SYLLABUS PART ONE[1]

COURSE TITLE AND COURSE NUMBER: **Introduction to Parallel Systems**
ECE4730(1)/6730(1) Sections 1

TERM: Fall 2022[2]

CLASS MEETING TIME AND PLACE: **4730/6730 lectures on Tues, 15:30 to 16:45** Section 1 – Riggs 305, Main Campus, Clemson . Online (If I am sick, or whatever) -- https://clemson.zoom.us/my/la.peste[3],

TIME TO WAIT: 15 minutes wait is preferred. Class attendance is not considered mandatory. If students are not available for class, they are still responsible for the material covered in class. Note that fee reimbursement may depend on the last date students attended class. Students are considered responsible for documenting when they stop attending class.

INFORMATION ON MODALITY: In person. The instructor may also use remote access when necessary (travel, illness, …) Some sessions will also be flipped classrooms where students are given media (readings, podcasts, videos, …) to absorb before class and lectures are devoted to discussions.

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[1] Version 0.1 Aug 19, 2021—Course syllabus contents subject to change in response to changing circumstances. The most current syllabus version will be posted on Canvas.

[2] See https://www.clemson.edu/registrar/academic-calendars/calendars.html?year=2021&semester=fall for official university start date and end date and other major dates from the academic calendar (last day to drop without a W, fall break, etc.)

[3] We intend to post recorded lectures at: https://clemson.box.com/s/tc5f2u9rrdswsas8157iod6glz7ahmfk Lectures from previous years are there. It is not clear how long the university will maintain this service. If changes are made, students will be informed promptly.

https://www.clemson.edu
PGP 1: 955B 3813 41C0 9101 3E6B CF05 02FB 29D6 8E1E 6137
PGP 2: FC15 BAF0 4296 B47E 932A 9DB3 D41B 81AF C6EA 90F6

Grader: Chunpeng Shao
Email: chunpes@g.clemson.edu
Office hours: TBD

DEPARTMENT AND COLLEGE OF INSTRUCTOR:

INSTRUCTOR EMAIL: rrb@acm.org I will attempt to respond to email inquiries within 36 hours, excluding weekends, university holidays, and travel.

UNIVERSITY OFFICE PHONE: 864-656-0920

OFFICE ADDRESS/OFFICE NUMBER: 313-C Riggs, Main Campus, Clemson, SC

Office Hours: 14:00 to 15:00 Tuesdays in Riggs 313-C. Maybe by zoom
https://clemson.zoom.us/my/la.peste
Or by individual arrangement. In person office hours will take place at the time and place we agree on (Preferably outdoors).

INSTRUCTOR PHOTO:

FIGURE 1PICTURE OF R. R. BROOKS

OFFICE AND/OR CLASSROOM MAP:
https://www.campus-maps.com/clemson-university/riggs-hall/

COURSE Introduces parallel computer architectures and their programming. Includes an introduction to MPI and OpenMP and a number of engineering problems, including numerical simulations. Introduces scalability analysis. Preq: ECE 3220 or ECE 3290, each with a C or better.

Value Statement

Parallel and distributed computing machines are complex. They can be faster and more dependable, or not. They can scale better, or not. This course is meant to provide you with the information you need to design and use these systems.

COURSE OVERVIEW

LEARNING OUTCOMES

At the completion of the course the student will:

- Students should be able to write working parallel programs with MPI
- Students should be able to write working parallel programs with OpenMP
- Students should be able to code important numerical parallel algorithms involving vectors, matrices, linear systems, etc.
- Understand how, why these systems scale
- Understand dependability and performance metrics for these systems
- Understand ongoing devlopments in distributed systems

PREREQUISITES ECE 3220 or ECE 3290, each with a C or better. Senior or graduate standing in ECE, or equivalent, and/or instructor permission.

REQUIRED MATERIALS

- The course had an out of print textbook. Will try to provide materials as needed.

