The Grainger College of Engineering
Information Trust Institute

CS 460/ECE419: Security Laboratory - Fall 2024 Syllabus

Course Dates: August 26 - December 11, 2024
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, Siebel Center for Computer Science, Room 0218

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, traffic analysis, network security, firewalls, detection engineering, cyber threat intelligence, open-source intelligence, operational technology, and internet of things.

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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).
- Extra credit assignment.
- Links to supplemental materials.

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12 Discussions (240 total points)
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.). Each post is worth 20 points each.

14 Lab Assignments (360 total points)
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 (545 total points)
The main goal of the semester course project is to provide depth in a particular area of security in a hands-on fashion. Students will work in teams of 3-4 students (depending on the total number of students in the class). Topics will be provided, and teams will select from the list on a first come first serve basis. The project deliverables include project meetings with Prof. O'Brien, a project proposal, three check points, a final project paper, a final team presentation, and completion of the Team/Peer Assessments. See Canvas > Module: Semester Project for more information.

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.

If you need extra time to complete an assignment, contact Prof. O'Brien by the due date. Otherwise, the assignment will be considered late, and a 20% penalty will be applied each week it continues to be so.

Grading Summary
Grades are assigned based on the grading policy stated in this syllabus, as follows:

Assignments	Points Possible for Each Activity	Total Points Possible
Discussions	20 points each (x12)	240
Lab Assignments	See individual assignments	360
Semester Project	See individual project assignments	545
TOTAL POINTS >>		1,145

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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 - 96%
A	=	95 - 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%

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.
- Generative AI usage policy: If you decide to use Generative AI through publicly available interfaces (e.g., ChatGPT), as well as being extremely cautious of their deficiencies for scholarly work, you are required to provide:
  - Your prompt(s),
  - The output text, with before/after highlighted (e.g. use "compare documents" in Word), and,
  - A change note analyzing your experience of advantages and disadvantages in use.

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.

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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. 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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Tentative Schedule (subject to change)

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