

ECE 407 (408) Introduction to Computer Networks with Laboratory (without Laboratory)

Credits: 3 (lecture) + 1 (with lab), **Contact Hours:** Two 75 minute lecture sessions per week, one 160 minute laboratory session per week.

Coordinator: L. Cai Associate Professor of ECE

Textbook: A.S. Tanenbaum, *Computer Networks*, Prentice Hall, 5th Edition, 2011.

2020 Catalog Data: ECE 407/408: Introduction to Computer Networks with Laboratory Credit 4. Emphasis on the physical, data link, and medium access layers of the OSI architecture. Different general techniques for networking tasks, such as error control, flow control, multiplexing, switching, routing, signaling, congestion control, traffic control, scheduling will be covered (along with their experimentation and implementation in a laboratory - ECE 407 only)

Prerequisites: Senior standing

Enrollment: Selected elective for CPE and EE majors

Specific outcomes of instruction:

After completing this course, the student should be able to do the following:

1. List the techniques and protocols for communicating between digital computers that were in use historically, are in use currently, or will be in use in the future.
2. Specify the details associated with computer networks in LAN, MAN, and WAN environments, and the many tasks performed by Routers/Gateways and Bridges in these networks.
3. Explain protocol stack implementation and verification, traffic considerations, congestion control techniques, etc.
4. Describe the functionality and significance of Circuit and Packet Switching, the Internet, ATM, VoIP, and other current topics.
5. Complete an engineering design incorporating engineering standards and realistic constraints.
6. Prepare an informative and organized design project report.

Relationship of ECE 407 and 408 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	1,2,3,4,5,6
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	1,5
3	An ability to communicate effectively with a range of audiences	2, 3, 4
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	
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	5, 6
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	5, 6
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

Topics:

- Overview of computer networks, network architecture, protocol stack (1 week)
- Physical layer technologies (1 week)
- Analog and digital transmission, multiplexing and switching (1 week)
- Data link layer (1 week)
- Error detection and correction (1 week)
- Flow control techniques, ARQ protocols (1 week)
- Medium Access Control (MAC) protocols (1 week)
- TDM/FDM and CSMA (1 week)
- Network layer (1 week)
- Internet protocol, switching, routing (1 week)
- Transport layer, flow control and network congestion control (1 week)
- TCP and UDP (1 week)
- Application layer (1 week)
- Cryptography (1 week)
- Network security (1 week)
- Exams (1 week)

Laboratory topics (applicable to ECE 407 only):

- Device configuration (1 week)
- Single segment networks (2 week)
- IP networks with subnets (2 weeks)
- Static/dynamic routing in IP networks (2 weeks)
- NAT, VLAN and DHCP (1 week)
- Transport layer protocols (1 week)
- Security configuration (1 week)
- Final exam and project (2 week)

Prepared by: L. Cai

Date: February 27, 2020