- Laptop with Linux or a suitable alternative approved by the instructor with gcc, mpi and related gnu tools.
- Some means of storing working files on an SD card or USB stick in order to transfer course files
- and back them up.Webcamera
- Microphone
- Internet connections
- Cell phone

MAJOR ASSESSMENT/GRADING ACTIVITIES AND TOPICAL OUTLINE

Date	Due	Reading assignments	Lecture topic	
8/22/2024		Syllabus		
8/27/2024		Chapter 1. Motivation and History		global sum assignment given
8/29/2024		Chapter 2. Parallel architectures		
9/3/2024		Chapter 3. Parallel Algorithm design		
9/5/2024		Chapter 4. Message Passing		
9/10/2024	Sum assignment due	Chapter 7. Speedup		Matrix multiplicaiton assignment given
9/12/2024		Chapter 8. Matrix vector Multiplication		
9/17/2024		Chapter 11. Matrix Mutliplication		
9/19/2024		Chapter 10. Monte Carlo		
9/24/2024	Matrix multiplication assignmer	Chapter 17 Open MP		
9/26/2024		Chapter 13. Finite Differences and Finite elements		Finite differences
10/1/2024		Midterm in class		
10/3/2024	Finite diff program	Python MPI, Python C interfaces, and Golang		
10/8/2024		Computer Math		
10/10/2024		Introduction to Dependability, Availability, Application to Clusters		
10/15/2024	**Fall break**			
10/17/2024		Dependabilty, Availability Analysis: Fault trees, DiffEQs, LaPlace transfer, and numerical solution		
10/22/2024		Network Algebra and Max Plus		Netork algerba assignment
10/24/2024		Max Plus Algebra programming		
10/29/2024		Random graphs		
10/31/2024		Random graph analysis of networks		
11/5/2024		Random graph proofs		
11/7/2024	Network algebra due	Web 3		Smart contract assignment
11/12/2024		Consensus Algorithms		
11/14/2024		*Consensus Algorithm comparisons*		
11/19/2024		Authentication and Authorization		
11/21/2024	Smart contract due	File system authentication		
11/26/2024		Cluster security		
11/28/2024	**Thanksgiving**			
12/3/2024	Graduate project due	HPFS security		
12/5/2024	Review			
12/13/2024	Final 11:30 AM to 2:00 PM			

Assignment	Group or Individual	Deliverable	Due	Points (and weighting) Undergraduate	Points for Graduate	Graduate weighting
Prog ass 1			09/10/24	5	5	3.85
Prog ass 2			09/24/24	5	5	3.85
Midterm			10/01/24	15	15	11.54
Prog Ass 3			10/03/24	10	10	7.69
Prog Ass 4			11/07/24	10	10	7.69
Prog Ass 5			11/21/24	10	10	7.69
Graduate project			12/03/24		30	23.08
3 quizzes			Random	20	20	15.38
Class participation				5	5	3.85
Final exam			12/13/2024	20	20	15.38
Total Undergrad				100		
Total Grad					130	100

Grading System

(Percentages. For undergraduates, points and percentages are identical. For graduate students, they are quite different.)

A – 90 or above

B – 80 to 89

C – 70 to 79

D – 60 to 69

F – Below 60

Deadlines are fixed. No extensions will be given. No late assignments will be accepted. This means that assignments are due at the start of class. No credit will be given for a late assignment. Printers printing slowly are not an adequate excuse for a late assignment. Presentations are interactive. Students must be prepared to answer questions from the instructor and other students. Documents must be professionally prepared. Sloppy and poorly written

Plagiarism, copying, and use of generative AI.

Each student is expected to do their own work. If copying is detected. The students will get no credit for the assignment/ test with one exception. If student(s) copy from each other, the first student to give the instructor the name of the other student turning in copied work gets credit for twice the maximum grade for the assignment. The student(s) identified get no credit. This also holds for students using generative AI. Note that many grades are based largely on novelty and originality. If many students have similar results, those students will get minimal credit, if any.

