

University of Oklahoma
Gallogly College of Engineering
School of Computer Science

CS4113/CS5113: Distributed Operating Systems

Fall 2025

Instructor: Dr. Richard Veras

Course Format: In-Person

Time: Noon – 1:15PM Tuesday and Thursday

Exam: 12/17/2025 1:30PM-3:30PM

Location: Carson Engineering Center 438

Office Hours: TBD

Office Hours Location: 210-C

Teaching Assistant: N/A

TA Office Hours: N/A

TA Office Hours Location: N/A

Learning Management System/website: canvas.ou.edu

Course Prerequisite:

Prerequisites (4113): C S 3113; and a statistics course from the departmentally approved list.

Prerequisites (5113): Graduate standing; C S 3113; and a statistics course from the departmentally approved list.

Course Description:

This course will cover the key distributed operating systems topics. These topics include advanced architectures, processes, communication, and coordination.

Course Goals:

This course is meant to provide an experience for the students to view programming as a goal-oriented process. A major component of this course will be learning from one another through challenging open-ended team assignments. Here students will be challenged to think creatively to synthesize potential solutions, devise testing strategies and integrate these solution into their implementations.

Learning Outcomes:

At the completion of the course, students will be able to:

- C: An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
- I: An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices.

ABET Student Outcomes: By the end of the semester, the students will have:

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- An ability to communicate effectively with a range of audiences.
- An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Texts and Materials:

“The Book of Kubernetes.” Alan Hohn. 2022. ISBN-13: 978-1718502642.

(Free) “Operating Systems: Three Easy Pieces.” <https://pages.cs.wisc.edu/~remzi/OSTEP/>

(Free) “Distributed Systems”, 4th ed., M. van Steen and A.S. Tanenbaum. distributed-systems.net, 2022.

Optional: "Systems Performance: Enterprise and the Cloud." Brendan Gregg. 2nd Edition. 2020. ISBN 978-0136820154.

Optional: "Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems." Martin Kleppmann. 978-1449373320

Teaching Philosophy

This course revolves heavily around group assignments to encourage peer learning. Your peers will continue to be your peers beyond graduation. It is my goal to create an inclusive classroom that encourages the strengthening of the bonds between you and your peers.

Learning Activities, Assignments, and Assessment:

The work in this course will be divided into several components including: homework assignments, group programming assignments, exams, and participation activities.

Homeworks will consist of regular written assignments covering the material in class. The group programming assignments will include a warmup component that involves working through examples for the given topic, followed by a competition component where teams will optimize an operation with respect to a given metric and compete against other teams. Team members will be randomized for each programming assignment and will be graded on mastery of material and team effort. A midterm and a final exam will cover the material in the lectures and lab assignments to assess your understanding of the content. Participation will include activities such as engaging in class discussion, being a designated note taker for a lecture, creating tool tutorials, and being a weekly grader assistant.

Graduate students taking this course as CS5113 will have higher thresholds for converting points to letter grades.

Assignment Weights:

Category	CS 4113/5113
Programming Assignments	10
Reading Assignments	30
Participation	10
Projects/Labs	40
Midterm	5
Final	5
<i>Total</i>	<i>100</i>

Grading Scale:

The letter grade thresholds will be no higher than the following; they may be lower at the discretion of the instructors.

4113 Grade Thresholds

Grade	Points (P)
A	$P \geq 90$
B	$80 \leq P < 90$
C	$70 \leq P < 80$
D	$60 \leq P < 70$
F	$P < 60$

5113 Grade Thresholds

Grade	Points (P)
A	$P \geq 95$
B	$85 \leq P < 95$
C	$75 \leq P < 85$
D	$65 \leq P < 75$
F	$P < 65$

Tentative Schedule (Subject to change)

Week	Topic
1	Queueing Theory and System Modelling
2	Scheduling I
3	Scheduling II
4	Concurrency I: Threads, Locks & Event-based Concurrency
5	Concurrency II: Locking Data Structures
6	Communication I: Time, Clocks & Ordering
7	Communication II: IPC with Shared Memory, FIFOs, Sockets
8	Communication III: Remote Procedure Calls & gRPC
9	Virtualization I: Operating Systems
10	Virtualization II: Virtual Machines & Infrastructure as Code
11	Virtualization III: Containers and Orchestration
12	Virtualization IV: Logging and Monitoring
13	System Performance I: Methodologies and Applications
14	System Performance II: CPUs and Memory
15	System Performance III: File Systems and Disks
16	System Performance IV: Networks

Course Policies

Academic Integrity and Plagiarism

Cheating is prohibited at the University of Oklahoma, because it devalues the degree you are working hard to get. As a member of the OU community, it is your responsibility to protect your educational investment by knowing and following the rules. For specific definitions on what constitutes cheating, review the Student's Guide to Academic Integrity at:

http://integrity.ou.edu/students_guide.html

To be successful in this class, all work on exams, quizzes and homework must be yours and yours alone. You may not receive outside help. Be aware that it is my professional obligation to report academic misconduct, which I will not hesitate to do. Sanctions for academic misconduct can include expulsion from the University and an F in this course, so do not cheat. It is simply not worth it.

