

Midwestern State University
Department of Computer Science
Spring 2024

Course Information

Course syllabus: Topics in Parallel Distributed Computing: Parallel Computing/Programming.
Course number: CMPS 4563 AND CMPS 5433(Cross listed)
Course Section: 201.
Class hours: noon to 12:50 pm, Monday, Wednesday and Fridays.
Classroom: McCoy Engineering Hall 207.

Instructor Information

Instructor's Name: Doctor Eduardo Colmenares.
Instructor's office: Bolin Hall, office 126C.
Instructor's email: eduardo.colmenares@msutexas.edu

Office Hours

Monday: 8:30 am to 9:30 am; 4:00 pm to 5:00 pm.
Tuesday: 3:30 pm to 4:30 pm.
Wednesday: 4:00 pm to 5:00 pm.
Thursday: 3:30 pm to 4:30 pm.
Friday: No office Hours.

ZOOM information

[Zoom Link](#)

Course Description

A practical introduction to the principles of parallel computing, parallel algorithm development and analysis, as well as, design, implementation, and evaluation of parallel programs in shared and distributed memory environments using MPI, OpenMP, Pthreads, and new and novel architectures such as Graphic Processing Units (GPUs). The class also includes discussions about contemporary advancements in High Performance Computing (HPC) architectures and potential applications.

Textbook

Is the textbook required? Strongly Recommended.
Textbook name: An Introduction to Parallel Programming
Textbook edition: Second Edition.
Textbook Author: Peter Pacheco

Students Resources

CS HPC Cluster (Turing)
TACC

Required Software

Winscp, which can be [downloaded here](#)
Putty, which can be [downloaded here](#)
A good C compiler

Grading Policy

90 to 100 points is an A.

80 to 89.99 points is a B.

70 to 79.99 points is a C.

60 to 69.99 points is a D.

0 to 59.99 points is an F.

Evaluation Process Summary Table

Category	Percentage
Tests	30%
Final Exam	20%
Homework	27%
Attendance	5%
Project	9%
Participation (Quizzes)	9%

Evaluation Process

The final grade for this course will be based on participation, home, project, attendance and exams. A description is provided next

- You will have two tests and one final exam, each one of the tests is worth 15 points. Your final exam is worth 20 points. All the tests including the final exam will count for fifty percent of your final your grade.
- You will have several programming assignments or also known as homework. All your programming assignments will count for twenty seven percent of final your grade. Your homework is classified in two different subcategories as follows
 - Take Home Homeworks (THH), these are traditional homework and you will be given plenty of time to work on them and successfully complete them.
 - In Class Homeworks (ICH), these type homework will be announced ahead of time in order to allow the students to prepare all the necessary hardware and software needed for its successful in class completion.
- The next category is attendance. Attendance will count for five percent of your final grade.
- The class project will count for nine percent of your grade. This is not an individual project.
- The last category is participation, and this will count for nine percent of your final grade. Please be aware that this category includes in class activities and quizzes. Next you will find additional information about this category.
 - Assignments given in class, also known as in class activities will be unannounced in nature.
 - Quizzes will be non-pop-up quizzes.
 - No makeup participation assignments are given.
 - Arriving late, leaving early to class voids the right to take a quiz or in class activity if it already started or it is about to start.

Laptop Policy

For this class, you are not required to buy a laptop. However, if the instructor announces an (In Class Homework (ICH) or In Class Activity (ICA), then you are responsible for the following:

- Bringing a laptop with all necessary programs properly installed, configured a tested.

- Bringing the laptop's charger: If you do not bring your charger and cannot complete the assignment(s) because your battery died, then your grade will not be a good one.
- Make sure that you have a fully working and in-classroom tested Wi-Fi capabilities. If you cannot submit your homework because your Wi-Fi does not work, then your grade will not be a good one.

Attendance

- Attendance is a component of the course grade (five percent). Each student will begin with 100 points for their attendance grade. For each additional unexcused absence 25 points will be subtracted from the attendance grade.
- Your instructor will go over the class roster at the beginning of class and will call the students by name, if the student is not present at that time, an absence will be given and not removed after arrival. Arriving late will be considered unexcused absence. The Attendance grade is 100% under the student's control.
- After 5 unexcused absences the student will be dropped from the class.
- Additional class attendance related MSU Policies apply.

