

Midwestern State University  
Department of Computer Science  
Fall 2024

### **Course Information**

Course syllabus: Topics in Parallel and Distributed Comp: HPC.

Course number: CMPS 4563.

Course Section: 101.

Class hours: 10:00 am to 10:50 am, Monday, Wednesday and Fridays.

Classroom: Bolin 109.

### **Instructor Information**

Instructor's Name: Doctor Eduardo Colmenares.

Instructor's office: Pierce Hall, office 141.

Instructor's email: [eduardo.colmenares@msutexas.edu](mailto:eduardo.colmenares@msutexas.edu)

### **Office Hours**

Mondays 8:30 am to 9:30 am and 11:00 am to noon.

Tuesdays 11:00 am to noon.

Wednesdays 8:30 am to 9:30 am.

Thursdays 11:00 am to noon.

Fridays, no office hours on Fridays.

### **ZOOM information**

[Zoom Link](#)

### **Course Description**

A theoretical and practical introduction to the principles of High Performance Computing (HPC), which includes but it is not limited to hardware behavior, hardware configuration, HPC architectures, parallel programming paradigms, parallel algorithm development, analysis and evaluation.

### **Textbook**

Is the textbook required? Strongly Recommended.

Textbook name: An Introduction to Parallel Programming

Textbook edition: The most recent one.

Textbook Author: Peter Pacheco

### **Students Resources**

CS HPC Cluster (Turing)

Stampede 2 at TACC

### **Required Software**

Winscp, which can be [downloaded here](#)

Putty, which can be [downloaded here](#)

A good C compiler (not C++)

### **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	6%
Project	9%
Participation (Quizzes)	8%

### 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 six 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 eight 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 33.33 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 five (5) unexcused absences the student will be dropped from the class (To be enforced).
- 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 December 11<sup>th</sup>, from 10:30 am to 12:30 pm.

## 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 assignment is released and stop the day before the assignment, exam, quiz, presentation is due.

## 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.

## Academic Misconduct Policy & Procedures

Cheating, collusion, and plagiarism (the act of using source material of other persons, devices, AI Generators, either published or unpublished, without following the accepted techniques of crediting, or the submission for credit of work not the individual's to whom credit is given). The Department of Computer Science has adopted the following policy related to cheating (academic misconduct). The policy will be applied to all instances of cheating on assignments and exams as determined by the instructor of the course. (See below for link to MSU definitions.)

- 1st instance of cheating in a course: 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.*

- 2nd instance of cheating in a course: The student will receive a grade of F in course & immediately be removed from course.
- All instances of cheating will be reported to the Department Chair and, in the case of graduate students, to the Department Graduate Coordinator.

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

See Also: [MSU Student Handbook](https://msutexas.edu/student-life/assets/files/handbook.pdf): 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 COVID 19 & Monkey Pox Policy**

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., will be addressed (Virtually-ZOOM) during office hours.

## **Covid Precautions**

I encourage all those who wish to wear a mask to do so.

## **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](mailto: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](mailto: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.

### **Pregnant and Parenting Students**

To support the academic success of pregnant and parenting students and students with pregnancy related conditions, the University offers reasonable modifications based on the student's particular needs. Any student who is pregnant or parenting a child up to age 18 or has conditions related to pregnancy, may contact MSU's designated Pregnancy and Parenting Liaison to discuss support available through the University. The Liaison can be reached by emailing [ruby.garrett@msutexas.edu](mailto:ruby.garrett@msutexas.edu) or calling 940-397-4500. Should a student communicate with me that they are pregnant or have a pregnancy related condition or may need additional resources related to pregnancy or parenting, I will communicate that student's information to the Title IX Coordinator, who will work with the student and others, as needed, to ensure equal access to the University's education program or activity.

A pregnant student, a parenting student, or a student with pregnancy related conditions may be provided with supportive measures, based on the student's individualized needs, analogous to those provided to a student with a temporary medical condition, and provided such supportive measures do not fundamentally alter the nature of an education program or activity.

## Other Academic Related Student Resources

[Click this text to go to student resources](#)

### 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, HPC
2. HPC Custer, idea, architectures
3. Winscp, Putty (installation and understanding)
4. C- Reinforcement
  - a. Basic C, Arrays, Functions in C
  - b. Bitwise operations (in C), Pointers, structures
  - c. Dynamic memory allocation (C)
5. Project Documentation: Doxygen
6. Project Management: Make files
7. Batch programming
8. Why we need to write parallel programs
9. Contemporary topics in HPC
  - a. Technology
  - b. Architectures
  - c. Government Initiatives
  - d. Job Landscape
10. Concurrent, Parallel, Distributed,
11. intro to (Ch2) Cache mapping
12. (Ch2) Virtual Memory,
13. (Ch2) Instruction Level Parallelism, Parallel Hardware.
14. (Ch2) SIMD, MIMD, Cache coherence, shared memory vs distributed memory
15. (Ch2) performance
16. (Ch3) MPI- Compilation, Execution, MPI\_Init, MPI\_Finalize, communicators, communication, SMPD
17. MPI\_Send, MPI\_Recv, message matching, semantics of MPI\_Send/Recv, Pitfalls
18. Trapezoid rule by hand, Trapezoid rule (sequential)
19. Trapezoid rule (MPI)
20. (Ch3) Dealing with input output
21. More MPI Non-Collectives
22. MPI Collective communications
23. Shared memory programming with Pthreads
24. Shared memory programming with OpenMP
25. GPU Concepts and introduction
26. 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.

## **LIFE - ADVISE**