CS-451: Computer Security

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Willamette University, Fall 2021

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Lecture MWF 11:30-12:30

Lecture Hall: Ford 204

Course Description

Cybersecurity can be understood as a mindset or approach rather than a subfield of computer science, such as secure mobile computing, network and operating system security, secure data bases, and secure cryptography algorithms. This course prepares a general computer science audience familiar with writing and understanding code to incorporate security concepts and ethics into the systems they develop or manage.

Required Materials

Required materials will be available on the course webpage under resources.

Prerequisites

This class is meant for computer science students who have completed introductory coursework in programming. Students should complete CS 141/151 and CS 241 before enrolling in this class.

Accessability

I will make every effort to ensure all coursework and materials are accessible to all students, including working with on-campus specialists. However, there is always room for improvement. I always appreciate hearing from students about how I can make the course more accessible, so please reach out if there is something I can be doing better!

Course Objectives

This course will teach you techniques for reasoning about information and computing and controlled accesses to these resources. As a survey course of the broad discipline of computer security, it will focus on different abstraction levels, from cryptographic code at a low level to the cultural and economic implications of secure and insecure data access at a high level.

- You will practice styles of thinking used by security researchers to contextualize their work in the broader context of computing and society.

- You will gain experience working with common coding practices for security, especially in the context of network and internet security.

- You will learn some historical efforts to attack and defend various computing systems, and discuss the implications of the state of computer security as a discipline and as deployed in practice..

- You will learn some theoretical background in formulating notions of security (the "logical foundations" of computer security).

- You will be exposed to state-of-the-art security research specific to hardware designs, including computer processors, as an example of ongoing research efforts.

This course will equip you apply notions of computer security to your other coursework, within computer science as well as within the college, and empower you to be a responsible computer scientist and member of an increasingly computer reliant society.

Course Structure

The course will be composed of lectures, labs, homeworks, midterms, and a final project.

Class Structure

Lectures are scheduled for Mondays, Wednesdays, and Fridays at 11:30 AM in Ford 204. The schedule of lectures will be available on the course webpage under schedule.

The course will be composed of two parts. In the first part of the course, class will be used for lecture on low level security concepts. In the second part of the course, class will be used for discussion of high level implications of computer security.

Lectures will be a combination of white board work and demonstrations. I will support a remote option for all lectures, likely through a streaming platform or Zoom, and will post recordings of lectures on the course website. While I will make every effort to follow best practices for accessible teaching, I will make mistakes! Please, if you find some material is inaccessible for any reason do not hesitate to reach out.

Discussions will be conducted in a format to be agreed upon by the class, whether in person, hybrid, or Zoom. Participation in lecture will be required and will be considered in course grades, both during class and in advance.

Homework Structure

Feedback will be provided on homework assignments. Homework assignments will be considered when determining grades for this course.

Homeworks will consist of programming assignments to be completed outside of class and submitted for feedback. There will be a "Homework 0" at the beginning of the semester to get used to programming and assignment submission, then two homework assignments throughout the semester. You will always have at least two weeks to complete homework assignments.

Homework assignment will be due at 11:30 AM on Fridays so we can discuss them in class on the day they are due.

As a rule, I encourage students to submit their assignment as-is at the due date and not to submit late work. By way of explanation, it is my experience as both a student and a grader that time spent working on assignments after their deadline is often better spent working on the next assignment.

As-is submission is supported in the grading policy by dropping the lowest homework grade. In special circumstances such as extended medical problems or other unforeseeable emergencies, please reach out and so we can collaboratively develop a more personal solution to achieve the learning objectives of the course.

Midterm Structure

Feedback will be provided on midterm exams. Midterm exams will be considered when determining grades for this course.

There will be two written midterm final exams, intended to be completed individual without access to notes or documentation. The midterms are intended to achieve a learning focus of

reasoning about data structures in isolation from coding environments, as well provide me as an instructor with greater insight into how effective course instruction has been.

Discussion Participation

Discussion participation will be considered when determining grades for this course.

Discussion participation will be intermediate between homework assignments and discussion class sessions. Discussion class will be driven by reviewing primary or secondary source documents relevant to some prominent case of a security breech of secure systems. Students will be expected to review these materials prior to class, and a submit a 1 or 2 paragraph reflection on the reading no latter than midnight before class, to be submitted by email (to give me time to read them before moderating discussion).

If you will be unable to attend class for any reason, be submit a reflection prior to the deadline and not you will not be able to attend.

Beginning the week of November 1, topics and readings will be chosen by a student and discussion will be moderated by that student. A list of potential topics will be provided, or students may chose their own topic in consultation with the instructor.

Final Project

Feedback will be provided on the final project. The final project will be considered when determining grades for this course.

There will be a final project that will be similar in format but distinct in content from discussions. Final projects are intended to be undertaken collaboratively with other students and provide a detailed overview of an important topics in computer security and society. Projects will be presented beginning the week of November 29 after submitting a project proposal by (Friday) October 29.

Feedback and Grading

Feedback will be provided on assignments, midterms, and the final project using a 100 point scale. Discussions will be graded by participation. This 100 point scale is intended to be familiar to established grading standards, such as letter grades. To provide aggregate feedback for the whole course, these feedback scores will be combined as follows:

- **20%** of your grade will be determined by homework assignments

    10% each for the two highest scored assignments (out of three).

