

CSE 484 / CSE M 584: Computer Security and Privacy

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Hello 😊

- Instructor: [David Kohlbrenner \(he/him\)](#)



- Hanfei Chen (he/him)



- Philip Garrison (he/him)



- Wenqing Lan (she/her)



- Tony Wang (he/him)



- Bowen Xu (he/him)



- Matt Ziegler (he/him)



- Karman Singh (he/her)



- Edan Sneh (he/him)



In-person, oh boy!

- This quarter might evolve rapidly, it might be all fine!
- I hope you are all doing okay
 - If you're not, that is normal, but please make sure to seek help where needed, talk with the advisors, talk with others, talk with us
- I've been running classes online, in-person will take a minute
- If something about the course isn't working, let us know! The sooner you do, the better

Course Plan

- Lectures and Sections and (most) Office Hours in-person
 - Lectures are recorded (please attend!)*
 - * Sections may be only partially recorded
 - * Office hours will not be recorded
 - * Recordings include student speech/video/chat (don't share if you don't want to!) and will not be shared outside the class
 - Access the links via Canvas
- Largely the same curriculum as usual
 - Labs and homeworks and final project; **no exams**
 - We will adapt throughout the quarter as needed

Discussion

- **Everyone** in this class **deserves** to be in this class!!
- We are **all** coming to this course with **different backgrounds** and experiences
- There are **no bad questions**; never belittle a questioner or their question; always be supportive
- Instructors / staff aren't always aware of everything, so **please call our attention to things as needed**
 - E.g., someone might harm someone else with what they say without ever realizing that what they said is harmful; that harm still exists, regardless of whether there was an intent to harm

Course Resource Cheat Sheet

- **Classrooms:** Lectures, sections, office hours
- **Zoom:** Limited office hours
- **Canvas:** Links to recordings, assignment submissions, grades
- **Course website:** Schedule, assignment details, readings, policies
- **Ed:** Discussion board
- **Course mailing list:** Announcements (though most go to Ed)
- **Email:** Reach course staff privately

What Does “Security” Mean to You?

I can't Zoom breakout anymore.

Talk to your neighbors!

Try putting some answers in <https://pollev.com/dkohlbre>

What are topics you are excited about?

- It is also okay if you don't know what topics you are interested in yet!
- We can ask this question again at the end of the course, after you know more about different topics.

How Systems Fail

Systems may fail for many reasons, including:

- **Reliability** deals with accidental failures
- **Usability** deals with problems arising from operating mistakes made by users
- **Design and goal oversights** deals with oversights, errors, and omissions during the design process
- **Security** deals with **intentional** failures created by **intelligent** parties
 - Security is about computing in the presence of an **adversary**
 - But **security, reliability, usability, and design/goals oversights** are all related

Challenges: What is “Security”?

- What does **security** mean?
 - Often the hardest part of building a secure system is figuring out what security means (“threat modeling”)
 - Who are the **stakeholders** for which we are considering “security”?
 - What are the **assets** to protect?
 - What are the **threats** to those assets?
 - Who are the **adversaries**, and what are their **resources**?
 - What is the **security policy or goals**?
- **Perfect security does not exist!**
 - Security is not a binary property
 - Security is about risk management

Multiple assignments and activities are designed to exercise your thinking about these issues.

Privacy?

- Privacy often strongly overlaps security
- Privacy may also consider when systems *work as intended!*
- Not a hard-and-fast distinction
 - Privacy and security are generally intertwined

Two Key Themes of this Course

1. How to **think** about security and privacy
 - The “Security Mindset” – a “new” way to think about systems
 - (This mindset will be valuable even outside of the security context, e.g., to consider diverse stakeholders of a system)
2. **Technical aspects of security and privacy**
 - Vulnerabilities and attack techniques
 - Defensive technologies
 - Topics including: software security, cryptography, malware, web security, web privacy, smartphone security, authentication, usable security, anonymity, physical security, security for emerging technologies

Theme 1: Security Mindset

- Thinking critically about designs, **challenging assumptions**
- Being **curious**, thinking **like an attacker**, exploring **use cases not considered by the designers**,
- “That new product X sounds awesome, I can’t wait to use it!” versus “That new product X sounds cool, but I wonder what would happen if someone did Y with it; I wonder if the designers thought of Z...”
- Why it’s important
 - **Technology changes**, so learning to **think like a security person** is more important than learning specifics of today’s systems
 - Will help you **design better systems/solutions**
 - Interactions with **broader context**: law, policy, ethics, etc.

Security Mindset Example



Security Mindset Example



Learning the Security Mindset

- Several approaches for developing “The Security Mindset” and for exploring the broader contextual issues surrounding computer security
 - Homework #1
 - Security reviews and ethics reflections
 - May work in groups of up to 3 people (groups are encouraged – **lots of value in discussing security with others!**)
 - In class discussions and activities
 - Participation in Ed discussion board (e.g., asking about news stories, technologies)

A Word on Groupwork

- We require it*
 - Need to learn how to work in groups
 - Especially if you don't like it 😊
 - Attack-based labs require some creativity, where group interactions can help generate ideas
- (Please follow all the usual in-person contact guidelines 😊)

*contact course staff ASAP if this isn't going to work for you

What This Course is Not About

- Not a comprehensive course on computer security
 - Computer security is a broad discipline!
 - Impossible to cover everything in one quarter
 - So be careful in industry or wherever you go!
- Not about all of the latest and greatest attacks
 - Read news, ask questions, discuss on Ed
- Not a course on ethical, legal, or economic issues
 - We will touch on these issues, but the topic is huge
- Not a course on how to “break into” systems
 - Yes, we will learn about attacks ... but the ultimate goal is to develop an understanding of attacks so that you can build more secure systems

