

Course title and number CSCE 438-500: DISTRIBUTED SYSTEMS and 438-200: HNR-DISTRIBUTED SYSTEMS
Term Spring 2022
Meeting times and location Tu, Th 11:10AM - 12:25PM, ZACH 350

Course Description and Prerequisites

The goals of this course are for students to gain an understanding of the principles and techniques (e.g., locking, concurrency, scheduling, communication across networks, fault tolerance) behind the design of distributed processing systems, such as Google, Facebook, Amazon, Yahoo and Microsoft, and to gain practical experience designing, implementing, and debugging real distributed systems. HNR students will work on a class project.

Prerequisites: CSCE 313 and senior/junior classification, or approval of instructor.

Learning Outcomes or Course Objectives

At the end of this course, you will understand the following aspects of a distributed system, in no particular order:

- Implement and structure distributed systems programs
- Write programs that can interoperate using well-defined protocols
- Use standard network communication primitives such as UDP and TCP
- Employ and create common paradigms for easing the task of distributed systems programming. Be able to clearly elucidate their benefits, drawbacks, and limitations.
- Debug highly concurrent code that spans multiple programs running on multiple machines
- Reason about distributed algorithms for locking, synchronization and concurrency, scheduling, and replication

Students in 438H will investigate Distributed Ledger, Smart Contracts and Blockchain, will be stimulated to propose new ideas for addressing existing problems and write a report.

Instructors Information

Name Radu Stoleru
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Office location PETR 324 or zoom: <https://tamu.zoom.us/j/7513482903>

Teaching Assistant Sherine Kozhikadan
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Office location PETR 350 or zoom: <https://tamu.zoom.us/j/8056586604>

Textbook and/or Resource Material

Maarten van Steen, Andrew S. Tanenbaum, "Distributed Systems," 3rd edition, version 3.0.2, 2020. The textbook in pdf format is distributed by the instructor. A hard copy can also be purchased from Amazon.

Research papers that serve the basis for some lectures will also be distributed by the instructor.

Grading Policies

Quizzes: 25%

Machine Problems: 30% (CSCE 438H students: 25%)

Midterm Exam: 20%

Final Exam: 25%

438H Report (only students in CSCE 438H): 5%

The grading scale will be: $A \geq 90\% > B \geq 80\% > C \geq 70\% > D \geq 60\% > F$.

Assignments: there will be 5 Machine Problems (MPs) involving C/C++ and Java programming. There will be weekly take-home quizzes.

Late Work Policy

1 MP can be up to 4 days late, 1 quiz can be up to 1 day late. Everything else is 20% per day.

Course Topics, Calendar of Activities

Week	Topic	
1	Introduction	
2-3	Processes and Communication	MP1 Due
4	Architectures	
5-6	Coordination	MP2 Due
7	Consistency and Replication	
7	Midterm Exam (March 10th, in class)	
8	Consistency and Replication	MP3 Due
9	Fault Tolerance, Google Chubby, Apache Zookeeper	
10	Distributed File Systems, Google GFS, Apache HDFS	
11	Big Data Storage, Google BigTable, Key-Value Store	MP4 Due
12	Big Data Processing, MapReduce, Apache Hadoop	
13	Real Time Stream Processing, Spark, Storm	
14	Edge Computing, MStorm	MP5 Due
	Final Exam (May 4th, 3pm-5pm, in class)	

University Policies

Attendance Policy

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments.

Please refer to [Student Rule 7](#) in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Makeup Work Policy

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to [Student Rule 7](#) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor” ([Student Rule 7, Section 7.4.1](#)).

“The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence” ([Student Rule 7, Section 7.4.2](#)).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See [Student Rule 24](#).)

Academic Integrity Statement and Policy

“An Aggie does not lie, cheat or steal, or tolerate those who do.”

“Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one’s work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case” ([Section 20.1.2.3, Student Rule 20](#)).

Texas A&M at College Station

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at aggiehonor.tamu.edu.

Texas A&M at Galveston

You can learn more about the Honor Council Rules and Procedures as well as your rights and responsibilities at tamug.edu/HonorSystem.

Texas A&M at Qatar

You can learn more about academic integrity and your rights and responsibilities at Texas A&M University at Qatar by visiting the [Aggie Honor System](#) website.

Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact the Disability Resources office on your campus (resources listed below) Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Texas A&M at College Station

Disability Resources is located in the Student Services Building or at (979) 845-1637 or visit disability.tamu.edu.

Texas A&M at Galveston

Disability Resources is located in the Student Services Building or at (409) 740-4587 or visit tamug.edu/counsel/Disabilities.

Texas A&M at Qatar

Disability Services is located in the Engineering Building, room 318C or at +974.4423.0316 or visit <https://www.qatar.tamu.edu/students/student-affairs/disability-services>.

Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual

harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, a person who is subjected to the alleged conduct will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Texas A&M at College Station

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services](#) (CAPS).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's [Title IX webpage](#).

Texas A&M at Galveston

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with the Counseling Office in the Seibel Student Center, or call (409)740-4587. For additional information, visit tamug.edu/counsel.

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the Galveston Campus' [Title IX webpage](#).

Texas A&M at Qatar

Texas A&M University at Qatar students wishing to discuss concerns in a confidential setting are encouraged to visit the [Health and Wellness](#) website for more information.

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's [Title IX webpage](#).

Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to engage in healthy self-care by utilizing available resources and services on your campus

Texas A&M College Station

Students who need someone to talk to can contact Counseling & Psychological Services (CAPS) or call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.

Texas A&M at Galveston

Students who need someone to talk to can call (409) 740-4736 from 8:00 a.m. to 5:00 p.m. weekdays or visit tamug.edu/counsel for more information. For 24-hour emergency assistance during nights and

weekends, contact the TAMUG Police Dept at (409) 740-4545. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.

Texas A&M at Qatar

Texas A&M University at Qatar students wishing to discuss concerns in a confidential setting are encouraged to visit the [Health and Wellness](#) website for more information.

Campus-Specific Policies

Texas A&M at Galveston

Classroom Access and Inclusion Statement

Texas A&M University is committed to engaged student participation in all of its programs and courses and provides an accessible academic environment for all students. This means that our classrooms, our virtual spaces, our practices and our interactions are as inclusive as possible and we work to provide a welcoming instructional climate and equal learning opportunities for everyone. If you have an instructional need, please notify me as soon as possible.

The Aggie Core values of respect, excellence, leadership, loyalty, integrity and selfless service in addition to civility, and the ability to listen and to observe others are the foundation of a welcoming instructional climate. Active, thoughtful and respectful participation in all aspects of the course supports a more inclusive classroom environment as well as [our mutual](#) responsibilities to the campus community.

College and Department Policies

College and departmental units may establish their own policies and minimum syllabus requirements. As long as these policies and requirements do not contradict the university level requirements, colleges and departments can add them in this section. Please remove this section if not needed.