- **<u>40%</u>** of your grade will be determined by midterm exams.

    <u>20%</u> each for the two midterms.

- **<u>20%</u>** of your grade will be determined by discussion participation.

    <u>10%</u> each for leading a discussion and participating in other discussions.

- **<u>20%</u>** of your grade will be determined by the final project.

Feedback scores will constitute the minimum grade on an assignment, but the instructor may exercise discretion at any time to award a higher grade. For example, a submitted homework may not use some important algorithmic technique as submitted, but if the student showed familiarity with this technique on an earlier assignment or exam, the absence of that technique in a specific case need not be counted against a student in grading, but only noted in feedback. This corresponds to the high level notion of feedback corresponding to how well an assignment reached the intended learning goals, while the overall course grade is meant to indicate that a student is prepared to succeed in latter coursework. Under this model, the final project will offer an opportunity to show familiarity with all content in the course, so a strong final project can ensure a high course grade for any student, regardless of prior scores on midterms and homeworks.

College Policies

The following material is adapted from "Information for Syllabus" recommended language on syllabus prepartion provided to insturctors in the College of Arts & Sciences.

Academic Integrity

Students of Willamette University are members of a community that values excellence and integrity in every aspect of life. As such, we expect all community members to live up to the highest standards of personal, ethical, and moral conduct. Students are expected not to engage in any type of academic or intellectually dishonest practice and encouraged to display honesty, trust, fairness, respect, and responsibility in all they do. Plagiarism and cheating are especially offensive to the integrity of courses in which they occur and against the College community as a whole. These acts involve intellectual dishonesty, deception, and fraud, which inhibit the honest exchange of ideas. Plagiarism and cheating may be grounds for failure in the course and/or dismissal from the College. http://willamette.edu/cla/catalog/policies/plagiarism-cheating.php

Commitment to Positive Sexual Ethics

Willamette is a community committed to fostering safe, productive learning environments, and we value ethical sexual behaviors and standards. Title IX and our school policy prohibit dis-

crimination on the basis of sex, which regards sexual misconduct — including discrimination, harassment, domestic and dating violence, sexual assault, and stalking. We understand that sexual violence can undermine students' academic success, and we encourage affected students to talk to someone about their experiences and get the support they need.

Please be aware that as a mandatory reporter I am required to report any instances you disclose to Willamette's Title IX Coordinator.

If you would rather share information with a confidential employee who does not have this responsibility, please contact our confidential advocate at confidential-advocate@willamette.edu. Confidential support also can be found with SARAs and at the GRAC (503-851-4245); and at WUTalk - a 24-hour telephone crisis counseling support line (503-375-5353). If you are in immediate danger, you may reach campus safety at 503-370-6911.

DACA/Undocumented Student Advocate

Willamette is committed to supporting our DACA/Undocumented students in a variety of ways. This year, Tori Ruiz is the contact person for all DACA/undocumented students can provide those students with a number of external and internal resources that are available. Her contact information is email: truiz@willamette.edu, Office: 3rd Floor UC, Phone: 503-370-6447.

Diversity and Disability Statement

Willamette University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. My goal is to create a learning environment that is usable, equitable, inclusive and welcoming. If there are aspects of the instruction or design of this course that result in barriers to your inclusion or accurate assessment or achievement, please notify me as soon as possible. Students with disabilities are also encouraged to contact the Accessible Education Services office in Smullin 155 at 503-370-6737 or Accessible-info@willamette.edu to discuss a range of options to removing barriers in the course, including accommodations.

Religious Practice

Willamette University recognizes the value of religious practice and strives to accommodate students' commitment to their religious traditions whenever possible. Please let me know within the first two weeks of the semester if a conflict between holy days or other religious practice and full participation in the course is anticipated. I will do my best to work with you to determine a reasonable accommodation.

As an instructor, I will exercise my discretion to offer accomodations for conflicts after the first two weeks of the semester. You may always reach out to me, including retroactively, though the quality of the accomodation I am able to offer may improve given advanced warning!

SOAR Center Offerings: Food, Clothing, and School Materials

The Students Organizing for Access to Resources (SOAR) Center strives to create equitable access to food, professional clothing, commencement regalia, and scholarly resources for WU and Willamette Academy students. The SOAR Center is located on the Putnam University Center's third floor (in the former Women's Resource Center and across from the Harrison Conference Room). The space houses the Bearcat Pantry, Clothing Share, and First-Generation Book Drive and is maintained by committed students and staff and faculty advisers.

Trans Inclusion and Gender Justice

I am always appreciative of the opportunity to address you by your affirmed name or gender pronoun. Please advise me of this at any point in the semester so that I may make appropriate changes to my records.

If I ever misgender you in any way, I would greatly appreciate that you let me know, in whatever manner makes you comfortable, so that I can correct that error and endeavour to repair any harm.

Mental Health

As a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. Willamette services are available and treatment does work. If you think you need help, please contact Bishop Health as soon as possible at http://willamette.edu/offices/counseling/. Crisis counseling is available 24/7 at WUTalk: 503-375-5353 and Campus Safety is available at 503-370-6911. Emergency resources are also available from the Psychiatric Crisis Center at 503-585-4949 and the National Suicide Prevention Lifeline at 1-800-273-8255.