Syllabus

Course Info and Contact Information

- Course Name: CSE 468, Computer Network Security
- Instructor: Jed Crandall
- Email: jedimaestro@asu.edu
- Meeting Times: Mondays and Wednesdays, 9:00am to 10:15am
- Meeting Location: Tempe - PSH153
- Online Discussions: Canvas

Exam dates and info

There will be three exams (not counting the final) throughout the term, on these dates:

- Wednesday, 9/24/2025
- Wednesday, 10/29/2025
- Monday, 11/24/2025

The final will be in the university-designated final exam slot for the course, which is:

- Wednesday, December 10th from 7:30am to 9:20am

The final will be cumulative and cover the topics from all three of the previous exams.

All exams, including the final, will be in the regular meeting room (PSH 153).

If you attend lectures, make an honest effort to understand what the lectures cover, and do your assignments and homeworks then the exams should be very straightforward.

The exams will be closed book and closed notes. You will need a calculator, but it must be a simple calculator and not any kind of scientific calculator.

Office Hours

10:30am to 12:00pm on Wednesdays. I will be on Jitsi (the word Jitsi is the link). I don't plan to hold physical office hours this semester (that might change), but if you walk with me after class we can go to my office in Biodesign.

TA and office hours

Your TA is Siddharth Ghule. Don't contact him directly through email or other means other than Canvas. His office hours are 10:30am to 12:30pm Tuesdays and Thursdays. His office hours are both physical and online: in BYENG 221 and on Zoom (the word Zoom is the link).

Course Description

Practical network security exposure and hands-on experience about basic security concepts, case studies and useful tools.

Course Objectives

- Students will gain an understanding of both symmetric and asymmetric applied cryptography.
- Students will gain an understanding of Network Intrusion Detections Systems (NIDS) and techniques for evading NIDS.
- Students will gain an understanding of how NIDS is applied around the world by various nation states for information controls (e.g., Internet censorship).
- Students will gain an understanding of basic tools used for network security analysis.

Course Learning Outcomes

- Students will identify if a given cryptosystem is symmetric or asymmetric.
- Students will identify if a cryptosystem has perfect forward secrecy.
- Students will identify NIDS evasions within a packet capture using industry standard tools, including Wireshark.
- Students will compare the NIDS systems and related evasion techniques that various nation states around the world use for information controls.
- Students will identify different types of network vulnerabilities.

Enrollment Requirements

Prerequisite(s) with C or better: Computer Science BS, Computer Systems Engineering BSE, or Software Engineering BS major; CSE 365 OR Computer Science, Computer Engineering, or Software Engineering graduate student OR Visiting University Student.

Grading Policies, Assignments, and Required Materials

There will be ten assignments (six digital artifacts, three homeworks, and a short essay) throughout the semester, each worth 2 points for 20 total. The four exams (three throughout the semester plus the final) are each worth 20 points. The total points possible is 100. Grades are based on the following scale where x is either the percentage or the points: $97.0 <= x <= 100.0$ is an A+, $93.0 <= x < 97.0$ is an A, $90.0 <= x < 93.0$ is an A-, $87.0 <= x < 90.0$ is a B+, $83.0 <= x < 87.0$ is a B, $80.0 <= x < 83.0$ is a B-, $77.0 <= x < 80.0$ is a C+, $70.0 <= x < 77.0$ is a C, $60.0 <= x < 70.0$ is a D, and $x < 60.0$ is an E.

There will be no adjustments to grades at the end of the semester. If you missed a certain grade by a small fraction of a percent, I can't do anything about that

for two reasons: (1) fairness to the rest of the class; (2) my own sanity–If I give every student a bump of 0.5%, for example, then students who missed a grade by 0.1% are happy but the students who missed it by 0.6% start emailing me. It's just not tenable to adjust any scores in any way. Grades will not be curved in any way, either.

Attendance will not be recorded and will not be part of your grade, but regular attendance is expected of all students.

There is no textbook for the course, neither required nor recommended. All materials used for the course lectures and assignments will be widely and publicly available and/or licensed open source.

Absence policies and the conditions under which assigned work can be made up

Everyone is entitled to the following course-specific late policy for every homework assignment, but cannot combine it with any other form of absence forgiveness (e.g., any of them from below): For every hour that an assignment is turned in late, you will lose 1% of the grade. Note that a little after four days late the assignment is worth 0%.

