

CS 4440 - Introduction to Computer Security

SPRING 2022

BASIC INFORMATION

Academic Calendar: <https://registrar.utah.edu/academic-calendars/spring2022.php> [.\(https://registrar.utah.edu/academic-calendars/spring2022.php\)](https://registrar.utah.edu/academic-calendars/spring2022.php).

Lecture Time: Monday & Wednesday, 04:35 PM - 05:55 PM

Lecture Location: WEB L101

Zoom: <https://utah.zoom.us/j/94913695375> [.\(https://utah.zoom.us/j/94913695375\)](https://utah.zoom.us/j/94913695375) (you will need to log into your Utah account to join the meeting)

Instructor: Jun Xu

Contact Info: Office MEB 3442, junxzm@cs.utah.edu (<mailto:junxzm@cs.utah.edu>), Phone TBD

Office Hours: Monday 3:30PM - 4:30PM, MEB 3442 and Zoom at <https://utah.zoom.us/j/91216486526> [.\(https://utah.zoom.us/j/91216486526\)](https://utah.zoom.us/j/91216486526) (passcode: crackme); Zoom will be used until the end of January (sorry my office is not quite ready yet).

Prerequisite(s): C- or better in CS 3500 Software Practice AND CS 3810 Computer Organization.

TAs:

- ELLA MOSKUN
 - Office hour: 11:30AM - 12:30PM, Tuesday
 - Location: Zoom @ <https://utah.zoom.us/j/96806557767> [.\(https://utah.zoom.us/j/96806557767\)](https://utah.zoom.us/j/96806557767) (passcode 442269) until the end of January
 - Email: ella.moskun@utah.edu (<mailto:ella.moskun@utah.edu>)
- Manila Devaraja
 - Office hour: Tuesday, 1:00PM-3:00PM
 - Location: Zoom @ <https://zoom.us/j/94098177546?pwd=WmRGZ3JQZTkWUXVsdjlXQUJFUS9Sdz09> [.\(https://zoom.us/j/94098177546?pwd=WmRGZ3JQZTkWUXVsdjlXQUJFUS9Sdz09\)](https://zoom.us/j/94098177546?pwd=WmRGZ3JQZTkWUXVsdjlXQUJFUS9Sdz09) until the end of January
 - Email: maniladevaraj@gmail.com (<mailto:maniladevaraj@gmail.com>)
- ANUJA GARG
 - Office hour: 10:30 AM - 12:30 PM, Monday
 - Location: MEB 3515
 - Email: anuja.garg@utah.edu (<mailto:anuja.garg@utah.edu>)
- CHANDRASHEKAR NAREDDY
 - Office hour: 2:30PM - 4:30PM, Thursday
 - Location: Zoom @ <https://utah.zoom.us/j/97025252330> [.\(https://utah.zoom.us/j/97025252330\)](https://utah.zoom.us/j/97025252330) (passcode: cs4440)
 - Email: u1399887@uemail.utah.edu (<mailto:u1399887@uemail.utah.edu>)

COURSE DESCRIPTION

This course will introduce students to the basic principles and practices of computer and information security. It will focus on security concepts and techniques applied to the software, the systems, and the networks, accompanied by detailed analysis of real-world examples. Main topics include cryptography, authentication, software and operating system security (e.g., buffer

overflow), network and communication security, internet and web security.

STUDENT LEARNING OUTCOMES

After successful completion of this course, students will be able to:

- Familiar with the common threats to computer security;
- Understand the fundamental principles of computer security;
- Enforce the security principles with proper techniques and products;
- Develop a security mindset for both daily life and professional work

COURSE MATERIALS

Textbook

- Computer & Internet Security: A Hands-on Approach, Second Edition, ISBN: 978-1733003926 (hardcover) and 978-1733003933 (paperback)

Platforms

- Canvas for all activities unless otherwise specified; Please email me through the Canvas mailbox!
- Gradescope for grading
- Slack: https://join.slack.com/t/slack-9ab3843/shared_invite/zt-11zrt587m-C~xz3GyEDfKJyVRHT5hOdA [.\(https://join.slack.com/t/slack-9ab3843/shared_invite/zt-11zrt587m-C~xz3GyEDfKJyVRHT5hOdA\)](https://join.slack.com/t/slack-9ab3843/shared_invite/zt-11zrt587m-C~xz3GyEDfKJyVRHT5hOdA) (optional)

FORMAT AND STRUCTURE

This course consists of two lectures per week, in-class practices and quizzes, homework assignments, and a final exam.

