CS 455/555: Intro To Networks and Communications

Fall 2008

TR 3-4:15 PM

Dragas 1117

http://www.cs.odu.edu/~mweigle/CS455-F08

Instructor: Dr. Michele Weigle   **Email:** *mweigle@cs.odu.edu*
Office: E&CS 3214   **Web:** *http://www.cs.odu.edu/~mweigle*

Course Overview

This is a split undergraduate/graduate-level course in computer networking, focusing on the applications and protocols that run on the Internet. We will take a top-down approach to the layered network architecture, studying applications first and then proceeding down the network "stack" towards the physical link. We will look at the operation of applications such as the web, FTP, e-mail, DNS, and peer-to-peer systems. At the transport layer, we will study both connectionless UDP and connection-oriented TCP. Since TCP is the protocol that the majority of Internet traffic uses, we will study its operation in-depth, including flow control and congestion control. We will also look at how data is routed through the Internet, regardless of transport protocol. We will also introduce current "hot" topics, such as network security and wireless/mobile networks.

Prerequisites

Prerequisites for this course for undergraduates are:
- CS 270 – Computer Architecture
- STAT 330U - Intro to Probability and Statistics

Prerequisites for this course for all students are:
- A working knowledge of the Unix program development environment
- A working knowledge of Java

Course Materials

The official textbook for this course:
- *Computer Networking: A Top-Down Approach Featuring the Internet*, 4th edition, by James F. Kurose and Keith W. Ross, Addison Wesley, 2007.

Another helpful book:
- *TCP/IP Sockets in Java: Practical Guide for Programmers*, by Michael Donahoo and Kenneth Calvert, Morgan Kaufmann Publishers.

CS 455 vs. CS 555

Graduate students enrolled in CS 555 will have additional problems on written homework assignments, will have more difficult questions on the exams, and will present a report on a networking topic to the class.

Course Objectives

By the end of the semester, you should be able to complete the following tasks, among others:

- Design and implement a socket-based application using either TCP or UDP. Examples include chat, echo, a web client, and an FTP client.

- Explain how the choice of a transport protocol can affect networked applications.
- Use networking tools such as `ping`, `traceroute`, `tcpdump`, and `dig` to investigate a network.
- Explain what happens on the network when you click a link on a web page.
- Explain how an email message you send to a friend is sent and delivered.
- List the two main types of routing algorithms and which protocols use those algorithms. Describe the main differences between the two algorithms.
- Explain why routers cannot have a routing table with an entry for every other router in the Internet.
- Compute the end-to-end delay for a packet given the propagation delay, link bandwidth, and packet size.
- List the five layers of the Internet protocol stack and give an example of each.
- Explain the difference between congestion control and flow control and how each is implemented in TCP.

Course Outline

The course will cover the following topics (subject to change):

Computer Networks and the Internet
- Basic networking terms
- Delay and loss in the Internet
- Protocol layers

Application Layer
- HTTP
- Email (SMTP)
- FTP
- DNS

Transport Layer
- Connectionless transport: UDP
- Reliable data transfer

Transport Layer (continued)
- Connection-oriented transport: TCP
- Congestion control

Network Layer
- Routing principles
- Hierarchical routing
- IP
- Routing in the Internet

Link Layer and LANs
- Error detection techniques
- MAC protocols
- Link-layer addressing
- Ethernet

Academic Integrity

By attending Old Dominion University you have accepted the responsibility to abide by the honor code. If you are uncertain about how the honor code applies to any course activity, you should request clarification from the instructor. The honor code is as follows:

> *"I pledge to support the honor system of Old Dominion University. I will refrain from any form of academic dishonesty or deception, such as cheating or plagiarism. I am aware that as a member if the academic community, it is my responsibility to turn in all suspected violators of the honor system. I will report to Honor Council hearings if summoned."*

Any evidence of cheating will result in a 0 grade for the assignment/exam, and the incident will be submitted to the department for further review. Evidence of cheating may include a student being unable to satisfactorily answer questions asked by the instructor about a submitted solution. Cheating includes not only receiving unauthorized assistance, but also giving unauthorized assistance. For class files kept in Unix space, students are expected to use Unix file permission protections (`chmod`) to keep other students from accessing the files. Failure to adequately protect files may result in a student being held responsible for giving unauthorized assistance, even if not directly aware of it.

Submitting anything that is not your own work without proper attribution (giving credit to the original author) is plagiarism and is considered to be an honor code violation. It is *not acceptable* to copy written work from any other source (including other students), unless explicitly allowed in the assignment statement. In cases where using resources such as the Internet is allowed, proper attribution must be given.

