



KENNESAW STATE
UNIVERSITY

SYLLABUS

COLLEGE OF COMPUTING AND SOFTWARE ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE

CS 4504: PARALLEL AND DISTRIBUTED COMPUTING

ACADEMIC TERM: FALL 2023

Course Information

Class meeting time: Mondays & Wednesdays, 3:30pm-4:45pm – **[Section 01, W01]**

Class meeting time: Mondays & Wednesdays, 5:00pm-6:15pm – **[Section 02, W02]**

Modality: Traditional F2F Lecture & 100% Asynch Online (includes Teams Lecture Recording)

Location: For F2F Section 01 (J 215B, Atrium Building), Marietta Campus

For F2F Section 02 (J 215B, Atrium Building), Marietta Campus

Instructor Information

Name: Patrick O. Bobbie, PhD

Email: pbobbie@kennesaw.edu

Office Location: Atrium Bldg, J386

Office phone: 470.578.3810

Office Hours: MW, 10a-12pm (**ONLINE via Teams or D2L Email**)

Preferred method of primary communication/inquiries: via D2L (not Outlook) Email

Course Description

Catalog Description:

This course introduces students to the fundamental principles common to the design and implementation of programs that run on two or more interconnected computer systems – in parallel or distributed configurations. Topics to be covered include essentials of operating systems, network protocols for process communication, and synchronization using message queues; understanding of client-server paradigms, web-based group or collaborative communication systems; advanced distributed computing paradigms for parallel computing and handling concurrency issues; and sockets. Programming will focus on using API's for parallel or distributed applications (e.g., MPI, OpenMP, PThreads, and RMI).

Prerequisites: CS 3502

Credit Hours: 3-0-3

Course Materials

Required Texts: Distributed Computing: Principles and Applications, M. L. Liu, Pearson/Addison-Wesley, ISBN: 0-201-79644-9

Recommended/Alternative Texts: Others (Supplemental)

Peter Pacheco, Parallel Programming, Elsevier Pub., 2011, ISBN: 978-0-12-374260-5

Learning Outcomes

Upon the completion of the course, students should be able to:

1. Apply problem solving (analysis, design, and development) skills to distributed and parallel computing applications.
2. Identify and decompose complex systems into its components parts.
3. Integrate OS and programming language concepts to solve/implement the (distributed) components of the systems.
4. Develop suites of networking protocols for implementing the communicating components.
5. Evaluate or validate their implementations via simulations and/or realistic projects using PDC platforms or IDEs such as MPI, OpenMP, and RMI (with UDP/TCP) or PThreads.

Course Requirements and Assignments

Summary of course requirements:

1. Homework assignments
2. Exams
3. Quizzes or Reading/Paper
4. Semester-long project

Evaluation and Grading Policies

The final grade will be assessed based on students' progress and findings as follows:

Assessment Criteria:	
1 Homework	10%
Examinations (variable number of them) 1 st , 20% 2 nd , 15% 3 rd , 15% 4 th , 15%	65%
Quizzes (optional, variable number of them)	0%
Semester Project – TCP/IP & UDP C-S System	25%
Total	100%

Notes: Quizzes, Homework, and Reading/Paper could amount to up 20% (total)

Grading Scale:	
A	90% - 100%
B	89% - 80%
C	79% - 70%
D	69% - 60%
F	59% or below

I will round up grades if they are $>$ or $= .5$ or above, for example, an 89.6 is an A, but 79.2 is a C. Examinations/Quizzes/Homework will be graded and returned within a week.

Course Policies

Homework Submission: Copying or paraphrasing codes from other sources or other students will be considered a violation of the Student Code of Conduct. Due dates for homework assignments will be specified on the homework themselves. **No late submission is acceptable.**

Feedback in a Timely Manner: Use ONLY the D2L email system to correspond with the professor and check your replies in same within 1-2 days.

Attendance Policy: Regular attendance is expected, with a lead time of one week to be excused for business travel or other critical reason or emergency. Frequent misses of class could affect a student's final grade.

Quiz/Exam Policy: All four (4) regular exams will be given in the semester. There will be no makeup exams, and no extra time will be given when a student shows up late for exams.

