

## ECE 444 – Computer Network Security

**Credits:** 3, **Contact Hours:** One 150 minute lecture session per week, 2 office hours per week with instructor, and 2 office hours per week with TA

**Coordinator:** Yu Cheng, Professor of ECE

**Textbook:** Charlie Kaufman, Radia Perlman, and Mike Speciner, *Network Security: Private Communications in a Public World*, 2nd edition, Prentice Hall.

**2019 Catalog Data:** ECE 444: Computer Network Security. Credit 3.  
This course introduces network security by covering topics such as network-related security threats and solutions, private- and public-key encryptions, authentication, digital signatures, Internet Protocol security architecture (IPSEC), firewalls, network management, email, and web security.

**Prerequisites or co-requisites by topic:** An introductory level course on computer networks

**Enrollment:** Required course for CPE and EE majors

### Specific outcomes of instruction:

Given a complex electrical and computer engineering challenge on ensuring information security in Internet applications, each student should be able to perform the following tasks by the end of the course.

1. Investigate typical solutions to a complex network security problem (on confidentiality, authentication, or integrity) via print and online resources.
2. Generate alternative solutions to a complex network security problem.
3. Determine an optimal solution to a complex problem via quantitative comparison with respect to the given design criteria.
4. Write codes with an appropriate programming language to implement a couple of fundamental cryptographic algorithms.
5. Evaluate the adequacy of the implemented solution with respect to the given design criteria.
6. Conduct in-depth study on a selected topic through academic paper reading.
7. Prepare a persuasive technical report describing the methodologies employed and results obtained in objectives 1-6.
8. Deliver a persuasive oral presentation describing the methodologies employed and results obtained in objectives 1-6.
9. Determine an information security solution not only from the technical aspect, but also from the social, legal, and ethic aspects.

### Relationship of ECE 444 specific outcomes of instruction to student outcomes:

	Student Outcomes	Course Goals
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	1,2,3,5,6
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	4,5,6
3	An ability to communicate effectively with a range of audiences	7,8
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	9
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	5,7,8
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	6

**Topics:**

- Introduction to security and cryptography (2 weeks)
- Secret key cryptography (3 weeks)
- Hashes and message digests (2 weeks)
- Public key algorithms (2 weeks)
- Key distribution (1 week)
- Strong password protocols (2 weeks)
- Email security (1 week)
- Wireless network security (1 week)

**Prepared by:** Yu Cheng

**Date:** February 28, 2020