Absences

You are expected to attend class and actively participate in the exercises and discussions. In cases of sickness, and quarantine alert you instructor before the class period via email, in case we need to discuss alternative arrangements. Additionally, you will be required to submit an absence form on canvas for each absence. These forms will be reviewed before the end of the semester. You will be allowed two (2) free absences throughout the semester. Absences beyond that may count against your participation score or your lab grade during lab days.

Late Assignments

Each assignment may contain a grading scale for late submissions. Beyond that, except cases of sickness or provost approved activities, late work will not be accepted. These cases must be documented ahead of time in an absence form.

Grading

Submissions will be scored against a rubric and not against other submissions. We can only grade what is submitted. The resulting grade reflects the quality of the submission, not the individual. If you believe there is an issue with a score to your assignment, with respect to the instructions, rubric, or syllabus, then you may submit a regrade request. If the request is approved, then a regrade of the assignment will occur before final grades are due. The instructor will decide if either part of the assignment will be re-graded, or the entirety. If uncaught mistakes are found, they will be scored as such. If uncaught evidence of academic dishonesty is found, those will be reported as such. Other than professionalism points, there will be no additional extra credit.

Professionalism Points

In certain assignments there will be opportunities to earn additional points. These will be explicitly enumerated in the assignments and aim to highlight professional behavior in the field. These points may be invalidated through unprofessional behavior at the assignment level or the

course level. Professionalism points are designed to reward effort, thus behaviors that bypass effort will not receive that reward.

Generative AI

Unless an activity explicitly allows it, you are not allowed to use Generative AI tools on your assignments. This includes code assistants like copilot.

Dead Week Presentation

In this course you and your team will present your final lab at a departmental poster session. This will occur during the Thursday or Friday of dead week. Your team will be responsible for being present during the session.

Land Acknowledgement Statement Provided by OU's Tribal Liaison office:

Long before the University of Oklahoma was established, the land on which the University now resides was the traditional home of the "Hasinai" Caddo Nation and "Kirikir?i:s" Wichita & Affiliated Tribes.

We acknowledge this territory once also served as a hunting ground, trade exchange point, and migration route for the Apache, Comanche, Kiowa and Osage nations. Today, 39 tribal nations dwell in the state of Oklahoma as a result of settler and colonial policies that were designed to assimilate Native people. The University of Oklahoma recognizes the historical connection our university has with its indigenous community. We acknowledge, honor and respect the diverse Indigenous peoples connected to this land. We fully recognize, support and advocate for the sovereign rights of all of Oklahoma's 39 tribal nations. This acknowledgement is aligned with our university's core value of creating a diverse and inclusive community. It is an institutional responsibility to recognize and acknowledge the people, culture and history that make up our entire OU Community.

Expectations for Academic Integrity:

Cheating is prohibited at the University of Oklahoma, because it devalues the degree you are working hard to get. As a member of the OU community, it is your responsibility to protect your educational investment by knowing and following the rules. For specific definitions on what constitutes cheating, review the Student's Guide to Academic Integrity at: http://integrity.ou.edu/students_guide.html

To be successful in this class, all work on exams, quizzes and homework must be yours and yours alone. You may not receive outside help. Be aware that it is my professional obligation to report academic misconduct, which I will not hesitate to do. Sanctions for academic misconduct can include expulsion from the University and an F in this course, so do not cheat. It is simply not worth it.

University Policies

Mental Health Support Services

Support is available for any student experiencing mental health issues that are impacting their academic success. Students can either be seen at the University Counseling Center (UCC) located on the second floor of Goddard Health Center or receive 24/7/365 crisis support from a licensed mental health provider through [TELUS Health](#). To schedule an appointment or receive more information about mental health resources at OU please call the UCC at 405-325-2911 or visit [University Counseling Center](#). The UCC is located at 620 Elm Ave., Room 201, Norman, OK 73019.