Excused absences for classes will be given without penalty to the grade in the case of (1) a university-sanctioned event ACD 304-02.; (2) religious holidays ACD 304-04.; a list of religious holidays can be found here https://eoss.asu.edu/cora/holidays; (3) work performed in the line-of-duty according SSM 201-18. Students who request an excused absences must follow the policy/procedure guidelines. Excused absences do not relieve students of responsibility for any part of the course work required during the period of absence.

Instructor recording of class sessions

Faculty may record class meetings to make an archived recording available to enrolled students, instructors, or support personnel. Creation of recordings for groups beyond these requires consent from students who are recorded.

Note that class sessions may be recorded, and recordings provided to enrolled students, instructors or instructional support personnel. If you have concerns about being recorded, please contact the course instructor.

Recordings of all class sessions will be posted in Canvas for all students to access for reviewing course materials.

Instruction Style

The course will be a combination of lectures and assignments. Attendance is required.

For questions and answers regarding course materials and homework please use Canvas or come to office hours, unless there is some compelling reason to use email. Use email for course administrativia (requesting an extension, you need a signature from me for some reason, etc.) Feel free to email me any time for anything, I won't shame you, but if you're asking questions about the assignments or lectures you're much more likely to get a timely response in Canvas than via email. If I'm slow to reply in Canvas then pinging me over email is fine.

All digital artifacts assignments should be done in Linux. If you use other OSes you do so at your own risk, and with no guarantee of support from me. If you attempt to do the assignments in Mac OS, it's probably possible but it's going to be painful and the amount of help I can offer is minimal. The same goes for any BSD-based OS. If your OS of choice is another UNIX, like Solaris, I also can't help you with OS-specific questions and...seriously? If you attempt to do the assignments in OSes that don't have a native UNIX-like shell, such as Windows, you will most likely fail. There are exceptions, but unless you've been competing in CtFs with your OS of choice for years and already have an environment set up for dealing with raw files, common file formats, packet captures, encodings, etc., please just use a Linux virtual machine or install Linux somewhere.

You are responsible for your own file backups and time management. E.g., feel free to email me, or send as a private post in Canvas, the day before something is due, "I worked on it all day and then my VM crashed and I lost my file!" I won't shame you, but that's not grounds for an extension and I'm not going to be able to do anything about it to make sure you submit your homework on time. I recommend keeping your code and other work for this course in a *private* git repository that you periodically commit to. (You can use GitHub, but the repo should be marked as private).

Classroom Behavior

Please refrain from anything that will distract you or others from fully engaging in the class. Disruptive behavior will be dealt with according to university policies. While classroom behavior (unlike attendance) is not explicitly part of the grade, you are hereby notified that both your attendance and classroom behavior are considered as part of your overall performance in the course to the extent allowed by university policies.

You may not record lectures without permission.

All engineering students are expected to adhere to the ASU Student Honor Code and the ASU academic integrity policy. Students are responsible for reviewing this policy and understanding each of the areas in which academic dishonesty can occur. If you have taken this course before, you may not reuse or submit any part of your previous assignments without the express written permission from the instructor. All student academic integrity violations are reported to the Fulton Schools of Engineering Academic Integrity Office (AIO). Withdrawing

from this course will not absolve you of responsibility for an academic integrity violation and any sanctions that are applied. The AIO maintains a record of all violations and has access to academic integrity violations committed in all other ASU college/schools.

Generative AI

Generative AI is a technology that can often be useful in helping students learn the theories and concepts in this course. However, unless explicitly allowed by your instructor, the use of generative AI tools to complete any portion of a course assignment or exam will be considered academic dishonesty and a violation of the ASU Academic Integrity Policy. Students confirmed to be engaging in non-allowable use of generative AI will be sanctioned according to the academic integrity policy and FSE sanctioning guidelines.

Threatening behavior

Students, faculty, staff, and other individuals do not have an unqualified right of access to university grounds, property, or services (see SSM 104-02). Interfering with the peaceful conduct of university-related business or activities or remaining on campus grounds after a request to leave may be considered a crime. All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students.

Textbook

As stated above, no textbook is required for this course.