TENTATIVE COURSE SCHEDULE

Week	Topic(s)	Pre-lecture Preparations (suggested but not graded)	Readings (post)
1 *Jan 10 - Jan 16*	Introduction, The Security Mindset, and Ethics (Slide-1 , Slide-2 , Slide-3)		Link 1 .(https:// Link 2 (https://www.use Link 3 (https://www.d.ur spring/presentati

2 *Jan 17 - Jan 23* (no class Monday)	Communication Security: Message Confidentiality & Symmetric Encryption (Slide-1)		Textbook, Chapt Encryption); Linke 1 .(https:// (optional) Video 1 .(https:// app=desktop&v=
3 *Jan 24 - Jan 30*	Communication Security: Message Integrity & Randomness (Slide 1)		Textbook, Chapt Function); Link 1 .(https:// Link 2 .(https:// Link 3 .(https://
4 *Jan 31 - Feb 6*	Communication Security: Key Exchange & Asymmetric Encryption (Slide 1) Web and Network Security: Web Architecture (Slide 1)		Textbook, Chapt Cryptography) Link 1 (https://en.wikip Link 2 .(https:// Web Architecture Link 1 .(https:// Link 2 .(https:// Link 3 .(https:// Link 4 .(https:// Link 5 .(https://
5 *Feb 7 - Feb 13*	Web and Network Security: Web Architecture & Vulnerabilities (Slide 1)		Textbook, II (Wel 11 (SQL Injection Link 1 .(https:// Link 2 .(https:// Link 3 .(https://
6 *Feb 14 -	Web and Network Security: Web Architecture & Vulnerabilities (Slide 1)	Reading .(https://portswigger.net/web-security/csrf)	

Feb 20*		Practice .(https://github.com/zhangutah/webseciab)	
7 *Feb 21 - Feb 27* (no class Monday)	Web and Network Security: HTTPS (Slide 1)	Reading .(https://https.cio.gov/faq/) Practice .(https://www.keycdn.com/blog/openssl-tutorial)	Textbook, Chapt Cryptography), S Textbook, Chapt Infrastructure), S
8 *Feb 27 - March 6*	Web and Network Security: Network Attacks & Defenses (slides 1)	Reading 1 .(https://en.wikipedia.org/wiki/OSI_model) .(https://en.wikipedia.org/wiki/OSI_model) Reading 2 (https://www.cloudflare.com/learning/network-layer/what-is-ipsec/)	Textbook, Chapt
9 *March 7 - March 13* (Spring break)	NA		NA
10 *March 14 - March 20*	Host and Application Security: Software Vulnerabilities and Exploits (slides 1)	Reading .(https://www.exploit-db.com/docs/english/28475-linux-stack-based-buffer-overflows.pdf) Practice (you can just watch the video) .(https://gist.github.com/apolloc Clark/6cffb33f179cc9162d0a)	Link 1 .(https://inst.eecs Textbook, Chapt Attack)
11 *March 21 - March 27*	Host and Application Security: Software Security Hardening (slide 1 .(https://docs.google.com/presentation/d/1Ej4nNG8biILNB_RcjHlw4mAy6oJMJ3hVL8gRQNhXYGU/edit?usp=sharing) ., slide 2)		
			Link 1

12 *March 28 - April 3*	Host and Application Security: Malware (slide 1 , slide 2 , slide 3)	Reading 1 _ (https://en.wikipedia.org/wiki/Malware) Reading 2 _ (https://www.blackhat.com/presentations/bh-dc-07/Kendall_McMillan/Presentation/bh-dc-07-Kendall_McMillan.pdf)	_ (https://backend.)
13 *April 4 - April 10*	Security in Context: Privacy (slide 1)	Reading 1 _ (https://teachprivacy.com/10-reasons-privacy-matters) Reading 2 _ (https://clario.co/blog/what-is-online-privacy/)	
14 *April 11 - April 17*	Security in Context: Physical Security (slide 1)	Reading 1 (for fun) _ (https://arxiv.org/pdf/1708.09537.pdf) Reading 2 (for fun) _ (https://drive.google.com/file/d/1riKQMW9JxQ1Me90O2Hr1RKVNtUe7hzyo/view)	
15 *April 18 - April 24*	Security in Context: Side Channel (slide 1) Final Exam Review (slide)	Reading 1 _ (https://en.wikipedia.org/wiki/Side-channel_attack)	
16 *April 25 - April 27* (preparation for final exam; no class)	NA		NA
May 2nd, Monday, 6:00 - 8:00 PM, WEB L101	NA		NA

