

CS 460/ECE419: Security Laboratory - Fall 2023 Syllabus

Course Dates: August 21 - December 16, 2023

Credits: 3-4 Hours (undergraduate/graduate)

Pre-Requisites: CS 461 or ECE 422 or instructor approval

Meeting Times/Location: Lecture: Online; Lab: In-person, Wednesdays, 5:00-7:50pm, 1214 Siebel Center for Computer Science

Instructors:

- Professor David M. Nicol, Department of Electrical and Computer Engineering (and Director of Information Trust Institute), Coordinated Science Lab (CSL) 451, dmnicol@illinois.edu, 217-244-1925
- Casey W. O'Brien, Assistant Director, Cyber Defense Education and Training, Information Trust Institute, CSL 449, cwobrien@illinois.edu, 217-265-7689
- Matthew E. Luallen, Lead Research Scientist for Education Translation, Information Trust Institute, CSL 457, mluallen@illinois.edu, 312-375-4715

Office Hours: By appointment only for each instructor.

Overview

This 15-week, 3/4-credit course will introduce learners to the effective design, implementation, and administration of computer and network security mechanisms by emphasizing how to protect the underlying networking infrastructure and related systems and applications (whether on-prem or cloud-based) from unauthorized access, misuse, or theft. This involves creating a secure infrastructure for users, devices, and applications to work in a secure manner.

A variety of Information Technology and Operational Technology security technologies will be explored including system and server defenses (both on-prem and cloud-based), network and application security mechanisms, and various other information gathering and attacker techniques (e.g., Open-Source Intelligence Gathering, common attacks against systems and applications).

The format of the course will be a combination of lecture (one asynchronous session per week, recorded) and in-person hands-on lab exercises. As such, the course will provide a foundation for those new to cybersecurity by delivering the broad-based knowledge and skills necessary to prepare students for further study in other specialized cybersecurity fields/domains.

Course Topics

The course material is divided into the following topics:

- Operating Systems Administration
- Cloud Computing
- Network Automation
- Traffic Analysis
- Network Security
- Firewalls
- Detection Engineering
- Threat Intelligence

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- Open-Source Intelligence Gathering (OSINT)
- Operational Technology (OT)
- Internet of Things (IoT)

Expected Course Outcomes

Upon completion of this course, students will be able to:

- Describe why information security is essential in today's enterprise environments.
- Recognize how an enterprise infrastructure is monitored.
- Identify common attacks and describe how to safeguard against them.
- Implement application, system, and network security mechanisms of both on-prem and cloud-based systems/software.
- Work collaboratively in teams to identify and address cybersecurity challenges from different points of view.
- Collect and analyze network traffic.
- Work from a command line interface (CLI) in both Linux and Windows environments.
- Automate system administration tasks.
- Understand and analyze the unique cyber-physical security considerations for IoT and OT.

Learning Resources

- All required material (e.g., narrated video lectures, readings, lab exercises) will be provided to students, as per Canvas and the tentative schedule below.
- All campus resources (e.g., library, counseling, advising) provided to full-time undergraduate and graduate students.
- Lab Environment: The course leverages various online, hands-on lab environments. They will be used to deliver the software and related tools/files in a secure sandbox, which are necessary components to not only completing the lab assignments, but also to help the learner develop their knowledge and skills.

Assignments

The course's instructional content will be made available via Canvas, a web-based Learning Management System (LMS), that allows institutions to manage digital learning, educators to create and present online learning materials and assess student learning, and students to engage in courses and receive feedback about skill development and learning achievement. The Canvas course site is located at:

<https://canvas.illinois.edu>

Each week's Module may contain the following (not all weeks have the same assignments):

- Learning objectives for that week's Module.
- A checklist with that Module's assignments.
- Discussion topic.
- Video(s).
- Required and supplemental (optional) reading material.
- Hands-on lab assignment(s).

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- Extra credit assignment.
- Links to supplemental materials.

Discussions

Students will be required to participate in weekly, online discussions using the Discussions feature in Canvas. Each “posting” helps learners analyze one aspect of the methodological, theoretical, or disciplinary perspective based on that week’s topic, or a set of related concepts, and respond to at least one others’ post. Students are encouraged to use any resource at their disposal to complete these assignments. If external resources (e.g., websites, textbooks, ChatGPT, etc.) are used, be sure to cite them using the APA 7th edition format. Also, feel free to include curated media elements (e.g., videos, infographics, images, attached documents, etc.).

Lab Assignments

The hands-on lab assignments are web-based and designed to reinforce the concepts covered in the reading material, as well as to help you develop your knowledge and skills. For more information, see *Module 0: Getting Started > Assignment: Purchasing & Redeeming Your Infosec Learning Platform Access Code* and *Assignment: Getting Started in the Infosec Learning Platform* in Canvas.

Semester Project

The final project will count for 40% of your final grade. See the related Canvas Module for more details.

Extra Credit (TBD)

Extra credit assignments may be given during the semester. Students should do the extra credit, which is designed to be both fun and challenging.

Grading Policy

Grades will be based on performance on the lab exercises, attendance at in-person lab sessions, the end of semester project, any extra credit, and participation in the Canvas-based class discussions. Grades may be developed on a curve, depending on the class scoring distribution.

