CIT 595-001 2020A Computer Sys P rogramming

Post-Spring Break Schedule

After Spring Break, all course content will be delivered via pre-recorded videos. You are encouraged to stay up-to-date with the course material and watch the videos each week.

Optional live sessions will be held via Zoom video chat at **https://zoom.us/j/5043253752** ⤢ during the regular class meeting time (Tues/Thurs 10:30am EDT) starting March 24. This is an opportunity to ask questions about course content and chat with the instructor and your classmates. These sessions will be recorded and links to the videos will be shared here.

Week of...	Topic	Links
March	Interprocess	This week's lecture videos are available in [Class Recordings -> 03-23 Interprocess Communication](#) ⤢ Slides are available in [Files -> Lecture Slides -> 03-23 Interprocess Communication](#) Practice questions are available [here](#) 📄; we will go over the [solutions](#) 📄 during the live session on Tues Mar 31 The recording of the March 24 live session is available at [Class Recordings -> 03-24 Live Session](#) ⤢

| 23 | Communication | The recording of the March 26 live session is available at Class Recordings -> 03-26 Live Session ↗

Additional resource: this PDF provides much more detail about how socket programming (discussed in the second video for this week) works in C, but is considered supplemental material

Also, this PDF discusses how two processes on the same machine can communicate as mentioned in the first video for this week, but this is *not* material you are expected to learn for this course |
| March 30 | JavaScript and jQuery | This week's lecture videos are available in Class Recordings -> 03-30 JavaScript ↗

Slides are available in Files -> Lecture Slides -> 03-30 JavaScript

Practice questions are available here 📄; we will go over the solutions 📄 during the live session on Tues Apr 7

The recording of the March 31 live session is available at Class Recordings -> 03-31 Live Session ↗

The recording of the April 2 live session is available at Class Recordings -> 04-02 Live Session ↗

Homework #3 will go out this week and be due April 11. |
| | | This week's lecture videos are in Class Recordings -> 04-06 C++ Basics ↗

Slides are available in Files -> Lecture Slides -> 04-06 C++ Basics

The recording of the April 7 live session is available at |

April 6	C++ Basics	The recording of the April 7 live session is available at [Class Recordings -> 04-07 Live Session](#) 🔗
		The recording of the April 9 live session is available at [Class Recordings -> 04-09 Live Session](#) 🔗
		Practice questions are available [here](#) 📄; we will go over the [solutions](#) 📄 during the live session on **Thurs Apr 16**
		Additional resource: [C++ Language Tutorial](#)
April 13	C++ Object-Oriented Programming	This week's lecture videos are in [Class Recordings -> 04-13 C++ STL and OOP](#) 🔗
		Slides are available in [Files -> Lecture Slides -> 04-13 C++ STL and OOP](#)
		The recording of the April 16 live session is available at [Class Recordings -> 04-16 Live Session](#) 🔗
		Practice questions are available [here](#) 📄; we will go over the [solutions](#) 📄 during the live session on Tues Apr 21
		Additional resource: [STL documentation](#) 🔗
		[Homework #4](#) will go out this week and be due April 24.
April 20	More C++	This week's lecture videos are in [Class Recordings -> 04-20 C++ Additional Features](#) 🔗
		Slides are available in [Files -> Lecture Slides -> 04-20 C++ Additional Features](#)
		The recording of the April 21 live session is available at [Class Recordings -> 04-21 Live Session](#) 🔗
		The recording of the April 23 alumni Q&A session is available at [Class Recordings -> 04-23 Alumni Interview](#)

		available at Class Recordings -> 04-23 Alumni Interview ↗

Practice questions are available here 📄; we will go over the solutions 📄 during the live session on Tues Apr 28 |
| April 27 | Course Conclusion | There are no lecture videos for this week.

The recording of the April 28 live session is available at Class Recordings -> 04-28 Live Session ↗ . |

Please see the note in Piazza ↗ for additional logistical information regarding the second half of the semester. Information in that post supersedes course policy information that is described below.

Course Overview

This course is a continuation of CIT 593 and is divided into four parts. We will begin by building on your knowledge of C and covering advanced programming in C for Linux, specifically the libraries that programmers use for concurrency and synchronization. The second part of the course expands the model from a single process to a multiprocess machine and introduces important concepts in modern operating systems: processes, scheduling, caching, and virtual memory. The third part of the course further expands the model and considers how processes communicate across a network, using low-level socket programming and high-level web technologies. Finally, the course introduces the C++ programming language.

