

**University of Oklahoma
Gallogly College of Engineering
School of Computer Science**

**CS4473/ CS5473: Parallel, Distributed, and Network Programming
Spring 2019**

Instructors: Sudarshan Dhall

Course will be co-taught by: Dr. Chongle Pan, and Dr. Sridhar Radhakrishnan,

Offices: Devon Energy Hall (refer to directory on first floor for office numbers)

Email: cpan@ou.edu, sdhall@ou.edu, and sridhar@ou.edu

Office Hours: Dhall: 3 – 4:30 pm on Mondays and by Appointment

Pan: 3 – 4:30 pm on Thursdays and by appointment

Sridhar : By appointment

Learning Management System: canvas.ou.edu

Course Meeting Time and Location: 6:00 – 8:40 on Mondays in *Room 438 CEC*,

Course Prerequisite: CS 3113 Operating Systems, CS 4413 Algorithm Analysis

Course Description:

Parallel and distributed computer architectures, algorithms, and programming paradigms. Topics include distributed and shared memory systems, network programming, GPU architectures, load balancing, SIMD/SPMD/MIMD, message passing interface (MPI), multithreaded programming, and Hadoop. Students will learn to program using MPI, OpenMP, and CUDA. No student may earn credit for both 4473 and 5473.

Texts and Materials:

Required textbook: *An introduction to parallel programming*, Peter S. Pacheco, 2011, Morgan Kaufmann, ISBN-13: 978-0123742605

Recommended textbook: *CUDA by Example: An Introduction to General Purpose GPU Programming*, Jason Sanders, Edward Kandrot, Nivida, Addison-Wesley, 2010.

Learning Outcomes:

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

- Explain parallel hardware, parallel software, and computer network
- Explain the TCP/IP layered protocol, Socket Programming, and other network protocols
- Develop parallel programs with MPI in distributed memory systems
- Develop multi-threading programs with OpenMP in shared memory systems
- Develop programs using general-purpose graphics processing unit (GPGPU)
- Develop distributed programs using Hadoop and MapReduce
- Analyze and measure the performance of parallel algorithms

Evaluation:Course Grading:

- Homework: 30%
- Projects: 30%
- Midterm: 20%
- Final: 20%

Graduate students taking this course as CS5473 will have additional assignments (beyond those required for CS4473).

NOTE: Graduate students enrolled in CS4473 will not get graduate credit for the class.

Grading Scale:

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

Grade	Points
A	>90
B	80-89
C	70-79
D	60-69
F	<60

Tentative Lecture Plan:

Date	Class	Topics	Instructors
01/14	Lecture 1	Introduction	Dhall
01/21	Martin Luther King Holiday		
01/28	Lecture 2	Parallel hardware and software	Dhall
02/04	Lecture 3	Parallel algorithms - matrix operations, Linear Systems	Dhall
02/11	Lecture 4	Computer networks	Radhakrishnan
02/18	Lecture 5	MPI programming	Pan
02/25	Lecture 6	MPI programming	Pan
03/04	Lecture 7	OpenMP programming	Pan
03/11	Lecture 8	OpenMP programming (First half) of the class)	Pan
03/11	Mid-term	(Second half of the class)	
03/18	Spring Break		
03/25	Lecture 10	Parallel programming (n-body)	Pan
04/01	Lecture 11	Parallel programming (tree search)	Pan
04/08	Lecture 12	GPGPU programming	Dhall
04/15	Lecture 13	GPGPU programming	Dhall
04/22	Lecture 14	Hadoop programming	Radhakrishnan
04/29	Final Exam		

University Policies

Academic Integrity

Cheating is strictly 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 and quizzes must be yours and yours alone. You may not receive outside help. On examinations and quizzes you will never be permitted to use your notes, textbooks, calculators, or any other study aids. Should you see someone else engaging in this behavior, I encourage you to report it to myself or directly to the Office of Academic Integrity Programs. That student is devaluing not only their degree, but yours, too. 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 don't cheat. It's simply not worth it.

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.

Reasonable Accommodation Policy

There is not specific language for the Reasonable Accommodation policy to be included in the syllabus. It is good to become familiar with the policy and describe it in your own words. Including the link to Disability Resources Center is encourage, <http://www.ou.edu/drc/home.html>.

Students requiring academic accommodation should contact the Disability Resource Center for assistance at (405) 325-3852 or TDD: (405) 325-4173. For more information please see the Disability Resource Center website <http://www.ou.edu/drc/home.html> Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

Title IX Resources and Reporting Requirement

For any concerns regarding gender-based discrimination, sexual harassment, sexual assault, dating/domestic violence, or stalking, the University offers a variety of resources. To learn more or to report an incident, please contact the Sexual Misconduct Office at 405/325-2215 (8 to 5, M-F) or smo@ou.edu. Incidents can also be reported confidentially to OU Advocates at 405/615-0013 (phones are answered 24 hours a day, 7 days a week). Also, please be advised that a professor/GA/TA is required to report instances of sexual harassment, sexual assault, or discrimination to the Sexual Misconduct Office. Inquiries regarding non-discrimination policies may be directed to: Bobby J. Mason, University Equal Opportunity Officer and Title IX Coordinator at 405/325-3546 or bjm@ou.edu. For more information, visit <http://www.ou.edu/eoo.html>.

Adjustments for Pregnancy/Childbirth Related Issues

Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact your professor or the Disability Resource

Center at 405/325-3852 as soon as possible. Also, see <http://www.ou.edu/eoo/faqs/pregnancy-faqs.html> 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 (<https://apps.hr.ou.edu/FacultyHandbook#4.10>).

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.

[Link to Severe Weather Refuge Areas](#) , [Severe Weather Preparedness - Video](#)

Armed Subject/Campus Intruder: If you receive an OU Alert to shelter-in-place due to an active shooter or armed intruder situation or you hear what you perceive to be gunshots:

1. GET OUT: If you believe you can get out of the area WITHOUT encountering the armed individual, move quickly towards the nearest building exit, move away from the building, and call 911. *2. HIDE OUT:* If you cannot flee, move to an area that can be locked or barricaded, turn off lights, silence devices, spread out, and formulate a plan of attack if the shooter enters the room. *3. TAKE OUT:* As a last resort fight to defend yourself.

For more information, visit <http://www.ou.edu/emergencypreparedness.html>

[Shots Fired on Campus Procedure - Video](#)

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](#)