Security: Not Just for PCs



smartphones



voting machines



EEG headsets



medical devices



wearables



RFID



mobile sensing
platforms



cars



game platforms



airplanes

Communication

- dkohlbre@cs
 - Use this if something is sensitive, personal, confidential, etc.
- cse484-tas@cs.washington.edu
 - Use this to reach all course staff (including instructor)
- Ed Discussion Board
 - Use this if other students in the class would benefit from your question/answers
[common case]
- Course mailing list: cse484a_au21@uw.edu
 - We'll use this (and Ed) for announcements
- We will do our best to be responsive, but **please be professional**, and plan ahead!

Course Materials

- Readings:
 - I'll be posting reading materials as we go
 - Feel like we're missing something? Let me know!
- Attend lectures
 - Lectures will not follow any textbooks
 - Lectures will focus on “big-picture” principles and ideas
- Attend sections (if you have questions about assignments, best to attend rather than watch later)
 - Details not covered in lecture, especially about homeworks and labs
 - More opportunity for discussion

Guest Lectures

- We will have a few guest lectures throughout the quarter
 - Useful to give you a different perspective: research, industry, government, legal

Course Logistics (CSE 484)

Security is a contact sport!

- Labs (45% of the grade)
- Homework (25% of grade)
- Participation and in-class activities (10% of the grade)
- Final project (20% of the grade)

Course Logistics (CSE M 584)

Same as before, but...

- Labs (42% of the grade) [-3%]
- Homework (22% of grade) [-3%]
- **Research readings (10%)** [+10%]
- Participation and in-class activities (10%)
- Final project (16% of the grade) [-4%]

Labs

- General plan:
 - 3 labs
 - First lab out next week
 - Topics:
 - Software security (Buffer overflows, ...)
 - Web security (XSS attacks, SQL injections, ...)
 - Smart homes
 - Submit to Canvas
 - Groups must be configured *on Canvas*

Homework

- 3 homeworks distributed across quarter
 - <http://courses.cs.washington.edu/courses/cse484/21sp/assignments>
 - First homework out shortly

Ethics

- To learn to defend systems, you will learn to attack them. You must use this knowledge ethically.

In-Class Participation

- Trying to bring the best of online, in-person
 - In-class discussions, polls, and other online tools
 - More use of the online discussion board
 - Questions live and via pollev
- **Main component: Lightly graded in-class activities**
 - Canvas “quiz” submission (intended for use during class, but can be submitted up until start of next lecture); *not* a “quiz” in the traditional sense

Late Submission Policy

- 5 free late days, no questions asked
 - Cumulative, throughout the quarter
 - Use up to 3 for one submission
 - All group members use days at once
- After that, late assignments will be dropped 20% per calendar day.
 - Late days will be rounded up
 - So an assignment turned in 26 hours late will be downgraded 40%
 - See website for exceptions -- a small number of assignments must be turned in on time

Mailing List

cse484a_au21@uw.edu

- Make sure you're on the mailing list
 - We'll send an email later today
 - If you recently enrolled, wait 24 hours
- URL for mailing list on course website
- We will use the mailing list and/or Ed for **announcements**; please use the Ed Discussion Board for discussions (not the mailing list)

Discussion Board

- We've set up a Ed Discussion Board for this course:
 - TODO
- Please use it to discuss the homework assignments and labs and other general class materials
- You can also use it to exercise the “security mindset”
 - Discussions of how movies get security right or wrong
 - Discussions of news articles about security (or not about security, but that miss important security-related things)
 - Discussions about security flaws you observe in the real world

Final Project

- **No midterm or final exam!**
- Instead: **12-15 min video** about a security/privacy topic of your choice
 - Groups of up to 3 people
 - Security is a broad field, and this class can't remotely cover everything – [this is your chance to explore a security or privacy topic in more detail!](#)
 - [Multiple checkpoint deadlines throughout quarter](#)
- Details linked from website's Assignments page

Prerequisites (CSE 484)

- Required: Data Abstractions (CSE 332)
- Required: Hardware/Software Interface (CSE 351)
- Assume: Working knowledge of C and assembly
 - One of the labs will involve writing buffer overflow attacks in C
 - You must have detailed understanding of x86 architecture, stack layout, calling conventions, etc.
- Assume: Working knowledge of software engineering tools for Unix environments (gdb, etc)
- Assume: Working knowledge of Java and JavaScript
- **Assume: Ability to learn new programming languages / skills easily**

Prerequisites (CSE 484)

- Useful (not required): **Computer Networks; Operating Systems**
 - Will help provide deeper understanding of security mechanisms and where they fit in the big picture
- Useful (not required): **Complexity Theory; Discrete Math; Algorithms**
 - Will help with the more theoretical aspects of this course.

Prerequisites (CSE 484)

- Most of all: **Eagerness to learn!**
 - This is a 400 level course.
 - We expect you to push yourself to learn as much as possible.
 - We expect you to be a strong, independent learner capable of learning new concepts from the lectures, the readings, and on your own.
 - **Of course, this quarter is different than usual. Take care of yourselves and communicate with us!**

Another Example



To Do

- Homework #1 (due Oct 8th)
 - Now: Start forming groups (e.g., use discussion board) and thinking about technologies you'd like to review.

Questions?

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