GRADING POLICIES

Objectives and outcomes: This course is a project-oriented introduction to computer and network security. Security is a process that maintains well-defined system properties. Students will need to understand security threats and existing security countermeasures. Discussions will identify security holes in current network implementations. A set of challenging assignments has been developed that provide students with the basic skill sets needed for work in network security. In class discussions will help students prepare their assignments. Ethical and legal aspects of computer security issues are introduced and discussed as a part of the course. The final includes essay questions on these topics. Assignments will include:

- Technical deliverables (system installation, implementation, test, and maintenance).
- Technical reports and design documents.
- Technical presentations.

Students are expected to create and deliver professional quality materials. Graduate students need to implement a security research project and present their results to the class. The security project should be at a level suitable for submission to a professional conference.

ATTENDANCE POLICY:

1. Attendance is mandatory. I give in-class quizzes or other graded activities. If you are not present for these, you will get a zero on them, they cannot be made up.
1. Tests can only be made up by prior arrangement. This means you must contact me, explain the proposed absence, and have it approved by me in writing, otherwise you will get a zero for the test. I might excuse an emergency situation provided it was dire and documented, do not approach me with silly excuses (I might charge that 0 for double points!).
2. In the event of a class cancellation on a test day, the instructor tests will be given at the next available period that is not also canceled.
3. Students must use the Notification of Absence module in Canvas or email to inform the instructor of unavoidable or planned student absences.

MODIFICATION STATEMENT: The instructor reserves the right to modify any aspect of the syllabus, including but not limited to the above schedule, policies, procedures, and assignments, at any time during the semester in the event of extenuating circumstances, by mutual agreement, and/or to ensure better student learning. This includes but is not limited to COVID-related situations.

TESTING and HOMEWORK PROCEDURES: All homework will be turned in on paper.

NOTIFICATION OF ABSENCE:

The **Notification of Absence module in Canvas** allows students to quickly notify instructors (via an email) of an absence from class and provides for the following categories: court attendance, death of immediate family member, illness, illness of family member, injury, military duty, religious observance, scheduled surgery, university function, unscheduled hospitalization, other anticipated absence, or other unanticipated absence. The notification form requires a brief explanation, dates and times. Based on the dates and times indicated, instructors are automatically selected, but students may decide which instructors will receive the notification. This does not serve as an "excuse" from class. It is a request for an excused absence and students are encouraged to discuss the absence with instructors, as the instructor

is the only person who can excuse an absence. If students are unable to report the absence by computer, they may reach the Office of Advocacy and Success via 864.656.0935. Students with excessive absences who need academic or medical assistance can also contact the Office of Advocacy and Success.

Any exam that was scheduled at the time of a class cancellation due to inclement weather will be given at the next class meeting unless contacted by the instructor. Any assignments due at the time of a class cancellation due to inclement weather will be due at the next class meeting unless contacted by the instructor. Any extension or postponement of assignments or exams must be granted by the instructor via email or Canvas within 24 hours of the weather-related cancellation.

COURSE FEEDBACK

Please feel free to provide feedback at any time. Requests for suggestions on how to improve the class will be provided.

How to be successful in this course

Honesty, openness, and respect are expected from everyone in the course. Feel free to be creative, experiment, and try new ideas. Do not damage the property, or privacy, of others. That is way too easy to do, and there can be legal consequences.

Student's Responsibility

- Be prepared for all classes
- Be respectful of others
- Actively contribute to the learning activities in class
- Abide by the University Academic Integrity Policy
- Do your own work
- Be creative
- Ask questions when you are confused, or reach a point where you do not know what your next wove will be. The course is designed to make that occur).

Instructor's Responsibility

- Be prepared for classes
- Evaluate all fairly and equally
- Be respectful of all students
- Create and facilitate meaningful learning activities
- Behave according to University codes of conduct
- Provide open and honest feedback to student work and questions.