

# TCP/IP NET 215

## Course Overview & Syllabus

N. Todd Pritsky  
Fall 2007 Semester

[[ [Link to Course Calendar](#) ]]

**Hello!** and welcome to *TCP/IP*. We hope that you find the course fun, informative, and interesting.

This course will provide detailed coverage of the Transmission Control Protocol/Internet Protocol (TCP/IP) suite, the *lingua franca* of the Internet. Network professionals today need to be thoroughly familiar with the Internet and TCP/IP, so here we are! Luckily, the subject is an interesting one and the Internet is a network that we all use, so although this is going to be very different than what many of you have seen before, you already have some basic familiarity. Although we will cover some theoretical stuff, this is a practical applications-oriented course, relying heavily on hands-on exercises.

Course topics will include:

- The OSI Reference Model and data communications protocol suites
- The ARPANET, Internet, and TCP/IP
- Packet sniffing and protocol basics
  - LAN protocols (e.g., Ethernet)
  - Access protocols (e.g., HDLC, PPP, T1, frame relay)
  - TCP/IP Suite: IP, ICMP, TCP, UDP, application protocols
- IP: Operation, addressing, subnets, subnet masks, ICMP, ARP, IP version 6
- TCP: Operation, ports, error handling
- UDP: Operation, ports
- Overview of common TCP/IP application protocols (e.g., FTP, Telnet, SSH, DNS, SMTP, etc.)
- Security issues related to all aspects of TCP/IP, including the IP Security (IPsec) protocols, voice over IP (VoIP) and VPNs
- Protocol analysis with tcpdump/WinDump

**Course prerequisite:** CIS 232 (Introduction to Data Communications)

It is expected that incoming students to this course have a basic understanding of network access, LAN, and WAN technologies, and the OSI protocol reference model.

### **Course outcomes:**

Upon completion of this course, students will be able to:

- Compare and contrast the TCP/IP protocol suite with other protocol suites, and cite advantages and disadvantages of using TCP/IP.
- Articulate and construct an IP-based subnet addressing plan, with particular understanding of private vs. public addressing and subnet masks.
- Explain the protocol operation of the major components of the TCP/IP suite, recognize the data unit formats, and understand basic troubleshooting (to include IP, ICMP, ARP, TCP, UDP, FTP, Telnet, Ping, HTTP, SMTP, POP, and DNS).
- Describe the relationship between IP, underlying network access protocols and technologies, and higher layer applications and services.
- Review the common security vulnerabilities associated with the TCP/IP protocol suite and ways to mitigate those vulnerabilities.
- Review the basic operation and function of IPsec and VPNs.
- Demonstrate the ability to troubleshoot IP-based networks using a protocol analyzer.

This course also addresses the college's core competencies in the following way:

- *Oral/written communication:* The applications and services that can be designed and implemented using the TCP/IP protocol suite often requires communication with an organization's non-technical management, customers, vendors, and users. Networking professionals have to be able to effectively communicate in both written and verbal form. These skills will extend those learned in other classes by use of papers, student presentations, and the demonstration of proper computer forensics techniques.
- *International awareness:* International issues are covered, as relevant. TCP/IP is the protocol used on the global Internet and there are few specific international issues.
- *Technology:* This course covers basic concepts related to networking protocols, and the application of TCP/IP protocols and services.
- *Critical Thinking:* Computer networks using TCP/IP often require performance analysis and troubleshooting, tasks that are more art

than science. Extending TCP/IP to non-traditional applications and fitting those applications to the communication needs of an organization requires out-of-the-box thinking. Discussion and analysis of a variety of real and hypothetical scenarios will show students how to view TCP/IP as more than just getting two computers to talk with one another.

