries, and views.
6. SQL III: Triggers, functions and procedures. Embedded SQL.
7. Database Design I: conceptual modeling (E-R diagrams), from E-R diagrams to database schemas.
8. Database Design II: functional dependencies and normalization, integrity constraints and design issues.
9. Query Processing and Optimization: data storage, query trees, implementation of relational operators, relational query optimization.
10. Transactions: basic concepts on concurrency control and crash recovery. ACID Transactions. Write-ahead logs and locking.

- **Course Objectives and Outcomes**

At the end of the semester a successful student will be able to:

1. Understand the basic concepts behind relational databases, including how data is represented and stored, and how it is manipulated.
2. Acquire a solid understanding of the core of the SQL standard.¹
3. Become familiar with database design principles and their use.
4. Understand the main factors that impact database performance, including transactions and query processing.
5. Be able to understand the database administrator's manual for most commercial relational database systems.

This course contributes to the following Student Outcomes:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions. (CAC 1)
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline. (CAC 2)
3. Apply computer science theory and software development fundamentals to produce computing based solutions. (CAC 6)
4. Acquire and apply new knowledge as needed, using appropriate learning strategies. (EAC 7)

- **Exams**

There will be two exams, the first one a midterm exam during the 8th week of the semester, covering points (1) to (5). The midterm exam will take place on Thursday, October 10 during class.

A Note on Late Withdrawal The midterm exam will be done and graded before the late withdrawal date so that students can make an informed decision about whether to continue with the class. If, for whatever reason, this does not work out, students can ask the instructor about their standing in class. Please note that the instructor cannot give advice as to what to do; this is a decision that each student must make based on his/her personal circumstances.

The second and last exam is a final, emphasizing the material covered since the first exam ((6) to (10)). The final exam takes place during exam's week, on Monday, December 9, 4:45 pm to 7:15 pm. *Both exams are open book, open notes.*

- **Quizzes**

Short quizzes (2-5 questions) will be posted periodically (one or more weekly) on Blackboard. Answers will be posted 4-5 days after the quiz is posted. Quizzes are self graded and carry no credit, but are a good opportunity for students to check their understanding of the material without any risk.

Students should do the quizzes on their own, and then compare their answers to the ones provided. NOTE: for some quizzes, more than one correct answer is possible. If a student has an answer different from the one provided, but think that their answer is also correct, they should contact the instructor to discuss the question and possible answers with the instructor.

The main purpose of the quizzes is to help you prepare for the exams and apply the concepts seen in the lectures. Therefore, they are very important, even though they carry no grade weight. *In the past, failure to complete quizzes has shown a strong correlation with low grades!*

¹A note on SQL: all relational database systems (whether commercial or open source) follow the SQL standard pretty closely. However, each system also deviates from the standard on some points. What we cover in class is restricted to the standard; we will not be examining the ways in which different systems expand and/or deviate from it. The goal of the class is to provide you with a useful foundation that you can apply to any system that you end up using.

- **Project**

There will be a project, carried out using MySQL. Students are expected to install MySQL in their computers. Pointers to documentation for this system will be provided. If you don't have any previous experience with this system, or with installing software, some issues may arise. In most cases, those issues can be solved by searching for help on your own (i.e. using Google or checking sites like Stackoverflow (www.stackoverflow.com)). However, if you experience unusual or persistent problems, you may contact the instructor for help.

The project will unfold as the semester progresses; instructions for the needed steps will be posted periodically via Blackboard.

- **Support**

Asking questions is a vital part of the learning process. If you have any questions about the lectures, the homeworks, or any of the material covered in class, you will have several opportunities to get help. For starters, there are the weekly Office Hours. If this does not work for you, you should contact the instructor directly, as soon as possible, by sending an email with any questions in writing. You should always send the messages from your UofL account. Email messages are almost always answered within the next 24 hours (for working days; weekends take longer). It is helpful that you state your questions as precisely as possible and provide some context. If email exchanges are not enough to address your concerns, you should make an appointment with the instructor for a one-on-one consultation. As a rule, these consultations will be scheduled within working hours (9 am to 5 pm, Louisville local time). Accommodations will be made for students working full-time.