This course will provide you with the requisite knowledge and experience for systems-focused CIS electives such as 505 Software Systems, 548 Operating Systems Design and Implementation, and 553 Networked Systems. After completing this course, you will have a better understanding of *how software*

works with hardware and *how systems (software, hardware, and networks) work together*, and be able to:

- Describe the process by which source code is compiled to machine language
- Implement applications that use modern C libraries
- Understand algorithms that operating systems use to schedule processes and enable processes to use more memory
- Develop systems of multiple programs that work together, collaborate, communicate, are synchronized, etc.
- Write large programs in C++ and analyze their behavior

Lecture, Recitation, and Exam Schedule

Date	Topics Covered	Links, notes, recommended readings, etc.
Jan 16	• Course introduction • Review: C memory model	• [Lecture slides]📄 • [Activity]📄 used in class
Jan 16 (recitation)	• Activity: C refresher	• Attendance is optional but all students are strongly encouraged to participate! • Recitation [activity]📄
Jan 21	• Review: C compilation and symbol table	• [Lecture slides]📄 • [Activity]📄 used in class (and [solutions]📄) • For more information, see sections 7.3 and 16.3 of your CIT 593

		textbook
Jan 23	• Review: C pointers, arrays, and strings	• [Lecture slides](#)
Jan 23 (recitation)	• Activity: C memory, pointers, arrays, and strings	• [Activity](#) (and [solutions](#))
Jan 28	• Review: C structs and data structures	• [Lecture slides](#)
Jan 30	• Void pointers and function pointers	• [Lecture slides](#) • [Lecture notes](#)
Jan 30 (recitation)	• Activity: Data structures	• [Activity](#) (and [solutions](#))
Feb 4	• Intro to Operating Systems • Processes	• [Lecture slides](#) • [Tanenbaum, *Modern Operating Systems*](#), sec 2.1
Feb 6	• **No lecture today!**	• Extra office hours TBA
Feb 6 (recitation)	• **No recitation today!**	• TAs will be available in DRL A5 to help with Homework #1
Feb 11	• Concurrency and threads	• [Lecture slides](#) • [Lecture notes](#) • [Sample code seen in class](#) • [Stevens & Rago, *Advanced Programming in the UNIX Environment*](#), chapter 11
Feb 13	• More concurrency	• [Lecture slides](#)

	• Race conditions	
Feb 13 (recitation)	• **No recitation today!**	• Extra office hours for Homework #1
Feb 18	• Mutex locks • Scheduling algorithms	• [Lecture slides]🖹 • [Tanenbaum, *Modern Operating Systems*](#), sec 2.4 🖹
Feb 20	• More scheduling algorithms	• [Lecture slides]🖹 • [Exam #1 overview slides]🖹
Feb 20 (recitation)	• Activity: threads and scheduling	• [Activity]🖹 (and [solutions]🖹)
Feb 25	• Memory management • Virtual memory part 1	• [Lecture slides]🖹 • [Warford, *Computer Systems*](#), ch. 9
Feb 27	• Virtual memory part 2	• [Lecture slides]🖹
Feb 27 (recitation)	• Activity: virtual memory	• [Activity]🖹 (and [solutions]🖹)

Instruction Staff and Office Hours

Instructor: Prof. Chris Murphy, he/him/his, cdmurphy@seas.upenn.edu

Teaching Assistants:

- Hannah Pan (Head TA), she/her/hers, Computer Science junior, hpenn@seas.upenn.edu
- Haoyu Chen, she or they pronouns, DATS second-year

- Haoyu Chen, she or they pronouns, DATS second-year, chhaoyu@seas.upenn.edu
- Katie Yang, she/her/hers, Computer Science junior, ykatie@seas.upenn.edu
- Lingyi You, she/her/hers, MCIT+Materials Science third-year, lyyou@seas.upenn.edu
- Ningke Hu, she/her/hers, MCIT second-year, huningke@seas.upenn.edu
- Pranav Panganamamula, he/him/his, Computer Engineering junior, ppranav@seas.upenn.edu

Office hours will be updated weekly in [Piazza](#) ⤢ .