F2F Students: *All four (4) examinations will be given in a face-to-face, proctored mode during class times, as scheduled in this syllabus for F2F students.*

All Online Students: *Exams will be taken from the student's respective location- home, office, etc., but in a synchronous mode. Thus, the students will answer the exam questions in a .docx file that will be placed in a D2L Exam-Folder, at the same time as the F2F students are taking theirs on the scheduled exam date set in this syllabus. (To do so, open the .docx file and answer the set of questions without printing it first, and use the same 'spaces' provided after each question without adding more lines of space.) At the end of the exam period, save the answered questions as a PDF file and repost it in the D2L Submission-Folder immediately – before the cut-off time to close the Folder or before the exam time is over. **Note: (a) Any plagiarism, copy-paste from the Internet/ChatGPT etc., or shared answers that would be detected will result in an automatic F-grade for all culprits for the class(es). (b) Students are responsible for setting aside or obtaining permission for sufficient time and having access to the Internet wherever they may be, to take the exam on the scheduled date. (c) There will be no exception to these Online exam policies, as I try to accommodate reasonable excuses and offer flexibility to all Online students.***

Electronic Devices and Classroom Behavior Policy: To minimize the level of distraction, all beepers and cellular phones must be on quiet mode during class meeting times. Students who wish to use a computer/PDA for note taking need prior approval of the instructor since key clicks and other noises can distract other students. Recording lectures by any method requires prior approval of the instructor. Students using a laptop in class should not check their email, browse the web, or in other way detract from the focus of the class.

Students are reminded to conduct themselves in accordance with the Student Code of Conduct ([KSU Student Code of Conduct, Section III](#)), as published in the Undergraduate and Graduate Catalogs. Every KSU student is responsible for upholding the provision. Students who are in violation of KSU policy will be asked to leave the classroom and may be subject to disciplinary action by the University.

Tutoring: The College of Computing and Software Engineering offers tutoring services for certain courses. If needed, contact: <http://ccse.kennesaw.edu/ccselabs/ccse-tutoring.php>

MIDTERM GRADES – Decision Time!

A new KSU policy related to student success is informing students to decide about their progression in each course towards a 'successful' end.

"A midterm grade will be assigned by the midterm grade due date identified on the Spring 2024 academic calendar. This midterm grade is for assessing mid-semester performance prior to the last

day to withdraw without academic penalty. You may view your midterm grade in Owl Express. Note that only your final grade will be officially recorded on your academic transcript".

Midterm Grades: Due in Banner, Tuesday, Feb. 27th, Spring 2024 to check midterm grades.

Withdrawal: The last day to withdraw without penalty, Spring 2024 – Tuesday, March 5th, 2024.

Department or College Policies

Students are expected to be aware that the Computer Science department has certain policies in place that govern practices within the department including:

1. "B" or better grade is required for CS 1321/L and CSE 1322/L and their equivalent transfers. All courses used toward any undergraduate degree in computer science must be completed with an assessed performance grade of "C" or better. This means that all prerequisite courses from the CS Department must have been completed with a "C" or better for a student to enter the next course in a sequence.
2. All requests for course overloads must be made through the College advising office and with the approval of the Program coordinator and department chair. The instructor of any course is not permitted to authorize course overloads.
3. All requests for prerequisite bypasses must be made through the College advising office and with the approval of the Program coordinator and department chair. The instructor of any course is not permitted to authorize course overwrites.
4. All students are encouraged to register their current choice of major using the department major change process. Students who are not recorded under their intended major may find that they may be limited from registering for courses they require to complete their intended program of study.

Institutional Policies

Federal, BOR, & KSU Course Syllabus Policies:

http://curriculum.kennesaw.edu/resources/federal_bor_ksu_student_policies.php

Student Resources:

http://curriculum.kennesaw.edu/resources/ksu_student_resources_for_course_syllabus.php

Academic Integrity Statement:

<http://scai.kennesaw.edu/codes.php>

KSU Student Resources

This link contains information on help and resources available to students:

https://curriculum.kennesaw.edu/resources/ksu_student_resources_for_course_syllabus.php

COVID-19 GUIDELINES:

Course Delivery

KSU may shift the method of course delivery at any time during the semester in compliance with University System of Georgia health and safety guidelines. In this case, alternate teaching modalities that may be adopted include hyflex, hybrid, synchronous online, or asynchronous online instruction.

