

Midwestern State University
Department of Computer Science
Fall 2019

Course Information

Course syllabus: Topics in High Performance Computing, Parallel Computing/Programming.
Course number: CMPS 4563.
Course Section: 101.
Class hours: 11:00 am to 12:20 pm, Tuesday and Thursdays.
Class room: Bolin 312.

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 9:00 – 10:00 am
Tuesday 1:00 – 2:00 pm
Wednesday 9:00 – 11:00 am
Thursday 10:00 – 11:00 am
Friday No Office Hours

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.

Textbook

Is the textbook required? The answer is yes.
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

89 to 100 points is an A.
79 to 88.99 points is a B.
69 to 78.99 points is a C.
59 to 68.99 points is a D.

0 to 58.99 points is an F.

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 12.5 points. Your final exam is worth 20 points. All the tests including the final exam will count for forty percent of your final your grade.
- You will have several programming assignments or also known as homework. All your programming assignments will count for thirty 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 ten percent of your grade. This is not an individual project.
- The last category is participation, and this will count for ten 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.

Evaluation Process Summary Table

Category	Percentage
Tests	25%
Final Exam	20%
Homework	30%
Attendance	5%
Project	10%
Participation (Quizzes)	10%

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 have one unexcused absence. Each student will begin with 100 points for their attendance grade. For each additional unexcused absence, 20 points will be subtracted from the attendance grade. Please let your instructor know if you are going to miss a class for academically related extracurricular activities. If this is the case you must present the sponsoring university member's written justification before your absence occurs.

Tests

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

1. Surgery, Medical Emergency, Death in the family, Presentation at a Conference, some others as determined by the instructor.
 - a. If you miss an exam, you will receive a permanent zero unless you notify the instructor and demonstrate with the proper official documentation that an emergency that you could not circumvent existed. This documentation must be presented not later than 24 hours after the test.
 - b. Students who miss an exam due to University business should notify the instructor in advance, and present the sponsoring university member's written justification.

If you do miss an exam and you 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.

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](#).

Final exam Date is Tuesday December 10, 2019.

Final exam time goes from 1:00 pm to 3:00 pm.

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.
- Assignments submitted to the instructor's email will be considered invalid, even if submitted before the deadline. Assignments MUST be submitted to the corresponding dropbox via D2L.
- Late assignments will not be accepted.
- 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 (1) and (2) ON TIME, WILL NOT excuse you from a bad grade.
- What does it mean to be late?

Answer: for example, if your assignment is due today at 8:00 am and you 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.

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 1-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.

Important Information about our grading policy

The instructor reserves the right to adjust the grade distributions for the whole class. What does it mean? It means that grade distributions will not be adjusted on an individual basis.

Departmental Cheating Policy and Ethical Conduct

Policy on Academic Honesty

The Department of Computer Science had 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. In addition, 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.

Policy on Testing Process

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

1. 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.
2. Unless otherwise announced by the instructor, nothing is allowed on the desk but pen/pencil/eraser and test papers.
3. No student is allowed to leave the room during an exam and return. Be prepared to remain in the classroom for the entire duration of the test.

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 Website](#).

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.

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](#).

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@mwsu.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. If you have any questions, contact the Office of Undergraduate Research at (940) 397-6274 or by email at eureca@mwsu.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. 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.
31. Review for Final Exam
32. FINAL EXAM