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| COURSE INFORMATION | Location: | online via Discord |
| | Class Times: | MW 14:30 – 15:45 |
| | Instructor: | Karl Frinkle |
| | Office: | MTH 112 |
| | Office Hours: | by appointment only |
| | E-mail: | kfrinkle@se.edu |
| | Website: | http://homepages.se.edu/kfrinkle/ |

COURSE OVERVIEW In this course, we will use MPI (Message Passing Interface) in a C/C++ environment running under the OpenHPC cluster operating system to write high performance computing (HPC) programs. All work will be done by programming in C/C++ on the Cumulonimbus cluster. We will focus most of our efforts on writing code in parallel to increase the performance and reduce run times of standard serial code.

COURSE OUTLINE Although the course will be more project based, these are some of the key areas we will cover:

I. Introduction:

- Hardware inspection of the Cumulonimbus cluster
- Overview of parallel versus serial programming

II. Working on the Cluster

- Connecting to the cluster using SSH
- User accounts, privileges, and responsibilities
- Editors: Vi, nano

III. Compiling Programs

- C++
- MPI with C++

IV. Submitting MPI Jobs to the Queue

- Slurm
- batch files
- Job status
- Job output

V. Getting Started with programming

- Simple Hello World
- MPI Hello World

VI. MPI Topics

- Initialization
- Broadcast versus Send/Receive
- Gather and Scatter
- File I/O
- Helpful MPI Commands and their uses
- Optimization
- Even work distribution versus first come first serve work loads

V. Sum of Three Code

- Overview of the problem

- Serial code
- Parallel code
- Analysis and further optimization of code

COURSE WORK Most work will consist of writing programs, analyzing the results, and revising programs after the analysis is complete. You will be expected to hand in programs which compile and execute as described by the given assignment. A major emphasis will be placed on the revising of programs based upon runtime analysis. You will be expected to be able to present your work, analysis, and revisions in a coherent manner, not just to the instructors, but to your fellow students.

GRADES Programming will count for the entirety of your grade. You will be expected to turn in programming assignments in a timely manner, and will receive subsequent feedback in a timely manner.

COURSE MODIFICATION I reserve the right to change any policies as I see fit to ensure that you are indeed receiving the best possible education that I can give you in the subject matter at hand. If I feel a certain aspect of the course does not appear to be effective in its method, I will attempt to change it (for the better I hope).

TECHNOLOGY All cell phones and other such devices must be turned off and put away before class begins. If you are caught using a cell phone during class, your final grade will be dropped by **one letter grade per incident**.

MANDATORY STATEMENTS **Counseling Center:** Any student experiencing mental or emotional issues who desires free, confidential, clinical counseling is encouraged to contact the SE Counseling Center at (580) 745-2988 to schedule an appointment during normal working hours Monday-Friday, 8:00AM to 5:00PM. For after-hours mental health emergencies, please call SE Campus Police at (580) 745-2911 or the Mental Health Crisis Hotline at 1-(800) 522-1090.

Disability Accommodations: Any student needing special accommodations due to a disability should contact the Office of Disability Services, GDJ Student Union Room 328 or call (580) 745-3036. It is the responsibility of each student who anticipates or experiences barriers to their academic experience to make an official request for disability related accommodations in a timely manner. If you have questions regarding disability accommodation process or policy please contact Tiffany Tate, ttate@se.edu for more information.

Equity and Non-Discrimination Statement: Southeastern Oklahoma State University, in compliance with all applicable federal and state laws and regulations, does not discriminate on the basis of race, color, religion, national origin, sex, age, disability, sexual orientation, gender identity, or status as a veteran in any of its policies, practices, procedures, or programs. This includes, but is not limited to: admissions, employment, financial aid, and educational services. Inquiries regarding non-discrimination and equity policies may be directed to: Michael Davis, Title IX Coordinator, (580) 745-3090, or mdavis@se.edu

Academic Dishonesty: Academic dishonesty of any kind will not be tolerated. You may fail an assignment, fail the course or be expelled from the University for academic dishonesty. As a student, it is your responsibility to be familiar with and abide by The Student Code of Conduct, which may be viewed in the Student Handbook. Please note that your own original work is expected for all assignments that you submit. Ignorance is not generally accepted as an excuse.

COVID STATEMENTS **Conversion to Online Format:** Southeastern students should be aware that in the event of a University closure due to COVID19, onsite classes will be converted to an online/remote format. Students should plan ahead to ensure they have access to the computer equipment (either PC,

MAC, or tablet), webcam, and internet connectivity to continue their classes in an online/remote format. Please read all your official Southeastern student emails as the transition from onsite to online/remote might require a reorganization in your personal situation. Students will be granted a 72-hour transition and grace period. Online classes will continue as scheduled without disruption. Wear a mask, stay safe, and contact your Instructor as the situation arises. These policies and procedures were updated on July 30, 2020 and are subject to change.

Face Coverings: Per the Southeastern Oklahoma State University guidance on face coverings on campus, in the instructional setting, faculty and students must wear face coverings. At the discretion of the instructor, to accomplish an educational objective as long as safety protocols are met (including ample distance, shielding and other measures), faculty and students may be authorized to temporarily remove face coverings. Students without coverings, or those who do not comply with the rules relating to face coverings, will not be able to participate in on-campus classroom activities. To request an ADA exception to this requirement, students should contact the Disability Services Office. Failure to comply with the face coverings requirement may result in the Instructor directing the student to leave the classroom. Any student asked to leave the classroom may be referred to the Office of Student Conduct. These policies and procedures were updated on July 23, 2020 and are subject to change.

Attendance Policy: We are facing an unprecedented situation in which all of us must be flexible and make prudent decisions in the best interest of our families, our campus, and our community. In light of this, Southeastern is temporarily establishing campus-wide course attendance guidelines as follows: Students who are sick or need to quarantine should not attend classes. Students will not be required to provide formal documentation from a health care provider and will not be penalized for COVID-19 related absences when proper notification to campus health officials is made in accordance with the guidelines stated below.

Faculty will notify students about important course information and delivery changes through Blackboard and campus email.

Students will:

- Provide notification to campus officials (Illness Reporting Form) if they have tested positive for COVID-19 or have to quarantine so we can confirm reported absence with instructors, monitor, and assist the campus community.
- Notify instructors in advance of an absence.
- Connect with that class through Zoom if the class session is being transmitted in a hybrid fashion.
- Keep up with and/or make up missed classwork or assignments.
- Submit assignments digitally through Blackboard or other means as announced by your instructor.
- Work with their instructors to reschedule exams, labs, and other critical academic activities described in the course syllabus.
- Check Blackboard and campus email daily to receive important announcements pertaining to the course.

During this period, all faculty will establish assigned seating to facilitate roll-taking, and, if necessary, contact tracing. Additionally, we ask all members of the University community to be attentive to their health, and safeguard others, by following the CDC's guideline to stay home when you are sick. **You should stay home if you have symptoms.** More information on what to do if you are sick is available at the CDC's website. These policies and procedures were updated on July 24, 2020 and are subject to change.