

Spring 2009

CSC 4900, 8560 – Computing Networks

Syllabus

Instructor	Mirela Damian, MSC 167A mirela.damian@villanova.edu Phone: (610)519-7414
Office Hours	M 1:30 pm – 2:30 pm Th 4:30 pm – 5:30 pm
Course Meets	Th 6:15 pm - 9:00 pm in Mendel G87
Prerequisites	Systems (2400, 8410), Algorithms (8301)

Course Description

This course introduces the underlying principles of computer networks, with an emphasis on protocols and communication and their role in the Internet. The course starts with a brief overview of physical network hardware and continues to build functionality on top of it. The emphasis is on the upper three TCP/IP layers: network, transport and application. At the end of this course students should have general knowledge on how the Internet works and have basic network programming skills.

Intended Learning Outcomes:

1. Students will demonstrate an understanding of network architecture concepts, the OSI reference model and the TCP/IP architecture.
2. Students will demonstrate proficiency in analyzing LAN technologies (including Ethernet, Token Ring, ATM-based LANs and wireless LANs).
3. Students will demonstrate an understanding of the basic principles of error, flow, and congestion control at various levels of the protocol stack.
4. Students will differentiate between main interconnecting technologies (including hubs, bridges, switches, routers) in terms of cost, functionality and performance.
5. Students will differentiate between circuit-switching and packet-switching technologies.
6. Students will demonstrate proficiency in analyzing and verifying communication protocols (such as IP, IPv6, ICMP, UDP and TCP).
7. Students will demonstrate an understanding of routing principles and algorithms, and routing protocols used on the Internet (RIP, OSPF, and BGP).
8. Students will demonstrate an understanding of application-layer protocols (DNS, SMTP, FTP, HTTP) and their interaction with underlying services.
9. Students will demonstrate an ability to design and analyze simple computer networks.
10. Students will demonstrate proficiency in network programming in C and Java.
11. Students will establish a thorough understanding of network-related security threats and solutions.

Resources

The textbook for this class is

Larry Peterson and Bruce Davie
Computer Networks -- A system's Approach, 4th edition
Morgan Kaufmann, ISBN: 978-0-12-370548-8

Course-related resources (in electronic form, access free with textbook purchase):

Network Simulation Lab Manual
OPNET Software (Academic Edition)
NET-SEAL (Simulation Experiments and Animation Library)

Other course material will be posted online at

<http://www.csc.villanova.edu/~mdamian/networks/>

Please make sure you check the class page regularly.

Course Requirements

1. **Assignments:** 4-5 assignments, some of which will involve programming.
2. **Labs.** The textbook comes with a lab manual containing 15 OpNet labs (the OpNet software comes for free with textbook purchase). Teams of 2-3 students will select one lab to complete and demonstrate it to class. Labs will be assigned first come, first served.

Student teams will also complete one hands-on lab in G 291 (the networks lab) to get some experience with real equipment.
3. **Research Project:** Teams of 2-3 students will select a networks topic not covered in class, and present it to their peers in the final weeks of the semester.
4. **One exam.** The exam will be closed books, closed notes. However, you are allowed to bring one sheet of paper (letter size) with any information you think will help you during the exam. *Please note that notes may not be shared during the exam.*
5. **Class Attendance.** Regular attendance is expected of all students. Each student is responsible for all material, announcements, and assignments covered during any class missed.
6. **Late Policy.** All assignments are due at the beginning of the class on the due date. No credit will be given to late assignments. Exceptions will be granted only in extraordinary circumstances.

Tentative Grading Procedure

The following allocation of points is tentative and may change during the semester:

Exam:	35%
Assignments:	35% graduates, 40% undergraduates
Labs:	15% graduates, 25% undergraduates
Research project:	15% (graduates only)

Academic Integrity

I encourage you to collaborate on assignments and learn from your fellow students. However, there is a fine line between collaboration and cheating. Collaboration means discussing problems and solution approaches with other students and independently writing your own answers; cheating means copying solutions from someone else or giving someone else your solutions. If you have questions about what is acceptable, please bring them to me *before* submitting your work.

Cheating, plagiarism and helping others commit these acts are all forms of academic dishonesty, and will not be tolerated. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the entire Code on Academic Integrity, consult

<http://www.academics.villanova.edu/AcademicIntegrity.html>

Special Arrangements

If anyone has a disability or other problems that warrant the need for special accommodation to complete the course work, please contact me at your earliest convenience.

Tentative Course Schedule

The course schedule below is approximate and subject to change as the semester progresses. It is the responsibility of the student to learn and adjust to changes. Please **read chapter material to be covered prior to each session.**

Date	Topic	Readings
Wk 1: Jan. 15	Overview of Networks. OSI, TCP/IP. Lab 000.	Ch. 1
Wk 2: Jan. 22	Ethernet (802.3). Packet Switching. Labs 004, 005.	Ch. 2.1, 2.6, 3.2
Wk 3: Jan. 29	IP Addressing. IP Forwarding. Lab 003.	Ch. 3.1, 4.1.1-4.1.4
Wk 4: Feb. 5	UDP and TCP. Congestion Control. Lab 009.	Ch. 5.1 - 5.2, 6.1 - 6.4
Wk 5: Feb. 12	Translating Addresses (DNS, DHCP, ARP).	Ch. 9.1.3, 4.1
Wk 6: Feb. 19	Middleboxes (VPN, NAT, Firewalls). Lab 012.	Ch. 4.5.3, 8.5
Wk 7: Feb. 26	SMTP. Network Security. Lab 013.	Ch. 9.1.1. Ch. 8.1-8.4
Mar. 2 – 8	Spring Break – ENJOY !	
Wk 8: Mar. 12	Sockets. Routing. Labs 006, 007, 008.	Ch. 4.2, 4.3.3, 4.3.4
Wk 9: Mar. 19	Wireless and Mobile Networks. Labs 014, 015.	Ch. 2.8, 4.2.5
Wk 10: Mar. 26	Multimedia streaming. Lab 005.	Ch. 3.1.2, 3.3, 4.5, 7.2
Wk 11: Apr. 2	Overlay and Peer-to-Peer Networks. Midterm.	Ch. 9.4
Apr. 9 – 13	Easter Recess – ENJOY !	
Wk 12: Apr. 16	Research Project Presentations.	Web.
Wk 13: Apr. 23		
Wk 14: Apr. 30	Topic of choice.	Web.
Th, May 7	Final exam period (7:00 – 9:30 pm) will be used for student presentations.	