Department of Electrical and Computer Engineering
ECE 422: Computer Communication Networks

ECE 422 - Computer Communications Networks (3-0-3)

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Textbook: A. Leon-Garcia I. Widjaja, *Communication Networks*, McGraw-Hill, 2nd
edition, ISBN-13 978-0-07-246352-1 (main text)

Course Description:
Introduction to the fundamental concepts of computer communication networks. Topics
include the OSI reference model, the physical, data link, network, and transport layers,
TCP/IP, LANs (including token ring, token bus, and ethernet), ALOHA, routing and flow
control.

Prerequisites: ECE 321 or Math 333   **Corequisite:** none

Specific Course Learning Outcomes (CLO): The student will be able to

1. define and recognize the basic elements of networks, and the different topologies
2. know how to select the cabling format optimum for a specific case
3. know and understand layering, the reasons for that concept, and the utilization of
   some interfacing devices such as bridges, switches and routers
4. be versed in TCP/IP, the original source for the layering concept
5. recognize the characteristics of larger networks and their inherent requirements
6. distinguish between all the sources of threat to networking, and how to
   circumvent them when possible
7. discuss the need and formats of wireless communications in networking
8. define and select among the many encoding techniques used to minimize errors in
   networking
9. evaluate the merits of various routing algorithms
10. Present in front of peers a practical implementation of the knowledge acquired in
    the course (implementation of servers, programming of routers suitable for a
    given application, and other topics of networking)

Relevant Student Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering (CLO 2, 4, 7,
8, 9, 10)
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(CLO 2, 3, 4, 7, 8, 9, 10)
(c) an ability to design a system, component, or process to meet desired needs within
realistic constraints such as economic, environmental, social, political, ethical, health and
safety, manufacturability, and sustainability (CLO 2, 5, 10)
(e) an ability to identify, formulate, and solve engineering problems (CLO 10)

(f) an understanding of professional and ethical responsibility (CLO 5, 6, 8, 9, 10)

(g) an ability to communicate effectively (CLO 10)

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (CLO 1, 5, 6, 7, 8, 9, 10)

(i) a recognition of the need for, and an ability to engage in life-long learning (CLO 3, 6, 7, 8, 9, 10)

(j) a knowledge of contemporary issues (CLO 10)

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (CLO 10)

Topics:

Topic	Week
Communication Network and Services • Evolution of network architecture and services • Key factors in communication network evolution	1
Applications and Layered Architectures • Examples of protocols, services, and layering: HTTP, DNS, SMTP, TCP, UDP • OSI reference model • TCP/IP architecture	2-3
Digital Transmission Fundamentals • Digital communications • Communication channels • Line Coding • Modems and digital modulations • Properties of media and digital transmission systems • Error detection and correction	3-4
TCP/IP • TCP/IP Architecture • The internet protocol • User datagram protocol • Transmission control protocol • Internet routing protocol • Multicast routing • DHCP, NAT, and Mobile IP	5-7
Mid-term exam	7
Medium Access Control Protocols and Local Area Networks • ALOHA • Scheduling approaches to MAC • Channelization • Delay Performance of MAC and Channelization Schemes • LAN Protocols • Wireless LANs and IEEE 802.11 Standard • LAN bridges and Ethernet switches	8-9

Packet-Switching Networks • Packet network topology • Datagrams and virtual circuits • Routing in packet networks • Shortest-path routing • ATM Networks • Firewalls	10-11
Peer-to-Peer Protocols and Data Link Layer • ARQ protocols • Sliding-window flow control • Framing • Point-to-point protocol • HDLC Data link control	12
Group project presentation, Review	13-14
Final exam	15

Grading: Class participation, Homework, Pop quizzes 20%; project including demonstration 20%; Mid-term 30%; Final exam 30%.

Updates and Assignments to be distributed via email

Honor Code: The NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students.

Office: ECEC 311

Office hours: T   10:30 AM - 11:20 AM
               W   11:30 AM – 12:45 PM
               R   1:00 PM - 2:25 PM
               F   10:30 AM - 11:20 AM through appointment
Other times can be arranged through appointments
Times may change if more convenient choices for the students are found

Prepared by: M. Feknous