COURSE REQUIREMENTS

Attendance

- ~~Outdated Rule: Attendance is not mandatory, but there will be in-class practices/quizzes during the semester.~~
- Updated Rule: During the lectures (starting February 9th), the instructor will randomly take a snapshot of the attendance TWICE. The results will be taken as an extra in-class practice. Your presence in EITHER of the two snapshots will bring you the full score for the practice. Both in-classroom and over-zoom attendance are OK.
- Zoom will be used concurrently with the lecturing and videos will be recorded to accommodate those going through interruptions (e.g., quarantine due to Covid)

In-class Practices and Quizzes

- ~~Outdated Plan: There will be 4 practices + 2 quizzes during the lectures. Each practice/quiz will be announced 2-3 days before the corresponding lecture.~~
- Updated Plan: There will be 5 practices + 2 quizzes during the lectures. Each practice/quiz will be announced 2-3 days before the corresponding lecture. The last practice will be simply the presence test.

Homework

- There will be 4 homework assignments, which will be tentatively scheduled in Week 3, 6, 9, and 12.

Final Exam

- There will be a final exam during the final week

GRADING POLICY

- In-class practices and quizzes (30%)
- Homework (40%)
- Final exam (30%)

GRADING SCALES

This course plans to use standard Utah grading scales, but it is subject to curving.

Grade Range [Inclusive, Exclusive)	Letter Grade	Points	Explanation
93 or greater	A	4.0	Excellent performance, superior achievement
[90, 93)	A-	3.7	
[87, 90)	B+	3.3	Good performance, substantial achievement
[83, 87)	B	3.0	
[80, 83)	B-	2.7	
[77, 80)	C+	2.3	Standard performance and achievement
[73, 77)	C	2.0	

[70, 73)	C-	1.7	Substandard performance, marginal achievement
[67, 70)	D+	1.3	
[63, 67)	D	1.0	
[60, 63)	D-	0.7	
[0, 60)	F	0.0	Unsatisfactory performance and achievement

LATE POLICIES

Zero credit is given for late work; Please just submit what you have for partial credit if unfinished. However, you can have in total three late calendar days to use at your discretion, which you can only use for one assignment. You must notify the instructors via Canvas of your intent to use this privilege by the original due date. Also, additional leeway can be given for officially sanctioned University activities (e.g., sport games) if previous notice is given to the instructors via Canvas.

REGRADE / ERRORS IN GRADING

If you believe there is an error in grading (homeworks or quizzes), you may request a regrading within one week of receiving your grade. Requests must be made by email to the instructor, explaining clearly why you think your solution is correct.

It is very important to us that all assignments are properly graded. If you believe there is an error in your assignment grading, please submit an explanation via email to us (the staff mailing list) within 7 days of receiving the grade. No regrade requests will be accepted orally, and no regrade requests will be accepted more than 7 days after you receive the grade for the assignment.

ACADEMIC MISCONDUCT

University and SoC policies:

- **Statement and Acknowledgment:** Links to the policy statement and acknowledgment form are found below: https://www.cs.utah.edu/docs/misc/cheating_policy.pdf (https://www.cs.utah.edu/docs/misc/cheating_policy.pdf) https://www.cs.utah.edu/docs/misc/SoC_ack_form.pdf (https://www.cs.utah.edu/docs/misc/SoC_ack_form.pdf)
- The School of Computing has instituted a two strikes and you're out cheating policy, meaning if you get caught cheating twice in any SoC classes, you will be unable to take any future SoC courses. <https://handbook.cs.utah.edu/2021-2022/Academics/policies.php> (<https://handbook.cs.utah.edu/2021-2022/Academics/policies.php>)
- For a detailed description of the university policy on cheating, please see the University of Utah Student Code: <http://www.regulations.utah.edu/academics/6-400.html> (<http://www.regulations.utah.edu/academics/6-400.html>)

Exam rules: The following procedures apply to quizzes and exams for this course. As the instructor, I reserve the right to modify any conditions set forth below by printing revised Exam Room Conditions on the quiz or exam.

1. Students may use the following devices during quizzes and exams. Any electronic devices that are not mentioned in the list below are not permitted

Device	Permitted?