COVID-19 illness

If you are feeling ill, please stay home and contact your health professional. In addition, please email your instructor to say you are missing class due to illness. Signs of COVID-19 illness include, but are not limited to, the following:

- Cough
- Fever of 100.4 or higher
- Runny nose or new sinus congestion
- Shortness of breath or difficulty breathing
- Chills
- Sore Throat
- New loss of taste and/or smell

COVID-19 vaccines are a critical tool in “Protecting the Nest.” If you have not already, you are strongly encouraged to get vaccinated immediately to advance the health and safety of our campus community. As an enrolled KSU student, you are eligible to receive the vaccine on campus. Please call (470) 578-6644 to schedule your vaccination appointment or you may walk into one of our student health clinics.

For more information regarding COVID-19 (including testing, vaccines, extended illness procedures and accommodations), see KSU’s official [Covid-19 website](#).

Face Coverings

Based on guidance from the University System of Georgia (USG), all vaccinated and unvaccinated individuals are encouraged to wear a face covering while inside campus facilities. Unvaccinated individuals are also strongly encouraged to continue to socially distance while inside campus facilities, when possible.

Shifting Modalities

Please note that the university reserves the right to shift teaching modalities at any time during the semester if health and safety guidelines require it to do so. Some teaching modalities that may be used are F2F, Hyflex, Hybrid, or online, both synchronous and asynchronous instruction.

Course Schedule

Course Topics and Outline

- Introduction to Parallel (hardware/software) and Distributed Computing
- Inter-process Communication
- Distributed Computing Paradigms
- Distributed Programming and Deadlock resolution
- Client-Server Paradigm
- Group Communication and Multicast Protocols
- Distributed Objects Paradigm, RMI/Advanced RMI
- Object Space Paradigm, Message System Paradigm, Mobile Agents, and Cloud Computing
- Distributed Logical Clocks – Event Synchronization

Course Objectives

- To build on the foundation courses with practical emphasis
- To understand the differences between parallel systems and distributed systems
- To understand the design principles of parallel software and distributed software, and network protocols
- To prepare students for the job market with grounding in parallel & distributed computing

Planned Weekly Schedule

Meeting	Dates (M/W)	Chapters	Topics
1	01/08/24	(Pacheco – PP/MPI)	Intro to Parallel Prog & MPI
2.	01/10/24	(Pacheco – PP/MPI)	Intro to Parallel Prog & MPI
3.	01/15/24 01/17/24	MLK Holiday (Pacheco – PP/MPI)	Intro to Parallel Prog & MPI
4.	01/22/24	(Pacheco – PP/MPI)	Intro to Parallel Prog & MPI
5.	01/24/24	Project Discussions	
6.	01/29/24	Exam 1 Review	Interactive discussions
7.	01/31/24	Exam 1	On chps 1 & 3 - Pacheco
8.	02/05/24	1	Intro to PDC / Interprocess Communication
9.	02/07/24	1	<u>Interprocess Communication (IPC)</u>
10.	02/12/24	2	IPC
11.	02/14/24	2/3	IPC/Distrib Computing Paradigms
12.	02/19/24	3	Distrib Computing Paradigms
13.	02/21/24	Exam 2	On Chps 1-3 (Liu's book)
14.	02/26/24	Project Advance	Proj Part 1 Report Due / Part 2 starts
15.	03/04/24	4	(Midterm grades due 2/27)
16.	03/06/24	4/5	Socket API, MPI IDE/Client-Server Paradigm
17.	03/11/24	Holidays	
18.	03/13/24	Holidays	
19.	03/18/24	5	Client-Server Paradigm
20.	03/20/24	6	Group Communication & Multicasting
21.	03/25/24	6	Group Communication & Multicasting
22.	03/27/24	7	Distributed Objects Paradigm, RMI
23.	04/01/24	7	Distributed Objects Paradigm, RMI
24.	04/03/24	Exam 3	On Chps 4, 5, 6, 7
25.	04/08/24	8	Advanced RMI
26.	04/10/24	8	Advanced RMI
27.	04/15/24	11	Applets/Servlets
28.	04/17/24	12	Object Spaces, Mobile Agents, MOM
29.	04/22/24	12	Object Spaces, Mobile Agents, MOM
30.	04/24/24	12	Distributed Logical Clocks (DLC)
31.	04/29/24	Exam 4	On Chps 8, 11, 12
32.	05/01/24		