Students may still provide legitimate assistance to one another. You are encouraged to form study groups to discuss course topics. *Students should avoid discussions of solutions to ongoing assignments and should not, under any circumstances, show or share code solutions for an ongoing assignment.*

Please see the ODU Honor Council's webpage at http://orgs.odu.edu/hc/ for other concrete examples of what constitutes cheating, plagiarism, and unauthorized collaboration. *All students are responsible for knowing the rules.* If you are unclear about whether a certain activity is allowed or not, please contact the instructor.

Grading

Your grade in this class will be based on the following:[1]

- **Programming Assignments**   **15%**
  There will be about three (3) programming assignments. *These are to be completed individually* and are due at the *beginning of class* on the due date.

- **Written Homework Assignments**   **25%**
  There will be about five (5) written homework assignments. *These are to be completed individually.* They are due at the *beginning of class* on the due date.

- **Mid-Term Exam**   **20%**
  The exam questions will be similar in style and complexity to the written homework assignments.

- **Undergraduate Report / Graduate Presentation**   **10%**
  Undergraduates will complete a report on a networking topic (to be approved by the instructor). Graduate students will complete a report on a networking topic and give a presentation on the topic to the class. More details about these will be given later in the semester.

- **Participation / Quizzes**   **5%**
  May include unannounced quizzes.

- **Final Exam**   **25%**
  Our final exam is scheduled for Saturday, December 6 at 3:45pm. The final will cover topics from the entire semester.

Programming Assignment Grading Guidelines

- Programs that do not compile will receive a 0.
- Programming assignments will be graded based on how your program performs on a number of test cases. You are *strongly encouraged* to rigorously test your program before submitting it.
- Programming style (including code comments) and design will also be considered in grading. Sloppy programs that work 100% will *not* receive a grade of 100.
- *Include your name, assignment number, due date, and course in the comments of each file that you submit.*

Grading Scale

There will be no '-' grades given. The grading scale (for both undergraduates and graduates) is as follows:

90-100	A		67-69	D+ (undergraduates only)
87-89	B+		60-66	D (undergraduates only)
80-86	B		0-59	F (undergraduates)
77-79	C+		0-69	F (graduates)
70-76	C			

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[1] The percentages listed are only approximate and are subject to change (by no more than 10%).

Course Conduct

Attendance

I expect you to attend class and to arrive *on time*. If you have to miss a class, you are responsible checking the course website to find any assignments or notes you may have missed. Students may leave after 15 minutes if the instructor or a guest lecturer does not arrive in that time.

Late Assignment Policy

Any assignment submitted after its deadline is considered late. Assignments that are submitted within 24 hours after the original deadline are considered to be "one day late," within 48 hours "two days late," *etc*. Weekends count just like weekdays in determining the number of days late.

Five percent (5%) of the assignment's total value will be deducted for each day an assignment is late, as long as solutions to the assignment have not been provided to the class. After a solution to an assignment has been distributed or the solutions have been discussed in class, no credit will be awarded for a late assignment.

Email

Students should activate their Old Dominion e-mail accounts and check them every day. If a student chooses to have his/her messages forwarded to another account, it is the student's responsibility to take the necessary steps to have them forwarded.

Classroom Conduct

Please be respectful of your classmates and instructor by minimizing distractions during class. *Cell phones should be turned off during class*.

Make-ups

Make-ups for graded activities are possible *only* with a valid *written* medical or university excuse. It is the student's responsibility to give the instructor the *written* excuse and to arrange for any makeup work to be done. A makeup exam may be different (and possibly more difficult) than the regularly scheduled exam.

Disability Services

In compliance with PL94-142 and more recent federal legislation affirming the rights of disabled individuals, provisions will be made for students with special needs on an individual basis. The student must have been identified, as "special needs" by the university and an appropriate letter must be provided to the course instructor. Provisions will be made based upon written guidelines from the University's Special Needs Students Resource Office. All students are expected to fulfill all course requirements.

Seeking Help

The course website should be your first reference for questions about the class. The schedule will be updated throughout the semester with links to lecture notes and assignments. Announcements and frequently asked questions (FAQ) will also be posted to the course website.

The best way to get help on assignments and in understanding lectures is to come to office hours. If you cannot make office hours, please send an email to setup an appointment. *Unfortunately, I am not able to take "walk-in" questions outside of office hours*.

I am available via email, but do not expect or rely on an immediate response.

Since this course will include several programming assignments, here's a word of advice – ***start working on assignments early!*** *An hour spent reading and understanding an assignment on the day it is given out will be worth many hours on the night before it is due*.