Tests

Tests are comprehensive in nature. No make-up exams will be given, except for the following cases:

- Properly documented Surgery, Medical Emergency, Death in the family, Presentation at a Conference, some others as determined by the instructor.
- If you miss an exam, the make-up exam you need to notify the instructor and demonstrate with the proper official documentation (signatures, seals, contact information) that an emergency that you could not circumvent existed. This documentation must be presented not later than 24 hours after the test. The date on the documentation must match the date of the exam that you missed.
 - a. Students who miss an exam due to University business should notify the instructor in advance, and present the sponsoring university member's written justification.
 - b. If your instructor cannot verify or validate the given documentation, then it will consider invalid and no make-up exam will be given.

If you do miss an exam and your case fall in one of the categories above this means that you have a properly documented case. Your instructor will proceed to assign a temporary grade of zero, which will be substituted for your excused test grade (Final Exam). However, this substitution can only be performed once during the semester. Exams are uniquely composed for each term.

Quizzes

- Quizzes are announced in nature and conducted to evaluate how well the students understand material explained and or assigned in class. There is no make up for quizzes.
- If you arrive to the classroom after a quiz has started, you will not be allowed to take it and an unexcused absence assigned. Please be on time.

Final Exam

- There is no make-up final exam. The final exam will take place in our regular classroom. It is the student's responsibility to keep track of the designated date, time. A complete list of all MSU exams (by time) can be found at [Final Exam Schedule](#).
- The date of our final exam is Wednesday May the 8th from 3:30 pm to 5:30 pm.

Assignments - Late Policy & Deadlines

- Submitted work is due when specified, as specified (format) by the instructor. It is in the student's best interest to keep track of all deadlines.
- The instructor is not required to remind students of ANY date and/or deadline associated with tests, homework, reports, project assignment, etc.
- **Late assignments WILL NOT BE ACCEPTED. This rule will be enforced**
 - **What does it mean to be late?** Answer: for example, if your assignment is due today at 8:00 am and you attempt to deliver your report by 8:00:01 am (1 second late) then it will be considered late. There will not be exemptions of any kind.
 - **Assignments MUST be submitted to the corresponding Dropbox via D2L before it closes (deadline).** If the Dropbox has closed and you cannot upload your assignment to it, then you are late and your assignment will not be accepted.
 - Students will have more than enough time to complete their assignment on time.
 - Internet outage, computer problems, car problems, work, and several others are NOT a valid excuse for a late delivery.
- Very Important: Before you submit any file, take your time and double OR triple check that
 - a. You are uploading the correct and ALL necessary files
 - b. Your work is correct at the best of your abilities
 - c. Failure to fulfill (a) and (b) ON TIME, WILL NOT excuse you from a bad grade.

Additional Grade Policy

Once the grades, have been either returned to the students, or published via D2L, the student will have one week to examine them and check for inconsistencies, errors, etc. After the one week window of opportunity all grades will become PERMANENT and WILL NOT change. It is not only the student's responsibility to check the accuracy of his/her grades, but also in his/her best interest to do it. This rule DOES NOT apply to the final exam because the final is exam triple checked by the instructor before publishing the grade.

No Procrastination Policy

Students are strongly encouraged to contact the instructor during office hours to clarify questions associated with lectures, exams, assignments, presentations, quizzes, homework, etc. Questions are more than welcome from the moment the assignments, projects, quizzes, exams are either released or announced, however, all questions stop the day before the assignment, exam, quiz, presentation is due. This rule is designed to promote responsible time management and personal organization.

Academic Misconduct Policy & Procedures

Academic misconduct is cheating, collusion, and plagiarism: it is the act of using either published or unpublished source material of other students, persons, or generative AI (unless there are instructions that allow it), and must follow accepted techniques of crediting. The Department of Computer Science has adopted the following policy related to academic misconduct. The policy will be applied to all submission of work for credit as determined by the instructor of the course, e.g., assignments, quizzes and exams. (See below for link to MSU definitions.)

- 1st instance of cheating in the program: The student will be assigned a non-replaceable grade of zero for the assignment, project or exam. If the final grade in the course, does not

result in a one letter grade reduction, the student will receive a one letter grade reduction in course.