Creating an Inclusive Environment

It is expected that all members of the course community – the instructor, TAs, and students – will work together to create a supportive, inclusive environment that welcomes all students, regardless of their race, ethnicity, gender identity, sexuality, religious beliefs, physical or mental health status, or socioeconomic status. Diversity, inclusion, and belonging are all core values of the MCIT program and this course. **All participants in this course deserve to and should expect to be treated with respect by other members of the community.**

Lectures, office hours, recitation sessions, and group working time should be spaces where everyone feels welcome and safe. In order to facilitate a welcoming environment, students of this course are expected to :

- Exercise consideration and respect in their speech and actions
- Attempt collaboration and consideration, including listening to opposing perspectives and authentically and respectfully raising concerns, before conflict
- Refrain from demeaning, discriminatory, or harassing behavior and speech

All members of the course community are expected to be familiar with and abide by the University's guidelines on general conduct and sexual harassment:

- University Code of Conduct: https://catalog.upenn.edu/pennbook/code-of-student-conduct/ ↗
- University Sexual Harassment Policy: http://www.upenn.edu/affirm-action/introsh.html ↗

Students should also be familiar with other University guidelines regarding personal conduct:

- Conduct & Personal Responsibility guidelines in Pennbook: https://catalog.upenn.edu/pennbook/#policiesbytopictext ↗
- University Principles of Responsible Conduct: http://www.upenn.edu/audit/oacp_principles.htm ↗

If you are a victim of, witness, or are otherwise affected by unacceptable behavior:

- In cases of sexual harassment and assault, please consult DPS Special Services (https://www.publicsafety.upenn.edu/about/special-services/sensitive-crimes/ ↗) at 215-573-3333 or 511 from a campus phone; this is a confidential resource.
- To report other bias incidents, contact the Penn Office of Diversity: https://diversity.upenn.edu/diversity-at-penn/bias-motivated-incident-report ↗
- For other violations of the code of student conduct, the Office of Student Conduct has an incident reporting form at https://www.osc.upenn.edu/referral-form ↗

If you are unsure which office to contact, please contact a member of the instruction staff.

Please note that the Instructor is legally obligated to report incidents of sexual

assault or harassment that he becomes aware of; if you wish your report to remain confidential, contact DPS Special Services using the information listed above.

Mental Health and Wellness

Your mental health and wellness is extremely important to the course instruction staff, if not the University as a whole. All members of the instruction staff will be happy to chat or just to listen if you need someone to talk to, even if it's not specifically about this course.

If you or someone you know is in distress and urgently needs to speak with someone, please do not hesitate to contact [CAPS](#) : 215-898-7021; 3624 Market St. If you are uncomfortable reaching out to CAPS, any member of the instruction staff will be happy to contact them on your behalf.

Course Grading

The final course grade will be determined by the following:

- (Individual) Homework assignments: 50%
- Group project: 15%
- Recitation: 5%
- Exams: 30% total (each is worth 15%)

The assignment of weighted averages to letter grades will likely be as follows:

over 98	A+
93-98	A

90-93	A-
87-90	B+
83-87	B
80-83	B-
77-80	C+
73-77	C
70-73	C-
50-70	D
under 50	F

Note that this may change slightly after final grading is completed.

Assignment Extensions and Late Penalties

There are no "late days" for homework assignments per se, but short extensions (up to 24 hours) may be given due to unforeseen circumstances, e.g. traveling for job interviews.

When possible, requests for extensions should be made *in person* during the instructor's office hours or right before/after class meetings.

Please note that extensions are unlikely to be given due to work in other courses,

and should be made more than 24 hours before the assignment due date.

Unless an extension is granted, or unless otherwise noted in the assignment description, late submissions will be penalized 10% per day, up to seven days, after which they will no longer be accepted.

For prolonged extensions due to illness, family emergency, etc. please coordinate with Dr. Sonya Gwak (sgwak@seas.upenn.edu) in the SEAS Office of Research and Academic Services so that the reason for the extension can be verified. Please be sure to CC the instructor on your communications with Dr. Gwak.

Exam Rescheduling

If you know in advance that you will be unable to take the first exam (e.g. because of traveling to a job interview), please discuss this *in person* with the instructor as soon as possible so that the instructor can verify the reason for the absence. Any makeup exam is likely to take place after the scheduled date.

Please note that although care has been taken to schedule the first exam on a day that is unlikely to conflict with other classes' midterms, the University does not have any policy regarding rescheduling midterm exams when more than one are scheduled on the same day. Thus, requests for a makeup midterm exam due to another exam on the same day are unlikely to be approved.

