Course Information
Course syllabus: Topics in DistribParallelComputing: GPU Programming
Course number: CMPS 4563
Session number: 101.
Class hours: 10:00 am to 10:50 pm, Monday, Wednesday and Fridays.
Class room: Bolin 144.

Instructor Information
Instructor's Name: Doctor Eduardo Colmenares.
Instructor's office: Bolin Hall, office 124B.
Instructor's email: eduardo.colmenares@msutexas.edu

Office Hours (by appointment)
Monday: 2:00 pm to 4:00 pm
Tuesday: 8:30 am to 9:30 am
Wednesday: 2:00 pm to 3:00 pm
Thursday: 8:30 am to 9:30 am
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 by using and targeting and adequate balance between multicore CPU's and many-core Graphics Processing Units (GPU's).

Course Prerequisites
Minimum grade of C in Data Structures and Computer Architecture.

Textbook
Is the textbook required? The answer no, but strongly recommended.
Textbook name: Programming Massively Parallel Processors. A hands-on Approach
Textbook edition: First, second or third edition.
Textbook Author: Kirk and Hwu.

Required Software
Winscp
Putty

Student Resources:
- CS-HPC Turing Cluster.
- Texas Advanced Computer Center (TACC)

Required Hardware
- Regular traditional PC/Mac. Chromebooks are NOT allowed.
- Printer and Paper

Evaluation Process Summary Table

Category	Percentage
Test 1	16
Test 2	16
Final Exam	17
Homework (THH and ICH)	23
Participation (Quizzes and In Class Activities (ICAs)	12
Project	10
Attendance	6

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.
69 to 69.99 points is a D.
0 to 59.99 points is an F.

Evaluation Process
The final grade for this course will be based on participation, projects and exams. A description is provided below:
- You will have two tests and one final exam (FE). Test 1 and test 2 are worth 16 percent each. Your final exam is worth 17 percent.
- You will have several programming assignments. All your programming assignments will count for 23 percent of final your grade. Students must be prepared to defend and properly explain any submitted code or homework at any time.
- The next category is participation, this will count for 12 percent of your final grade. Please be aware that this category includes in class activities and quizzes. Below 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. There are three potential formats for our Quizzes, the instructor decides which format to use and when.
        - Format 1 (online quizzes): if this option is used then you are required to use D2L to take the quiz, you cannot use a Chromebook for this purpose, and you should have
        - Format 2 (online but by hand): You will be required to print the document and scan it.
        - Format 3: Traditional in class hard copy.
    - 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.

- The last category is your GPU Project. This category is worth 10 percent of your grade. More information will be given during the semester. In the case of graduate students the level of complexity is expected to be more advanced than the undergraduate projects.

Attendance
- Attendance is a component of the course grade (six percent). Each student will begin with 100 points for their attendance grade. For each additional unexcused absence, 33.3 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:
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.
2. The exams for graduate students may differ from the undergraduate quizzes in the nature, type and number of questions.

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.
- The date of our final exam is December 10th, from 10:30 am to 12:30 pm.

Assignments - Late Policy & Deadlines
- In the case of graduate students the assignments may differ in length and complexity when compared to the one being assigned to undergraduate students.
- 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.

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.

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.

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 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. *In addition, the student will receive a one letter grade reduction in course, if the grade doesn't result in a grade reduction.*
- 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!

Can I use AI to solve my homework and/or project: The answer is NO, this is also an academic misconduct!

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](#).

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. I will also meet with students via Zoom by appointment.

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.

Laptop Policy
For this class, you are not required to buy a laptop. However, if the instructor announces an ICH (In Class Homework) or ICA (In Class Activity), you are responsible for:
a. Bringing a laptop with all necessary programs properly installed, configured a tested.
b. 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.
c. 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.

Excusing Late Work
Any document used to excuse the late delivery of an assignment MUST be presented no longer than one week from the corresponding missed deadline. Valid excuses (Surgery, Medical Emergency, Death in the family, and Presentation at a Conference).   Failure to fulfill this requirement will make null the excuse, leading to a permanent grade of zero in the corresponding assignment.

Tentative Agenda
We will try to respect this agenda as much as possible, however it is possible that some topics will require more, or less time to cover them, which may lead to changes. Students will be informed about those changes in class. The instructor reserves the right to modify, add, remove, and update the proposed agenda.

a) Syllabus, TACC, Turing, accounts, Why Parallel Computing is important, Virtual Machine, General Ideas
b) Chapter 1-2: - Introduction, GPU History
c) C Reinforcement: - Basic C, Functions in C, Arrays, Pointers, Bitwise operations (in C)
d) Data structures, Dynamic memory allocation, Linked Lists
e) Project Documentation: Doxygen
f) Project Management: Make files
g) Parallel Concepts: Speedup, Efficiency, etc, + Performance Analysis. Fast Fourier Transform (FFT)
h) Chapter 3: - Introduction To Data Parallelism and CUDA C
i) Chapter 4: - Data Parallel Execution Model
j) Chapter 5: - CUDA Memories
k) Chapter 5: - CUDA Memories
l) Chapter 6: - Performance Considerations
m) Chapter 7: Floating Point Format
n) Chapter 13: - Parallel Programming and Computational Thinking
o) Chapter 8: - Parallel Patterns, Convolution
p) Introduction to Distributed Memory Programming with MPI - Point to Point Comm. (Blocking and Non-Blocking)
q) In Class Project Presentation