# Syllabus

# COMPSCI 445: Information Systems (F24)

**Prerequisites**
COMPSCI 220 (or 230), COMPSCI 311, and COMPSCI 345 with a grade of C or better.
With instructor permission, students with prior experience in databases may substitute one of COMPSCI 320, 326, or 377 with a grade of C or better for the COMPSCI 345 prerequisite.

**Credits**
3 credits (10 h/week).

**Contacts**
- Instructor: Marco Serafini <marco@cs.umass.edu>
- TA: Tristan Carel <tcarel@umass.edu>

**Class meetings**
Monday/Wednesday 4.00-5.15 PM @ Ag. Engineering Bldg rm 119

**Office hours**
Marco Serafini
- Monday after class (5.15 - 6.15 pm) in the classroom or LGRC A335.
- Thursday 2-3 pm on Zoom (link)
Tristan Carel
- Wednesday 11 am - 12 pm
- Friday 1-2 pm
- Zoom link: https://umass-amherst.zoom.us/j/7546521542

**Online resources**
- Canvas: https://umamherst.instructure.com/courses/22701
- Piazza: https://piazza.com/umass/fall2024/compsci445
- Gradescope: https://www.gradescope.com/courses/844642
    - Code: 7EBEK4

**Course objectives**
This course is an introduction to the efficient management of large-scale data. Large datasets are abundant today and they are fundamental in many application domains. This course will focus on understanding the internals of the systems used for data management and on how to process large datasets efficiently.
The course includes principles for representing information as structured data, query languages for analyzing and manipulating structured data, and core systems principles that enable efficient

computation on large data sets. Classical relational database topics will be covered (data modeling, SQL, query optimization, concurrency control), as well as distributed data processing paradigms (e.g. MapReduce and Spark).

This course counts as a 400-level Computer Science Major elective.

**Course activities**

The course will consist of the following activities:

- *Lectures:* The class meetings will be lectures with the possibility of quizzes during the lecture. _Bring your laptop._
- *Exams:* There will be a midterm and a final exam.
- *Homework:* Homework assignments,including written problems and programming tasks, will typically be due each **Sunday at 11.59 pm.**

**Learning outcomes**

A student who has successfully completed this course with a C or above will be able to understand:

- how SQL queries map to relational operators and their cost.
- the challenges a Database Management System (DBMS) faces when executing queries efficiently.
- the cost of a query and how to reduce it.
- how a DBMS stores and indexes data efficiently.
- the problems arising from concurrent updates to the database.
- privacy and security of a database.
- how DBMSs store and query large datasets efficiently.

**Course materials and texts**

Students are expected to study and fully understand all the material contained in the slides. The slides and all the remaining course materials are available on Canvas. Lectures will be recorded.

As an additional, and optional, reference book, we recommend "*Database System Concepts"* by Silbershatz, Korth, and Sudarshan.

We will use Piazza for Q&A.

**List of topics**

- Relational model
- SQL
- Data modeling
- Storage
- Indexing
- Relational operators
- Query optimization

- Concurrency
- Big data processing systems

**Grading criteria**
The different activities will be weighted as follows
- Homework: 55%
- Quizzes: 5%
- Midterm exam 20%
- Final exam 20%

The final score in [0-100] will be converted (without rounding up) into letter grades using the following brackets. There will be no curving.
A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D+ (67-69), D (60-66), F (0-59).

**Late days and make-up policies**
Each student has 5 late days for homework, no question asked. To use a late day, students need to fill up **this form** before the due date of the homework. The TA will add the requested extra days to the gradescope due date. It might take up to one day for the TA to update gradescope, so please apply for late days before the due date to avoid using additional late days.

Make-up exams may be offered only for extenuating circumstances, which will have to be documented. Personal or family travel, family celebrations, work interviews, internships, or other non-academic commitments <u>do not</u> count as extenuating circumstances. Please plan accordingly.

No extra late days will be granted except for extenuating circumstances, so use your late days carefully.

**Expectations and requirements**
Students will be expected to install and run a DBMS (PostgreSQL) on their laptop. They should be familiar with using the OS shell, navigating directories, and using command-line interfaces.

**Weekly course and examination schedule**
See Canvas.

**Communication policy**
Please use Piazza to ask questions so that everyone will be able to see the answers.
The instructors welcome questions and your peers will not be able to see your name, so don't be shy!
If you need to contact the instructors regarding private matters, please use a private post.

The TA will try to answer Piazza posts within one day. The instructor will regularly check in to fill in the gaps.