	Yes	No
Laptops		√
Cell Phones		√
Tablets		√
Smart Watches		√
Google Glasses		√

2. Students may use the following materials during quizzes and exams. Any materials that are not mentioned in the list below are not permitted

Material	Permitted?	
	Yes	No
Handwritten Notes		√
Typed Notes		√
Textbooks		√
Readings		√

3. Students are NOT allowed to work with or talk to other students during quizzes and/or exams.

Assignment rules:

- For assignments, you may discuss answers with anyone, including problem approach, proofs, and code. But all students must write their own code, proofs, and write-ups. If a student is caught cheating on a homework or the project, they will receive a failing grade for the course.
- Students are encouraged to discuss assignments with fellow classmates, but students are responsible for writing their own answer. Cheating is: sharing written or electronic work either by copying, retyping, looking at, or supplying a copy. Cheating is: writing a solution during or immediately detailed discussion so that it leads to very similar solutions. Cheating is not: discussing high-level idea, answering questions about concepts or clarifying ambiguities, or helping someone understand how to use the class tools and software.
- You are welcome to discuss the course's ideas, material, and homework with others in order to better understand it, but **the work you turn in must be your own** (or for the project, your's and your teammate's). For example, you must write your own code, design your own visualizations, and critically evaluate the results in your own words. You may not submit the same or similar work to this course that you have submitted or will submit to another. Nor may you provide or make available solutions to homeworks to individuals who take or may take this course in the future. In **homeworks** you must not use libraries or code provided on the internet except when explicitly permitted in the instructions. You must acknowledge any source code that was not written by you by a proper citation (author, year, title, time accessed, URL) directly in your source code (comment or header) and provide a link to the source. You can also acknowledge sources in a README.txt file if you used whole classes or libraries. You also must include these references clearly visible. We will use both manual and automatic methods to check your submissions for plagiarism and will also check against online sources and submissions from previous years.

SAFETY

The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu. ([Links to an external site.](https://safeu.utah.edu)) (<https://safeu.utah.edu/>)

STUDENTS WITH DISABILITIES

- The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability and Access (<http://disability.utah.edu> ([Links to an external site.](http://disability.utah.edu)) (<http://disability.utah.edu/>)). CDA will work with you and the instructor to make arrangements for accommodations. Accommodations cannot be given without paperwork from this office.
- Note that instructors require that students arrange their accommodations through the CDA (see paragraph below). If you are aware that you qualify as having a disability or believe that you might qualify, we encourage you to reach out to the CDA as soon as possible. You can always choose not to use accommodations recommended by the CDA, and School of Computing faculty and staff are not made aware of your arrangement until you notify them.
- We also recognize that current circumstances can be very disruptive to established routines and strategies. We are not experts, but we encourage you (if you have not) to consider proactively establishing or re-establishing contact with appropriate groups or professionals in order to explore (for example) what routines or strategies might benefit from being updated given the current global circumstances. Also see the section below on Wellness, Resiliency, Self-Care, and Productivity.
- **Americans with Disabilities Act.** The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability & Access, (801) 581-5020. CDA will work with you and the instructor to make arrangements for accommodations.

ADDRESSING SEXUAL MISCONDUCT

- Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).
- **Discrimination and Harassment:** Violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression), race, national origin, color, religion, age, status as a person with a disability, veteran's status, or genetic information are civil rights offenses. If you or someone you know has been harassed or assaulted, you are encouraged [report the incident to the Office of Equal Opportunity And Affirmative Action \(OEO/AA\)](https://utah.i-sight.com/external/case/new) (<https://utah.i-sight.com/external/case/new>) or to the [Office of the Dean of Students](https://deanofstudents.utah.edu/) (<https://deanofstudents.utah.edu/>). Counseling is available at the [University Counseling Center](https://counselingcenter.utah.edu/) (<https://counselingcenter.utah.edu/>). Resources for general wellness and resiliency are available at the [Center for Student Wellness](https://wellness.utah.edu/) (<https://wellness.utah.edu/>). To report to the police, contact the [Department of Public Safety](https://dps.utah.edu/) (<https://dps.utah.edu/>), 801-585-2677(COPS).

