CS 600.444 (344)

Computer Network Fundamentals

Mon. & Weds., 12:00 - 1:15 p.m., Location: Bloomberg 272

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Office Hours: TBD

Syllabus subject to change

Course Description: Topics covered will include application layer protocols (e.g. HTTP, FTP, SMTP), transport layer protocols (UDP, TCP), network layer protocols (e.g. IP, ICMP), link layer protocols (e.g. Ethernet) and wireless protocols (e.g. IEEE 802.11). The course will also cover routing protocols such as link state and distance vector, multicast routing, and path vector protocols (e.g. BGP). The class will examine security issues such as firewalls and denial of service attacks. We will also study DNS, NAT, Web caching and CDNs, peer to peer, and protocol tunneling. Finally, we will explore security protocols (e.g. TLS, SSH, IPsec), as well as some basic cryptography necessary to understand these. Grading will be based on hands-on programming assignments, homeworks and two exams. [Systems]

Prerequisite(s): Intermediate programming
Credit Hours: 3

Text(s): *Computer Networking: A Top-Down Approach*, 7th Edition
Author(s): Kurose and Ross

Course Objectives:
At the completion of this course, students will be able to:

1. Understand network layering and be familiar with basic protocols at all layers
2. Use a network scanner such as Wireshark to analyze network traffic
3. Program sockets and build basic network layer building blocks.
4. Understand networking concepts such as congestion control, queueing, and routing.
5. Understand intra-domain and inter-domain routing protocols
6. Have a basic understanding of network security issues.

Grading:

Labs	15%
Homework Assignments	15%
Programming Projects	20%
Exam 1	25%
Exam 2	25%

Letter Grade Distribution:

Letter grades will be assigned on a curve.

Computer Science Academic Integrity Code

Cheating is wrong. Cheating hurts our community by undermining academic integrity, creating mistrust, and fostering unfair competition. The university will punish cheaters with failure on an assignment, failure in a course, permanent transcript notation, suspension, and/or expulsion. Offenses may be reported to medical, law or other professional or graduate schools when a cheater applies.

Violations can include cheating on exams, plagiarism, reuse of assignments without permission, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Ignorance of these rules is not an excuse.

Academic honesty is required in all work you submit to be graded. Except where the instructor specifies group work, you must solve all homework and programming assignments without the help of others. For example, you must not look at anyone else's solutions (including program code) to your homework problems. However, you may discuss assignment specifications (not solutions) with others to be sure you understand what is required by the assignment.

If your instructor permits using fragments of source code from outside sources, such as your textbook or on-line resources, you must properly cite the source. Not citing it constitutes plagiarism. Similarly, your group projects must list everyone who participated. Falsifying program output or results is prohibited.

Your instructor is free to override parts of this policy for particular assignments. To protect yourself: (1) Ask the instructor if you are not sure what is permissible. (2) Seek help from the instructor, TA or CAs, as you are always encouraged to do, rather than from other students. (3) Cite any questionable sources of help you may have received. On every exam, you will sign the following pledge: "I agree to complete this exam without unauthorized assistance from any person, materials or device. [Signed and dated]". Your course instructors will let you know where to find copies of old exams, if they are available.

For more information, see the guide on "Academic Ethics for Undergraduates" and the Ethics Board web site (http://ethics.jhu.edu).

Tentative Course Outline:
The weekly coverage might change as it depends on the progress of the class. However, you must keep up with the reading assignments.

Week	Content
Week 1: 1/30, 2/1	• Topic: Computer Networks & the Internet • Reading assignment: Chapter 1 • Lab: Wireshark Lab #1 assigned • HW problems #1 assigned
Week 2: 2/6, 2/8	• Topic: Application layer protocols, HTTP, FTP, SMTP, DNS • Topic: Socket programming with UDP and TCP in Python • Reading assignment: Chapter 2 • HW problems #2 assigned • Web Server Socket programming exercise assigned (due 2/12 10pm)
Week 3: 2/13, 2/15	• Topic: Transport Layer • Reading assignment: Chapter 3 • HW problems #3 assigned (on Weds, due Tues 2/21) • Wireshark Labs on TCP and UDP assigned (on Weds) • UDP socket programming project assigned (Weds, due 2/28 10pm)
Week 4: 2/20, 2/22	• Topic: Network Layer part 1 • Topic: Routing, IP, Link state, Distance vector • Reading assignment: Chapter 4 • HW problems #4 assigned • Wireshark Labs IP, ICMP assigned
Week 5: 2/27, 3/1	• Topic: Scapy • Reading assignment: TBA • Proxy Server programming exercise assigned (due 3/12 10 pm)
Week 6: 3/6, 3/8	• Topic: Network layer part 2 • Topic: Intra-AS, RIP, OSPT, Inter-AS, BGP, Broadcast, multicast • Reading assignment: Chapter 4
Week 7: 3/13, 3/15	• Lecture catchup and review on 3/13 • Exam #1 on 3/15

SPRING BREAK

Week	Content
Week 8: 3/27, 3/29	- Topic: Link Layer - Topic: Error Detection and correction, Switched LANs, Link virtualization - Reading assignment: Chapter 5 - HW problems #5 assigned - Wireshark Labs Ethernet, ARP, DHCP assigned - ICMP Programming Exercise assigned
Week 9: 4/3, 4/5	- Topic: Wireless and Mobile - Reading assignment: Chapter 6 - HW problems #6 assigned - Wireshark Labs IEEE 802.11 assigned
Week 10: 4/10, 4/12	- Topic: Multimedia networking - Reading assignment: Chapter 7 - HW problems #7 assigned - Traceroute programming exercise assigned
Week 11: 4/17, 4/19	- Topic: Security in computer networks - Topic: Crypto Principles, Message integrity, Authentication, IPsec, SSL, Wireless security - Reading assignment: Chapter 8 - HW problems #8 assigned - Wireshark Lab on SSL assigned
Week 12: 4/24, 4/26	- Topic: Network Management - Topic: MIB, SNMP, Administration - Reading assignment: Chapter 9 - HW problems #9 assigned
Week 13: 5/1, 5/3	- Lecture catchup and review on 5/1 - Exam #2 on 5/3