## Academic honesty policy

It is very important in all courses that you be honest in all the work that you complete. In this course you must complete all assignments, quizzes, exams, etc. on your own unless otherwise specified. If you do not, you are doing a disservice to yourself, the instructors for the course, the School of Computer Science, the University of Massachusetts, and your future. We design our courses to provide you the necessary understanding and skill that will make you an excellent computer scientist. Assignments and exams are designed to test your knowledge and understanding of the material. Plagiarism and academic honesty of any sort may seem like an easy way to solve an immediate problem (which it is not), however, it can have a substantial negative impact on your career as a computer science student. There are many computing jobs out there and many more people working hard to get those positions. If you do not know your stuff you will have a very difficult time finding a job. Please take this seriously.

We will carefully review your submissions automatically and manually to verify that "cheating" has not taken place. If you are suspected of plagiarism we will follow an informal path to determine if academic dishonesty has taken place. If you are found guilty you will receive an F for the course and it will go on your permanent record at UMass. This will disrupt your schedule for completing courses and may lead to you not completing your degree in a timely fashion. You should carefully review the [Academic Honesty Policy](), [Avoiding Plagiarism](), and the [Academic Honesty Flowchart]() to understand what academic honesty is, how you can avoid it, and the procedure we will follow if you are under suspicion. In general, you should review all documentation described by UMass' [Academic Honesty Policy and Procedures](). The use of ChatGPT and similar AI text generators is prohibited according to the [Academic Honesty Policy]().

## Attendance policy

Attendance is strongly recommended. There is no Zoom option for this class.

## Accommodation statement

Accommodations are collaborative efforts between students, faculty, and Disability Services (DS). Students with accommodations approved through DS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DS should contact DS immediately. If you are a student with a documented disability and are registered with Disability Services, please contact me immediately to facilitate arranging academic accommodations. Reasonable arrangements will be made in accordance with your accommodations provided by DS in the context of this course.

For midterm and final exams, students who need accommodations are responsible for contacting DS well before the exam. DS will then reach out to the instructor to get a copy of the exam. Failure to contact DS in a timely manner will result in missing the chance to give the exam.

## Inclusivity statement

We celebrate the diversity in our community and actively seek to include and listen to voices that are often silenced in the computing world. We welcome all individuals regardless of age, background, citizenship, disability, sex, education, ethnicity, family status, gender, gender identity, geographical origin, language, military experience, political views, race, religion, sexual orientation, socioeconomic status, and work experience.

## Names and pronouns

Everyone has the right to be addressed by the name and pronouns that they use for themselves. You can indicate your preferred/chosen first name and pronouns on SPIRE, which appear on class rosters. I am committed to ensuring that I address you with your chosen name and pronouns. Please let me know what name and pronouns I should use for you if they are not on the roster. Please remember: A student's chosen name and pronouns are to be respected at all times in the classroom.

To learn more read: Intro Handout on Pronouns

https://www.umass.edu/stonewall/sites/default/files/pronouns_intro.pdf

## Title IX statement

UMass is committed to fostering a safe learning environment by responding promptly and effectively to complaints of all kinds of sexual misconduct. If you have been the victim of sexual violence, gender discrimination, or sexual harassment, the university can provide you with a variety of support resources and accommodations

If you experience or witness sexual misconduct and wish to report the incident, please contact the UMass Amherst Equal Opportunity (EO) Office  (413-545-3464 | equalopportunity@admin.umass.edu) to request an intake meeting with EO staff. Members of the CICS community can also contact Erika Lynn Dawson Head, director of diversity and inclusive community development (erikahead@cics.umass.edu | 860-770-4770).

## Learning support

There are a range of resources on campus, including:
- Learning Resource Center: https://www.umass.edu/lrc/
- Supplemental Instruction Program: https://www.umass.edu/lrc/si.html
- UMass Libraries: https://www.library.umass.edu/
- Writing Center - http://www.umass.edu/writingcenter
- Learning Resource Center - http://www.umass.edu/lrc
- Assistive Technology Center - https://www.umass.edu/it/assistive
- Disability Services - https://www.umass.edu/disability/
- Student Success - https://www.umass.edu/studentsuccess/

- Center for Counseling and Psychological Health (CCPH) http://www.umass.edu/counseling
- English as a Second Language (ESL) Program - http://www.umass.edu/esl
- CMASS Success Coach Program - https://www.umass.edu/cmass/get-involved/success/academic-support
- Single Stop Resources - https://www.umass.edu/studentlife/single-stop