STUDENT WELLNESS

- Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.
- **Wellness, Resiliency, Self-Care, and Productivity.** Let us all take a moment to acknowledge that this semester is going to be at least a little different because of the pandemic. Some of us may feel that this is an extremely overwhelming and disruptive time. Others may feel that the pandemic and remote education do not impact their lives too much. Regardless, maintaining or

adopting new ways to proactively practice “self-care” can help maintain or improve your overall wellness and resiliency, which is valuable both for its own sake and because it can help you succeed academically. Additionally, working and studying from home removes some of the structure and “rituals” (e.g., physically going to the classroom) that you may have been accustomed to. You may need new strategies, especially if companies continue to have employees work remotely for a little while.

- **You might want to consider giving yourself the “homework” - especially early in the semester - of looking through wellness and work-from-home resources/opportunities and then figuring out what works for you. You could think of it as an opportunity to debug and learn how to optimize yourself!**
- General strategies for wellbeing include things like: getting enough sleep on a consistent schedule, getting enough exercise and sunlight, interpersonal contact, separation of “work” and “play” time and spaces, accountability structure (e.g., regularly attending lecture), and practicing time management (so that you know what you should be working on when, that you have enough time to get things done based on how things are going, and that you can put work down at the end of the day).
- We encourage you to dedicate some intentional time to better understand what helps you feel (and do!) your best so that you are well-equipped for whatever the year brings. The University has resources like:
 - [Center for Student Wellness](https://wellness.utah.edu/) [\(https://wellness.utah.edu/\)](https://wellness.utah.edu/)
 - [Mindfulness Center](https://mindfulnesscenter.utah.edu/) [\(https://mindfulnesscenter.utah.edu/\)](https://mindfulnesscenter.utah.edu/)
 - [Online Fitness Services at Campus Recreation Services](https://campusrec.utah.edu/programs/fitness-classes/index.php) [\(https://campusrec.utah.edu/programs/fitness-classes/index.php\)](https://campusrec.utah.edu/programs/fitness-classes/index.php)
 - [University Counseling Center](https://counselingcenter.utah.edu/) [\(https://counselingcenter.utah.edu/\)](https://counselingcenter.utah.edu/)

...However, you don't need to be limited by looking through the resources offered by the university!

CAMPUS RESOURCES

- **COVID-19 CENTRAL @THEU:** <https://coronavirus.utah.edu/> [\(https://coronavirus.utah.edu/\)](https://coronavirus.utah.edu/)
- **Resources available to students** (has a lot of the below, but also a few other additions): <https://attheu.utah.edu/facultystaff/resources-available-to-students/> [\(https://attheu.utah.edu/facultystaff/resources-available-to-students/\)](https://attheu.utah.edu/facultystaff/resources-available-to-students/)
- **Office for Inclusive Excellence:** <https://inclusive-excellence.utah.edu/> [\(https://inclusive-excellence.utah.edu/\)](https://inclusive-excellence.utah.edu/)
- **Center for Ethnic Student Affairs (CESA):** <https://diversity.utah.edu/centers/cesa/> [\(https://diversity.utah.edu/centers/cesa/\)](https://diversity.utah.edu/centers/cesa/)
- **LGBT Resource Center:** <https://lgbt.utah.edu/> [\(https://lgbt.utah.edu/\)](https://lgbt.utah.edu/)
- **Black Cultural Center:** <https://diversity.utah.edu/centers/bcc/> [\(https://diversity.utah.edu/centers/bcc/\)](https://diversity.utah.edu/centers/bcc/)
- **American Indian Resource Center:** <https://diversity.utah.edu/centers/airc/> [\(https://diversity.utah.edu/centers/airc/\)](https://diversity.utah.edu/centers/airc/)
- **Resources for Undocumented Students:** <https://attheu.utah.edu/announcements/resources-for-undocumented-students/> [\(https://attheu.utah.edu/announcements/resources-for-undocumented-students/\)](https://attheu.utah.edu/announcements/resources-for-undocumented-students/)
- **Office of Equal Opportunity, Affirmative Action, and Title IX:** <https://oeo.utah.edu/> [\(https://oeo.utah.edu/\)](https://oeo.utah.edu/)
- **Campus police courtesy escort:** 801-585-COPS (801-585-2677)
- **#SAFEU:** safeu.utah.edu [\(http://safeu.utah.edu\)](http://safeu.utah.edu)

ACKNOWLEDGEMENTS

The course structure and many of the ideas and slides are influenced or directly from other courses taught by Tamara Denning (University of Utah), Deian Stefan (UCSD), J. Alex Halderman (UMich), Michael Bailey (UIUC). If we missed anybody please let us know!