Online Resources: each semester, some students experience difficulties with the material and turn to browsing the Web (especially YouTube) in search of help. *This is strongly discouraged*, for several reasons: first, there are many resources on the Web (and on YouTube), and a few are excellent; but there are also many not-so-good ones. It can be hard for a student to tell the difference. Second, it may take quite a bit of time to find a good resource. Third, some resources may present the same ideas as the class but under different names or perspectives, causing confusion. Finally, even the best resources are not focused on the contents of this class, and do not guarantee that the student will be prepared to answer the questions in the exams. What students should do instead when they experience difficulties is to *contact the instructor* to discuss the issues –either via email or by setting up a virtual meeting. If you consult online resources, you do so at your own peril.

- **Grades**

Your grade in this course is based solely on your performance (i.e. scores) on the exams and project. There are no extra credit opportunities. In particular, this means that other circumstances like how hard the student worked, whether the grade is needed to graduate, etc. are not considered when assigning the student a grade. There is nothing that can be done after the exam to alter a student's grade. The time to achieve a good grade is *before the exam*, by preparing as thoroughly as possible -see section on **Support** above. Requests for grade changes, accommodations or extra credit will not be acknowledged.

Grades are computed as follows: midterm exam, 40%; final exam, 45%; project, 10%; class participation, 5%. Class participation is determined by the number of completed items on Blackboard. Cut points are 90 for As, 80 for Bs, 70 for Cs, and 60 for Ds. **There is no grade curving in this class.** Pluses and minuses are given on 3-point intervals. The instructor reserves the right to adjust the final (letter) grade in cases where the numerical grade falls between two letter grades. Any adjustments are always made to the benefit of the student.

If you have a question about a grade in an exam, you should contact the instructor as soon as possible. You can ask for a review any time, but it is recommended that if you have any concerns you let the instructor know right away. All students can request to see their graded exam and may ask any questions they have about the feedback. However, discussions about the evaluation process itself (the weight of different questions, the fairness of the assignment of credit, etc.) will not be entertained.

- **Exam make-ups**

PLEASE READ THIS SECTION CAREFULLY. The dates and times of the exams are announced in advance for a reason. Students are expected to take the exams precisely on those dates and at those times. In particular,

- *students are expected to clear their calendars so that they can take the exams on the dates announced.* If any student has a pre-existing appointment that prevents him/her from taking the midterm or final on the announced date, the student should contact the instructor *during the first week of classes* and let the instructor know.
- *students are expected to avoid scheduling conflicts.* If, in spite of this, any circumstances emerge between the first week of classes and the day of the exam that prevent a student from taking the exam, the student should contact the instructor as soon as possible and request an exam make-up. No make-ups will be given except for documented, exceptional circumstances, so please take note and plan accordingly. The decision of offering a make-up to a student or not is entirely up to the discretion of the instructor, who will decide on a case-by-case basis. The instructor will base the decision on whether the disrupting event was (a) unforeseen, and it was not reasonable to expect the student to foresee it; (b) out of the control of the student; and (c) disruptive to the student's ability to take the exam. The instructor will also consider whether the student could have avoided the conflict.

Once an exam has started, students cannot request a make-up.

- **Incompletes**

If, because of unexpected circumstances, a student is unable to complete the course work within the course deadlines, the student should contact the instructor as soon as possible to request an Incomplete. The instructors may grant an Incomplete if

- the instructor determines that there exist circumstances that are (a) unexpected, and it was not reasonable to expect the student to foresee them; (b) out of the control of the student; (c) negatively affecting the students ability to work in a normal manner (note that, to make this determination, the instructor will ask the student for documentation about the circumstances); and,
- *the performance of the student on the completed coursework is considered passing.*

This determination is made solely by the judgment of the instructor. Please be aware that incomplete grades are granted very rarely and only under extenuating circumstances. Incompletes cannot be requested once the final exam has started.