- Further instances of cheating in any course within the program: The student will receive a grade of F in the course & be removed from the course.
- All instances of cheating will be reported to the Department Chair, the MCOSME Dean, the Dean of Graduate Students, if a graduate student, and the Office of Rights and Responsibilities, who may decide at their own discretion to impose a stiffer sanction based on knowledge of other instances of cheating at MSU Texas.

Note: Letting a student look at your work is collusion and is academic misconduct!

See Also: [MSU Student Handbook](#): Appendix E: Academic Misconduct Policy & Procedures <https://msutexas.edu/student-life/assets/files/handbook.pdf>.

Policy on Testing Process

The Department of Computer Science has adopted the following policy related to testing.

- a) All bags, purses, electronics (turned off), books, etc. will be placed in the front of the room during exams, or in an area designated by the instructor.
- b) Unless otherwise announced by the instructor, nothing is allowed on the desk but pen/pencil/eraser and test papers.
- c) You are not allowed to leave the classroom. Please take this seriously and into consideration before any test and the final. Prepare yourself to be in the classroom during the entire exam.
- d) If you decide to leave the classroom during a test and/or the final exam, your exam will be collected, and you will not be allowed to continue.

Classroom Civility

All violations of classroom civility will be reported to the Dean of Students.

Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to ensure that all students gain from time spent in class, students are prohibited from engaging in any form of distraction, e.g. leaving the room for extended periods of time, reading newspapers (or other articles), working on other courses, and using cell-phones or laptops for calls or messages. If you indulge in any such inappropriate behavior (without explicit consent of the instructor), you will (at the very least) be asked to leave the classroom. [MSU Dean of Students Website](#).

Student with Disabilities

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from disability support office during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Disability Support Office has been provided. For additional information you may contact the Disability Support Office in Clark Student Center 168 - Phone: (940) 397-4140.

[Disability Support Services](#).

Dean of Students

The Dean of Students can assist in notifying the campus community of student illnesses, immediate family deaths and/or student death. Generally, in cases of student illness or

immediate family deaths, the notification to the appropriate campus community members occur when a student is absent from class for four consecutive days with appropriate verification. It is the student's responsibility for missed class assignments and/or course work during their absence. [MSU Dean of Students Website](#).

RECORDING OF CLASS LECTURES

Permission must be requested in writing & obtained from the instructor before recording of class lectures. If permission is granted, the recording may only be used by the student making the recording. Recordings may NOT be posted on any internet source without written permission of the instructor. Failure to adhere to the policy may result in removal from the course with a grade of F or other appropriate punishment.

Broadcasting of Lectures

Not a single lecture will be broadcasted or recorded unless

- The faculty members is instructed or required to work from home

University's Campus Carry

Senate Bill 11 passed by the 84th Texas Legislature allows licensed handgun holders to carry concealed handguns on campus, effective August 1, 2016. Areas excluded from concealed carry are appropriately marked, in accordance with state law. For more information regarding campus carry, please refer to the University's webpage at [Campus Carry](#).

Additional Office Hours & Meeting Policies

In order to protect your wellbeing and the one of those that you care about, the following preventive measurements will take place:

- a) Office hours can be virtual via ZOOM. Check your syllabus for detailed office hours.
- b) Your instructor will not touch any computer or USB Drive. NO Exemptions.
- c) If at some point you need/want me to look at your programming assignment or class project, you can do it by sharing your desk via ZOOM (Virtually) during office hours.
- d) Questions associated with ADVISING, degree plans, etc., can be addressed (Virtually-ZOOM) during office hours.
- e) The faculty member is open and available to face to face meetings if the student is in good health condition and not showing symptoms of running nose, sneezing, coughing.

Covid Precautions

I encourage all those who wish to wear a mask to do so. Any vulnerable or unvaccinated person should wear an N95 or equivalent, if they want to protect themselves from others.

Inclement Weather

Classes (and quizzes) **may be** held online in D2L, in cases of inclement weather. Please check the D2L course home page for this class for such type of announcement(s). This will be the faculty member decision.