For emergency absences (e.g. illness, family emergency, etc.), please coordinate with Dr. Sonya Gwak (sgwak@seas.upenn.edu) in the SEAS Office of Research and Academic Services so that the reason for the absence can be verified. Please be sure to CC the instructor on your communications with Dr. Gwak.

Policies regarding absences for the Final Exam are covered by the University Provost; for Spring semester courses, a makeup Final Exam would be scheduled at the start of the following Fall semester. Requests for a makeup Final Exam due to reasons that could reasonably be anticipated (e.g. traveling for summer break)

are unlikely to be approved.

Regrade Requests

Credit for work will be recorded only as reported by the TA in the Canvas Gradebook. It is your responsibility to make sure that your work has been properly recorded in the Gradebook.

If you need to request a regrade for an assignment, please adhere to the following policy:

- If there was a clerical or math mistake in calculating or recording your grade, please email the TA who graded it so that it can be fixed.
- If you lost points for something you did correctly, e.g. the grader said "-2 points for not doing X" and you actually did do that (or something similar), please *speak* with the TA who graded it during their office hours. It is preferable to discuss these things in person than over email. However, if you can't attend the grader's office hours, then email them to try to arrange another time to meet.
- Likewise, if you lost points for something and do not understand the grader's comments, please *speak* with the TA who graded it during their office hours if possible.
- For any other issues, please contact the instructor. This may be things like "I didn't realize we had to do X," "I misunderstood this part of the assignment," etc. This isn't to say that you'll necessarily get points back for your misunderstanding, but issues such as these should be discussed with the instructor.

Regrade requests must be made within one week of the score being posted in the Gradebook. Only regrades related to administrative mistakes (e.g., miscalculating the score or entering it incorrectly) made after the one-week period are likely to be considered.

Academic Honesty

Students are expected to abide by the [SEAS Graduate Student Code of Ethics](#) ⧉ and the [University Code of Academic Integrity](#) ⧉ . The course's academic honesty policy is governed by those two documents, unless otherwise explicitly noted in assignment descriptions.

In particular, *under no circumstances* should you be discussing or assisting other students with implementation/code for individual homework assignments. This includes but is not limited to:

- co-authoring code, either through pair programming or distributing the work
- sharing and distributing code, i.e.. one student writes it and allows other students to see it (even if the other students further modify it)
- sketching out code together on paper, a whiteboard, etc., even if you type it up separately
- reviewing another student's code "just to see how they did it"
- helping another student debug/troubleshoot their code

Additionally, submitting someone else's work (e.g. something found online, something given to you by a student who took the class in the past, etc.) and claiming it as your own, even with further modification, is considered plagiarism and will be treated as academic dishonesty.

Suspected violations of the academic honesty policy will likely be referred to the Office of Student Conduct (OSC) for further investigation. Should OSC find you responsible for violating the policy, you will receive a grade of zero for the affected assignment(s) and possible additional sanctions as determined by OSC.

Communication

We will use [Piazza](#) ⧉ for all announcements, including:

- changes to the lecture schedule
- listing of weekly office hours
- discussion of homework assignments

All students are expected to check Piazza regularly. Although important announcements will typically be made in class, other information may only be available through Piazza.

Course Summary:

Date	Details	
Thu Jan 16, 2020	Recitation #0: C Refresher	due by 6pm
Thu Jan 23, 2020	Recitation #1: Strings	due by 5:45pm
Thu Jan 30, 2020	Recitation #2: Structs and Data Structures in C	due by 5:45pm
Fri Jan 31, 2020	Homework #1 - Part 1	due by 11:59pm
Fri Feb 7, 2020	Homework #1 - Part 2	due by 11:59pm
Fri Feb 14, 2020	Homework #1 - Part 3	due by 11:59pm
Thu Feb 20, 2020	Recitation #3: Threads; Scheduling	due by 5:45pm

Thu Feb 27, 2020	Recitation #4: Virtual Memory	due by 5:45pm
Fri Feb 28, 2020	Homework #2	due by 11:59pm
Tue Mar 3, 2020	Exam #1	due by 10:30am
Thu Apr 16, 2020	Homework #3	due by 11:59pm
Wed Apr 29, 2020	Homework #4	due by 11:59pm
Sun May 10, 2020	(Optional) Additional Programming Assignment	due by 11:59pm
	Final Project Demo	
	Homework #1 Description	