

CS 2550: Principles of Database Systems

Department of Computer Science, University of Pittsburgh

Course Reference Number (CRN): 29755

Term: Spring 2022 (22-2 or 2224)

When: Tuesday & Thursday 1:00– 1:15 pm

Where: 5313 Sennott Square & Zoom

Instructor: Prof. Panos K. Chrysanthis

Email: panos@cs.pitt.edu

Web: <http://www.cs.pitt.edu/~panos>

Office: 6421 Sennott Square

Office hours: Tuesday, 2:30 – 4:00 pm

Thursday, 2:30 – 4:00 pm

by appointment

Teaching Assistants: Rakan Alseghayer

Email: cs2550-staff@cs.pitt.edu

cs2550-staff@list.pitt.edu

Office: 6414 Sennott Square

Office hours: Monday, 3:00 pm – 5:00 pm

Wednesday, 3:00 pm – 5:00 pm

Friday, 3:00 pm – 5:00 pm

by appointment

Office Hours: Instructors and TA's office hours are also listed on Canvas and the course web site.

Course Description: The principle objective of this course is to provide an in-depth knowledge of Database Management Systems design. Important aspects of distributed database systems and new data processing paradigms (such as data streams) will also be covered.

Prerequisite: Knowledge of data structures and files, basic operating systems concepts, and exposure to data models (i.e., CS1555 or its equivalent). Working knowledge in Java (or C/C++) is assumed.

Class Web Page: <http://db.cs.pitt.edu/courses/cs2550/current.term>

All handouts and class notes will be published on the class web page. You are expected to check this page frequently (at least twice a week).

Textbooks: *Database Systems: The Complete Book* (2nd Edition). Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, 2009. (ISBN-10: 0-13-187325-3; ISBN-13: 978-0-13-187325-4)
Fundamentals of Database Systems, 6th Edition. Fundamentals of Database Systems, 7th Edition Ramez Elmasri and Shamkant B. Navathe, Pearson (c) 2015, 7th Edition (ISBN-10: 0-13-397077-9; ISBN-13: 978-0-13-397077-7)

Reference: *Transactional Information Systems*. Weikum and Vossen, Morgan Kaufmann, 2002.

Concurrency and Recovery in Database Systems. Bernstein, Hadzilacos and Goodman, Addison-Wesley, 1987 [URL: <http://research.microsoft.com/pubs/ccontrol/> (in PDF)]

Transaction Processing: Concepts and Techniques. Cray and Reuter, Morgan Kauffman, 1993

PostgreSQL: The World's Most Advanced Open Source Relational Database (www.postgresql.org)

Mode of Instruction and Masking Mandate: The lectures during the first three weeks will be taught via *remote synchronous instruction*. Zoom meetings will be our primary platforms of interaction during this period. Afterwards, the lectures will be in-person. For maximum engagement during the remote lectures, we encourage everyone to keep their video on during Zoom sessions. Zoom links and passwords will be made available on Canvas and shared by email.

The current guidelines from the University call for all community members to wear masks while indoors in shared spaces on campus that are not designated dining areas, regardless of their vaccination status. Unless and until you have written clearance from Disability Resources and Services (DRS) to go without a mask indoors, you must always wear a mask. This means that during in-person class time and in-person office hours, all parties must wear a mask. *You may not remove your mask in the classroom for any amount of time or for any reason including taking a sip of water.* If you need to get a drink of water, please exit the classroom.

Dealing with the Unexpected If the instructor is not able to come to campus because of sickness, if the instructor is able to teach the class, he will teach it synchronous on Zoom.

Also, if you are sick, you should not attend class that day and you are encouraged to take advantage of our office hours. You should consider building a good study relationship with your peers in this class, because that will help you make up for missing classes due to illness.

Note on Email Communication: In order to receive the highest priority, you must include the keyword `cs2550` in the subject line of your email messages. (This rule applies to all email messages, that are sent to the instructor, the teaching assistant, or both: `cs2550-staff@cs.pitt.edu`).

We will make every effort to respond to all email requests *within one business day* at the latest, and no email replies should be expected after hours or during the weekends. **Due to spam filtering, you should always try to use your pitt email address when sending email and include your full name.**

Course Grading:

Assignments & Project	35%	
— Project demos		April 27-29
Midterm Exam	30%	Thu, March 3, 1:00-2:15pm
Final Exam	30%	April 27 or 29
Participation	5%	

Grading Policy: Unless explicitly noted otherwise, the work in this course is to be done independently. Discussions with other students on the assignments should be limited to understanding the statement of the problems. Cheating in any way, including giving your work to someone else will result in an F for the course and a report to the appropriate University authority.

Marks can be appealed up to two weeks after they have been posted, after that no appeals will be considered.

Class Attendance & Participation: Because of the remote synchronous teaching, your attendance in our Zoom meetings and your class discussion participation is essential. It is therefore important that you do not miss class and participate actively while there. You must come to class willing to actively volunteer and participate.

Submission & Late Policy: All written assignments must be submitted electronically and there is no late submission. An assignment which is late will be accepted *only* under special circumstances with the instructor's permission prior to its deadline. In such a case, the instructor will determine any penalty in a fair manner.

Make-up Policy: Students are expected to take both midterm and final exams. Make-up exams will only be given in the event of a medical situation or an emergency, and only if this is documented and the instructor is notified *immediately if in advance is not possible*. Missing an exam will result in a zero for the exam.

Students with Disabilities: If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services, 140 William Pitt Union, 412-648-7890 or 412-383-7355 (TTY) as early as possible in the term.

Religious Observance: In order to accommodate the observance of religious holidays, students should inform the instructor of any such days within the first two weeks of the term by email.

Audio/Video Recording - Use of Cell Phones To ensure the free & open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use. Also, any use of Cell Phones during lectures is disruptive and is not permitted.

Copyrighted Material: All material provided through Canvas and the class web site is subject to copyright. This applies to class notes & recordings, slides, assignments, solutions, project descriptions, etc.

You are allowed (and expected!) to use all the provided material for personal use. However, you are strictly prohibited from sharing the material with others in general and from posting the material on the Web or other file sharing venues in particular.

Outline: A detailed reading guide will be published on the web page, along with the class notes. Although we will follow the basic outline of the textbooks, we will re-order the material to improve the flow. Additional material will be introduced as needed.

Time permitting, we will cover the following topics:

1. Introduction to Database Systems & Data Models
2. Physical Database Organization
3. Transactions, Serializability Theory
4. Locking Schedulers, Deadlocks
5. Non-Locking Schedulers
6. Multiversion Concurrency Control
7. Recovery Concepts and Techniques
8. Query Processing and Optimization
9. Introduction to Distributed Database systems
10. Distributed Concurrency Control and Recovery
11. Extended Transactions Data Streams

COVID-19 University Statement: In the midst of this pandemic, it is extremely important that you abide by public health regulations and University of Pittsburgh Health Standards and Guidelines. While in class, at a minimum, this means you must wear a face covering and comply with physical distancing requirements; other requirements may be added by the University during the semester. These rules have been developed to protect the health and safety of all community members. Failure to comply with these requirements will result in you not being permitted to attend class in person and could result in a student conduct violation. For the most up-to-date information and guidance, please visit coronavirus.pitt.edu and check your Pitt email for updates before each class.

Pitt Community Compact: A pledge created by a dozen undergraduate, graduate and professional students to, “uphold the health and safety of our community,” amid the pandemic by promoting responsible behaviors. Let us all take the pledge.