



Spring 2020: CS 600.414/600.614

Computer Network Fundamentals

Tues. & Thurs., 9:00 - 10:15 a.m., Location: Ames 234
Tues. & Thurs., 1:30 - 2:45 a.m., Location: Ames 234



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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*, 6th Edition

Author(s): Kurose and Ross; **ISBN-13:** 978-0-13-285620-1

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: 1/28, 1/30 Taught By: Avi	<ul style="list-style-type: none">• Topic: Computer Networks & the Internet• Reading assignment: Chapter 1• Lab: Wireshark Lab #1 assigned• HW problems #1 assigned
Week 2: 2/4, 2/6 Taught By: Avi	<ul style="list-style-type: none">• Topic: Application layer protocols, HTTP, FTP, SMTP, DNS• Reading assignment: Chapter 2• HW problems #2 assigned• Web Server Socket programming exercise assigned (due 2/10 10pm)
Week 3: 2/11, 2/13 Taught By: Avi	<ul style="list-style-type: none">• Topic: Application layer and Transport layer• Reading assignment: Chapter 3• HW problems #3 assigned (due 2/24 10pm)• Wireshark Labs on TCP and UDP assigned (due 2/24 10pm)• UDP socket programming project assigned (due 2/24 10pm)
Week 4: 2/18, 2/20 Taught By: Avi	<ul style="list-style-type: none">• Topic: Transport layer (Continued)
Week 5: 2/25, 2/27 Taught By: Gabe	<ul style="list-style-type: none">• Topic: Network layer• Topic: Routing, IP, Link state, Distance vector• Reading assignment: Chapter 4• HW problems #4-1 assigned (due 3/2 10pm)• Wireshark Labs IP, ICMP assigned (due 3/2 10pm)• Proxy Server programming exercise assigned (due 3/9 10 pm)
Week 6: 3/3, 3/5 Taught By: Gabe	<ul style="list-style-type: none">• Topic: Network layer• Topic: Intra-AS, RIP, OSPT, Inter-AS, BGP, Broadcast, multicast• HW problems #4-2 assigned (due 3/9 10pm)• Reading assignment: Chapter 4
Week 7: 3/10, 3/12 Taught By: Gabe	<ul style="list-style-type: none">• Lecture catchup and review on 3/10• Exam #1 on 3/12

SPRING BREAK

Week	Content
Week 8: 3/24, 3/26 Taught By: Gabe	<ul style="list-style-type: none"> • Topic: Link Layer • Topic: Error Detection and correction • Switched LANs, Link virtualization • Reading assignment: Chapter 5 • Take Home “Exam 1” (Assigned Monday 3/24, due Monday 3/30 at 10pm) <ul style="list-style-type: none"> – Open book/internet, no talking to classmates or TA/CAs
Week 9: 3/31, 4/2 Taught By: Avi	<ul style="list-style-type: none"> • Topic: Network Security • Topic: Security in computer networks • Topic: Crypto Principles, Message integrity • Topic: Authentication, IPsec, SSL, Wireless security • Reading assignment: Chapter 8 • HW problems #5 assigned • Wireshark Labs Ethernet, ARP, DHCP assigned • ICMP Programming Exercise assigned
Week 10: 4/7, 4/9 Taught By: Avi	<ul style="list-style-type: none"> • Topic: More Security • NO CLASS 4/9 – PASSOVER • HW problems #8 assigned • Wireshark Lab on SSL assigned
Week 11: 4/14, 4/16 Taught By: Gabe	<ul style="list-style-type: none"> • Topic: Wireless and Mobile • Reading assignment: Chapter 6 • NO CLASS 4/16 – PASSOVER • HW problems #6 assigned • Wireshark Labs IEEE 802.11 assigned
Week 12: 4/21, 4/23 Taught By: Gabe	<ul style="list-style-type: none"> • Topic: Software Defined Networking • Topic: Physical Layer
Week 13: 4/28, 4/30 Taught By: Gabe	<ul style="list-style-type: none"> • Lecture catchup and review on 4/28 • Exam #2 on 4/30 • Take Home “Exam 2” (Assigned Monday 4/27, due Friday 5/1 at 10pm) <ul style="list-style-type: none"> – Open book/internet, no talking to classmates or TA/CAs