Research and Creative Activity Opportunities at MSU

Enhancing Undergraduate Research Endeavors and Creative Activities (EURECA) is a program that provides opportunities for undergraduates to engage in high-quality research and creative activities with faculty. EURECA provides incentives and funding through a system that

supports faculty and students engaged in collaborative research and creative works. For more information contact the Office of Undergraduate Research at (940) 397-6274 or by email at eureca@msutexas.edu or better yet, stop by the UGR office located in the atrium of the Clark Student Center, room 161. Information and resources are also available at [Eureca's website](#)

Undergraduate Research Opportunities and Summer Workshop (UGROW)

Like EURECA, UGROW provides opportunities for students to conduct research with faculty. However, the research occurs in the summer. For five weeks UGROW students experience the authenticity of scientific research as well as research and creative activities in art, music, theater education, business, health and social sciences, English, history, etc. in a highly interdisciplinary environment. Students work on projects of their choice and present their findings at the end of program and the MSU Undergraduate Research and Creative Activity Forum. Faculty members will introduce their research ideas February 13th, 2019, at 5:00 p.m., Comanche Suites, Clark Student Center. A break-out session with individual faculty members will follow. If you have any questions, contact the Office of Undergraduate Research at (940) 397-6274 or by email at eureca@msutexas.edu. More information and resources are available at [ugrow's website](#)

Council on Undergraduate Research

To support undergraduate research and creative activities, Midwestern State University holds an enhanced institutional membership with the Council on Undergraduate Research (CUR). This institutional membership includes unlimited memberships for any interested faculty, staff, and students. Students find information on benefits and resources at [the council for undergraduate research website](#) and sign up at no cost at [this website](#).

I would like to personally invite you to become a member of CUR so that you benefit from all the opportunities CUR offers to you.

CUR Undergraduate Resources Webpage contains:

- Research Opportunities;
- Presentation Opportunities;
- Undergraduate Research Journals;
- CUR-Sponsored Student Events;
- The Registry of Undergraduate Researchers;
- And more!

ScholarBridge

Midwestern State University is excited to announce a new resource designed to address a commonly expressed student need—the creation of a centralized searchable database of faculty research interests and opportunities. We have entered into a partnership with [ScholarBridge](#), is a website designed to help students participate in undergraduate research and creative activities. I strongly encourage you to join ScholarBridge at your earliest convenience.

Tentative Agenda

The instructor reserves the right to add, remove, reorder topics as he considered convenient towards the benefit of the class. By the end of the semester you will have a very good understanding of the following topics.

1. Syllabus, VM, TACC, Turing, Why Parallel, History, Potential

2. Basic C, Arrays, Functions in C
3. Bitwise operations (in C), Pointers, structures
4. Dynamic memory allocation, Linked Lists (in C)
5. Project Documentation: Doxygen
6. Project Management: Make files
7. Batch programming
8. Why we need to write parallel programs
9. Concurrent, Parallel, Distributed, intro to (Ch2) Cache mapping
10. (Ch2) Cache mapping
11. (Ch2) Virtual Memory,
12. (Ch2) Instruction Level Parallelism, Parallel Hardware.
13. (Ch2) SIMD, MIMD, Cache coherence, shared memory vs distributed memory
14. (Ch2) performance
15. (Ch3) MPI- Compilation, Execution, MPI_Init, MPI_Finalize, communicators, communication, SMPD
16. MPI_Send, MPI_Recv, message matching, semantics of MPI_Send/Recv, Pitfalls
17. Trapezoid rule by hand, Trapezoid rule (sequential)
18. Trapezoid rule (MPI)
19. (Ch3) Dealing with input output
20. More MPI Non-Collectives
21. MPI Collective communications
22. Test 1 Review
23. TEST 1
24. MPI Collective communications (Continues)
25. Shared memory programming with Pthreads
26. Test 2 Review
27. TEST 2
28. Shared memory programming with OpenMP
29. GPU Concepts and introduction
30. Contemporary advancement in HPC Architectures
31. In Class Project Presentation
 - a. All groups must present for 20 minutes
 - b. All members of the group must present, also, the complexity and length of the presentation for each member must be almost the same.
 - c. All members of a group must fully understand the whole project, concepts and solutions.
 - d. Questions can and will be asked, so all members must be prepared to answer.
32. Review for Final Exam
33. FINAL EXAM