Course Topics

The class can be roughly divided into three parts:

1. Confidentiality and cryptography

- Basic math of crypto (finite fields, modular exponentiation)
- Basic tool usage, including Wireshark, tshark, and tcpflow
- Physical, link, and routing layer security (case studies: ARP, BGP)
- Symmetric crypto (case studies: historical ciphers, DES, AES, RC4), including stream ciphers, block chain modes, and linear and differential cryptanalysis
- Wireless network security (case studies: WEP, WPA, WPA2, WPA3)
- Asymmetric crypto for key exchange (case study: Diffie-Hellman)
- Malleable encryption, perfect forward secrecy, future secrecy, and other advanced topics (case study: Signal messenger)
- Quantum computing and its impact on cryptography

2. Availability and socket security

- Information theory Basic tool usage, including nmap and Tor
- Firewalls
- Network Intrusion Detection (NIDS) and NIDS evasion
- Internet censorship and evasion (case studies: China's Great Firewall, Russia's TSPU, Tor)
- Analysis of encrypted traffic
- Port scans
- Denial of Service (DoS)
- Side channel attacks

3. Integrity and application-level security

- Fourier transforms and Haddamard transforms
- Ring theory
- Experimental design
- RSA, non-repudiation, and semantic security
- Secure hash functions and authentication
- Application security (case studies: TLS and SSH, including xz backdoor and ???)
- Malware and targeted attacks
- Software Defined Radio and attacks on radio communications

Homework Due Dates

Homework due dates will be posted in advance in Canvas and announced in class. All times will be Mountain Standard Time, i.e., Arizona time. Late submissions will be accepted with a 1% reduction of score per hour, as described above.

Academic Integrity

Students in this class must adhere to ASU's academic integrity policy, which can be found at https://provost.asu.edu/academic-integrity/policy. Students are responsible for reviewing this policy and understanding each of the areas in which academic dishonesty can occur. In addition, all engineering students are expected to adhere to both the ASU Academic Integrity Honor Code and and the Fulton Schools of Engineering Honor Code. All academic integrity violations will be reported to the Fulton Schools of Engineering Academic Integrity Office (AIO). The AIO maintains record of all violations and has access to academic integrity violations committed in all other ASU college/schools.

Plagiarism and Cheating Policies Specific to This Course

This course has a zero-tolerance policy: -Any violation of the academic integrity policy (detailed below) will lead to a failure on this course. -The violation will be reported to the AIO.

If you need more time to accomplish a homework assignment, please tell the instructor and ask for an extension. Extensions will be considered for circumstances

that are/were beyond your control. Do not attempt plagiarism.

For this course, you are allowed to use code snippets that you find on the Internet as long as you specify clearly in the comment of your source code where the code snippets come from, and the source snippets existed before the assignment was assigned. You are not allowed to upload any part of your solution online or show it to other students. Using other students' answers or code, past or present, with or without a citation is seen as a violation of the academic integrity policy. You will not turn in your source code for most assignments, and maybe not any assignment. But if I suspect cheating I reserve the right to require you to come to my office and show me your source code to get full points. All assignments are graded automatically by graders with anti-cheating mechanisms built-in. Do not cheat – it is not worth risking your grade and your academic profile.

Sexual Discrimination

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs. As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling is available if you wish to discuss any concerns confidentially and privately. ASU online students may access 360 Life Services, https://goto.asuonline.asu.edu/success/online-resources.html.

Copyright

All course content and materials, including lectures (Zoom recorded lectures included), are copyrighted materials. You may not share outside the class, upload to online websites not approved by the instructor, sell, or distribute course content or notes taken during the conduct of the course. See ACD 304-06, "Commercial Note Taking Services" and ABOR Policy 5-308 F.14 for more information.

You must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.

Disability Accommodations

Suitable accommodations will be made for students having disabilities. Students needing accommodations must register with the ASU Disabilities Resource Center and provide documentation of that registration to the instructor. Students should communicate the need for an accommodation in sufficient time for it to be properly arranged. See ACD 304-08, Classroom and Testing Accommodations for Students with Disabilities.

Photos

Arizona State University requires each enrolled student and university employee to have on file with ASU a current photo that meets ASU's requirements. ASU uses your Photo to identify you, as necessary, to provide you educational and related services as an enrolled student at ASU. If you do not have an acceptable Photo on file with ASU, or if you do not consent to the use of your photo, access to ASU resources, including access to course material or grades (online or in person) may be negatively affected, withheld or denied.

Waiting for an absent instructor

How Long Students Should Wait for an Absent Instructor: In the event the instructor fails to indicate a time obligation, the time obligation will be 15 minutes for class sessions lasting 90 minutes or less, and 30 minutes for class sessions lasting more than 90 minutes. Students may be directed to wait longer by someone from the academic unit if they know the instructor will arrive shortly.

Future changes

Syllabus changes: Any information in this syllabus (other than grading and absence policies) may be subject to change with reasonable advance notice.