Title IX Resources and Reporting Requirement

The University of Oklahoma faculty are committed to creating a safe learning environment for all members of our community, free from gender and sex-based discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking, in accordance with Title IX. There are resources available to those impacted, including: speaking with someone confidentially about your options, medical attention, counseling, reporting, academic support, and safety plans. If you have (or someone you know has) experienced any form of sex or gender-based discrimination or violence and wish to speak with someone confidentially, please contact [OU Advocates](#) (available 24/7 at 405-615-0013) or [University Counseling Center](#) (M-F 8 a.m. to 5 p.m. at 405-325-2911).

Because the University of Oklahoma is committed to the safety of you and other students, and because of our Title IX obligations, I, as well as other faculty, Graduate Assistants, and Teaching Assistants, are mandatory reporters. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This includes disclosures that occur in: class discussion, writing assignments, discussion boards, emails and during Student/Office Hours. You may also choose to report directly to the Institutional Equity Office. After a report is filed, the Title IX Coordinator will reach out to provide resources, support, and information and the reported information will remain private. For more information regarding the University's Title IX Grievance procedures, reporting, or support measures, please visit [Institutional Equity Office](#) at 405-325-3546.

Reasonable Accommodation Policy

The University of Oklahoma (OU) is committed to the goal of achieving equal educational opportunity and full educational participation for students with disabilities. If you have already established reasonable accommodations with the Accessibility and Disability Resource Center (ADRC), please [submit your semester accommodation request through the ADRC](#) as soon as possible and contact me privately, so that we have adequate time to arrange your approved academic accommodations.

If you have not yet established services through ADRC, but have a documented disability and require accommodations, please complete [ADRC's pre-registration form](#) to begin the registration process. ADRC facilitates the interactive process that establishes reasonable accommodations for students at OU. For more information on ADRC registration procedures, please review their [Register with the ADRC](#) web page. You may also contact them at (405)325-3852 or adrc@ou.edu, or visit www.ou.edu/adrc for more information.

Note: disabilities may include, but are not limited to, mental health, chronic health, physical, vision, hearing, learning and attention disabilities, pregnancy-related. ADRC can also support students experiencing temporary medical conditions.

Religious Observance

It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty. [\[See Faculty Handbook 3.15.2\]](#)

Adjustments for Pregnancy and Related Issues

Should you need modifications or adjustments to your course requirements because of pregnancy or a pregnancy-related condition, please request modifications via the [Institutional Equity Office](#) website or call the Institutional Equity Office at 405/325-3546 as soon as possible. Also, see the Institutional Equity Office [FAQ on Pregnant and Parenting Students' Rights](#) for answers to commonly asked questions.

Final Exam Preparation Period

Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's [Final Exam Preparation Period policy](#).

Emergency Protocol

During an emergency, there are official university [procedures](#) that will maximize your safety.

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather.

1. Look for severe weather refuge location maps located inside most OU buildings near the entrances.
2. Seek refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building.
3. Go to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows.
4. Get in, Get Down, Cover Up
5. Wait for official notice to resume normal activities.

Additional [Weather Safety Information](#) is available through the Department of Campus Safety.

The University of Oklahoma Active Threat Guidance

The University of Oklahoma embraces a Run, Hide, Fight strategy for active threats on campus. This strategy is well known, widely accepted, and proven to save lives. To receive emergency campus alerts, be sure to update your contact information and preferences in the account settings section at one.ou.edu.

RUN: Running away from the threat is usually the best option. If it is safe to run, run as far away from the threat as possible. Call 911 when you are in a safe location and let them know from which OU campus you're calling from and location of active threat.

HIDE: If running is not practical, the next best option is to hide. Lock and barricade all doors; turn off all lights; turn down your phone's volume; search for improvised weapons; hide behind solid objects and walls; and hide yourself completely and stay quiet. Remain in place until law enforcement arrives. Be patient and remain hidden.

FIGHT: If you are unable to run or hide, the last best option is to fight. Have one or more improvised weapons with you and be prepared to attack. Attack them when they are least expecting it and hit them where it hurts most: the face (specifically eyes, nose, and ears), the throat, the diaphragm (solar plexus), and the groin.

Please save OUPD's contact information in your phone.

NORMAN campus: For non-emergencies call (405) 325-1717. For emergencies call (405) 325-1911 or dial 911.

TULSA campus: *For non-emergencies call (918) 660-3900. For emergencies call (918) 660-3333 or dial 911.*

Fire Alarm/General Emergency

If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates:

1. *LEAVE* the building. Do not use the elevators.
2. *KNOW* at least two building exits
3. *ASSIST* those that may need help
4. *PROCEED* to the emergency assembly area
5. *ONCE safely outside, NOTIFY first responders of anyone that may still be inside building due to mobility issues.*
6. *WAIT* for official notice before attempting to re-enter the building.

[OU Fire Safety on Campus](#)