- **Academic dishonesty**

Academic dishonesty is a serious offense at the Speed School of Engineering because it undermines the bonds of trust and honesty between members of the community and defrauds those who may eventually depend upon our knowledge and integrity. Students are expected to recognize and to uphold standards of intellectual integrity. The J. B. Speed School of Engineering assumes that all work submitted represents the students own efforts. Academic dishonesty is defined in the University of Louisville's Code of Student Rights and Responsibilities. It is the students responsibility to become familiar with the Code.

- **Students with Special Needs**

Students with special needs will be accommodated and all necessary arrangements will be made to facilitate learning the material, doing the assignments, and taking the exams. However, students should let the instructor know during the first week of classes that they require special accommodations. Failure to let the instructor know in advance of his or her situation does not entitle the student to

repeat past work. The special need may have to be documented properly. Usually, this is done working with the Disability Resource Center (<https://louisville.edu/disability>).

- **Contingency Plans**

If the University transitions classes to 100% online, lecture videos will be posted on Blackboard in lieu of face-to-face lectures. Students are assumed to have Internet access and the necessary software to play the videos. Office Hours will also move online using Blackboard Collaborate.

If a student must quarantine or falls ill, the student should contact the instructor as soon as possible. Students in this situation will be accommodated by transitioning them to online for the duration of the quarantine/illness. If a student is unable to continue with the class, the student can petition for an Incomplete (see Incompletes section).

If the instructor were unable to carry on with the class on a timely manner, he will notify the students using Blackboard as soon as possible. If the instructor became unable to continue with the course, he will contact the department and try to make arrangements for the class continuation; students will be kept informed in as timely a manner as possible.

- **U of L Covid-19 Statement**

As a Community of Care, all Cardinals are expected to abide by public health guidelines and regulations as published by the University. While masks are currently not mandated, they are strongly encouraged when indoors (including classrooms, shared office spaces, etc), while Jefferson County is in “red level” (high risk) status based on CDC criteria.

Please note, in the event that the public health status changes, the University may reinstitute required masking, or otherwise alter their COVID policies. Students, Faculty, and Staff are expected to abide by any such requirements in the event they are implemented. As a Community of Care, please be courteous to others, whether or not they decide to wear a mask.

Faculty have the responsibility to help students meet these recommendations by allowing students absent for reason of illness and/or quarantine to make up missed work and not penalize students for these absences. Faculty may require documentation.

In the event the instructor becomes ill, he/she will send a notification via Blackboard prior to the subsequent class meeting to provide further instructions. Depending on the type of illness, class may be moved to a remote format (temporarily), may be run by a Graduate Teaching Assistant, or may be canceled. Please be sure to check your University email account regularly in case issues such as this arise. UofL will post updates to policies, FAQs, and other COVID information here. Updated COVID-19 Status for the Jefferson County area can be found here.

- **Computer Issues and IT Support**

Speed IT staff are available by appointment from 9 am to 4 pm to assist you with your technology needs. You may schedule an appointment by sending a detailed email including any relevant error codes and screen snips at SPDHelp@Louisville.edu (preferred) or 502-852-7620.

- **Title IX/Clery Act Notification**

Sexual misconduct (including sexual harassment, sexual assault, and any other nonconsensual behavior of a sexual nature) and sex discrimination violate University policies. Students experiencing such behavior may obtain confidential support from the PEACC Program (852-2663), Counseling Center (852-6585), and Campus Health Services (852-6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (852-5787) or University of Louisville Police (852-6111).

Disclosure to University faculty or instructors of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) is not confidential under Title

IX. Faculty and instructors must forward such reports, including names and circumstances, to the University's Title IX officer.

For more information, see <http://louisville.edu/hr/employeerelations/sexual-misconduct-brochure>.