A	=	100 - 93%
A-	=	92 - 90%
B+	=	89 - 87%
B	=	86 - 83%
B-	=	82 - 80%
C+	=	79 - 77%
C	=	76 - 73%
C-	=	72 - 70%
D+	=	69 - 67%
D	=	66 - 63%
D-	=	62 - 60%
F	=	Below 60%

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Course Policies

- Late assignments: 20% penalty per week.
- Attendance: In person for synchronous lab sessions.
- Participation: As per collaboration requirements in the online discussion forum and other related work.
- ChatGPT Usage Policy:
 - You may not type a question into ChatGPT, exactly copy and paste its response, and turn it in as your own work. You can however, use Grammarly on any ChatGPT output once you rephrase the answer in your own words.
 - You must cite any information that comes from ChatGPT in APA 7th edition. To cite ChatGPT in the APA 7th edition style, you will need to provide a reference for the source of the information you are citing. Here is an example of how you might cite: OpenAI. (n.d.). ChatGPT. Retrieved from <https://openai.com/blog/chatgpt>.
 - If you are citing specific information or ideas from ChatGPT in the text of your assignment, you will need to provide an in-text citation. Here is an example of how you might do this: "According to OpenAI (n.d.), ChatGPT is a large language model that can generate human-like text when provided with a prompt." Note that in APA style, you should include the author's name (in this case, OpenAI) and the year of publication if it is available. If the year is not available, you can use the abbreviation "n.d." (no date) to indicate that the year is not known.
 - It is also important to provide a full reference for the source in your reference list at the end of any assignments. This will allow your readers to locate the source and verify the information you have cited. For example, References: OpenAI. (n.d.). ChatGPT. Retrieved from <https://openai.com/blog/chatgpt>.

Contacting the Instructors

The best way for students to reach us is via email. We will typically respond to student emails within 24-48 hours.

Equal Opportunity and Access

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES you may visit 1207 S. Oak St., Champaign, call 217-333-4603 (V/TDD), or e-mail disability@uiuc.edu.

To ensure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class are asked to see the instructor as soon as possible.

If you need accommodations for any sort of disability, please contact the instructors.

Wellness

Significant stress, mood changes, excessive worry, substance/alcohol misuse or interferences in eating or sleep can have an impact on academic performance, social development, and emotional wellbeing.

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The University of Illinois offers a variety of confidential services including individual and group counseling, crisis intervention, psychiatric services, and specialized screenings which are covered through the Student Health Fee. If you or someone you know experiences any of the above mental health concerns above, it is strongly encouraged to contact or visit any of the University's resources provided below. Getting help is a smart and courageous thing to do – for yourself and for those who care about you.

- Counseling Center (217) 333-3704
- McKinley Health Center (217) 333-2700
- National Suicide Prevention Lifeline (800) 273-8255
- Rosecrance Crisis Line (217) 359-4141 (available 24/7, 365 days a year)
- Anonymous Suicide Incident Referral Form:
<http://www.counselingcenter.illinois.edu/counseling/counseling-center-policies/suicide-intervention-policy>

Academic Integrity

The Illinois Student Code should also be considered as a part of this syllabus. You should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL:
<https://studentcode.illinois.edu>.

Academic dishonesty will result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: <https://studentcode.illinois.edu>. Please note, you are responsible for reading this policy. Ignorance is not an excuse for any academic dishonesty.

Emergency Planning

Plan for emergency situations by reviewing the important material found at <http://police.illinois.edu/emergency-preparedness>. The more prepared you are, the safer you will be.

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Schedule (subject to change)

Weeks	Modules/Instructors	Assignments	Due Dates
1: Aug. 21-27	- Module 0: Getting Started	- See Canvas > Modules 0	08-27
2: Aug. 28 - Sep. 3	- Module 1: Linux Systems Administration, Justin Harris	- See Canvas > Module 1	09-03
3: Sep. 4-10	- Module 1: Windows Systems Administration, Justin Harris	- See Canvas > Module 1	09-10
4: Sep. 11-17	- Module 2: Cloud Computing, Matt Luallen	- See Canvas > Module 2	09-17
5: Sep. 18-24	- Module 3: Network Automation, Hanvitha Gavini and Sazzad Masud	- See Canvas > Module 3	09-24
6: Sep. 25 - Oct. 1	- Module 4: Traffic Analysis, Casey O'Brien	- See Canvas > Module 4	10-01
7: Oct. 2-8	- Module 5: Network Security, Casey O'Brien	- See Canvas > Module 5	10-08
8: Oct. 9-15	- Module 6: Firewalls, Dr. David Nicol	- See Canvas > Module 6	10-15
9: Oct. 16-22	- Module 7: Detection Engineering, Casey O'Brien	- See Canvas > Module 7	10-22
10: Oct. 23-29	- Module 8: Threat Intelligence, Dr. David Nicol	- See Canvas > Module 8	10-29
11: Oct. 30 - Nov. 5	- Module 9: Open-Source Intelligence Gathering (OSINT), Kate Trader	- See Canvas > Module 9	11-05
12: Nov. 6-12	- Module 10: Operational Technology (OT), Matt Luallen	- See Canvas > Module 10	11-12
13: Nov. 13-19	- Module 11: Internet of Things (IoT), Matt Luallen	- See Canvas > Module 11	11-19
14: Nov. 20-26	THANKSGIVING BREAK - NO CLASS		
15: Nov. 27 - Dec. 3	- Module 11: Internet of Things (IoT), Matt Luallen	- See Canvas > Module 11	12-03
16: Dec. 4-6	NO IN-PERSON CLASS: SEMESTER PROJECT WORK		
Dec. 8-15	FINALS WEEK		
Dec. 21	GRADES DUE BY 2PM		