Instructor contact information:

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#### ***Texts and supplementary resources:***

- [\*Guide to TCP/IP\*](#), 2nd. ed. by Laura Chappell and Ed Tittel (Course Technology, 2004) is the **required text** for this course. It is a good, accurate, readable text and also pretty current. The text will be supplemented with outside reading from the Web.
- [\*TCP/IP Illustrated, Volume 1: The Protocols\*](#) by W. Richard Stevens (Addison-Wesley, 1994) is considered by many to be the "bible of TCP/IP" even though it is over ten years old. It is one of the best books available if you want a detailed treatment of the basic protocols comprising TCP/IP. Many changes have occurred to TCP/IP since the book was written, however, so there are many new protocols that the book doesn't cover — e.g., Secure Shell (SSH), Secure Sockets Layer (SSL), IP version 6 (IPv6).
- [\*Troubleshooting TCP/IP\*](#) by Mark Miller (John Wiley & Sons, 1999) is a really good take on TCP/IP from the perspective of troubleshooting and protocol analysis.
- [\*TCP/IP Architecture, Protocols and Implementation with IPv6 and IP Security\*](#) by Sidnie Feit (McGraw-Hill, 2000) is another good TCP/IP text, this more from the user and usage perspective. It is currently available for purchase as a downloadable PDF file (7.9MB, 900+ pages).

- The [GaryKessler.net](http://www.garykessler.net) Web site has a number of papers and articles on topics related to this course and you should feel free to read and peruse them! In particular, take a look at the TCP/IP tutorial available at <http://www.garykessler.net/library/tcpip.html>.
- Packet sniffers and protocol analyzers are very useful tools if trying to understand protocols in action on real networks. There is a lecture in the course on the use of one such tool called tcpdump (and its Windows equivalent, WinDump). Students are encouraged to obtain [tcpdump/WinDump and/or Ethereal/Analyzer](#). You might also find it useful to download this [TCP/IP Pocket Reference Guide](#).
- Some other resources worth knowing about include:
  - The Internet Society Web site ([www.isoc.org](http://www.isoc.org))
  - The Internet Engineering Task Force Web site ([www.ietf.org](http://www.ietf.org))
  - The RFC Editor's Web site ([www.rfc-editor.org](http://www.rfc-editor.org))
  - Cisco Systems' *The Internet Protocol Journal* ([www.cisco.com/ipj](http://www.cisco.com/ipj))

Download the free Adobe Acrobat reader to be able to view course lecture notes and other course resources.

### **Grading:**

There are a number of components that will be used to determine grades in this course. The bottom-line is that you demonstrate your understanding of the material. Since this is not a lab course (although there will be some lab-type homework), that demonstration will be primarily in written or verbal form.

There are, then, a number of mechanisms that will be used to evaluate students to determine a grade. First, this course depends a lot on student-instructor interactivity. Therefore, class attendance and active participation are very important and will count heavily towards the final grade. Second, there will be a fair amount of reading and written work, as well as mid-term and final exams. In general, homework is due the week following its assignment (unless a different due date is posted when the homework is distributed); homework will be accepted late only in extraordinary circumstances **and** only with the instructor's permission.

Finally, there is a research project associated with the course. The project will have a written portion **and** a presentation portion. The written portion must be completed using some word processing software and the presentation portion must be completed using some presentation graphics

software. There will be more information on the project at mid-semester but this is a heads-up that you will need these skills. (Note that use of non-Office word processing and/or presentation graphics software is quite acceptable.)

Grades will be weighted roughly as follows:

- Midterm Exam: 20%
- Final exam: 20%
- Homework: 20%
- Project: 20%
- Attendance and participation: 20%

The College's standard numerical scale for calculating final grades will be used:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
93+	90	87	83	80	77	73	70	67	63	60	59-

### ***Students with Disabilities***

If you believe that you have a disability requiring accommodations in this class, please contact the Coordinator of Support Services for Students with Disabilities as soon as possible. After you receive your accommodation form, please see me so I can work with you to implement them in a timely fashion.

**Contact:** Janine Allo – office: Hauke 007; phone: 802-651-5961; email: [allo@champlain.edu](mailto:allo@champlain.edu)

### ***Academic Honesty Policy***

*The Rudder*, the Champlain College Student Handbook, describes the Academic Honesty policy. It basically says that if the instructor thinks that you have cheated on an assignment — i.e., to either actually or attempt to knowingly give, receive, or use work that is not your own — you can be given a 0 on that assignment. The point of all of this is that if you hand in work that is supposed to be your own, it should be. That also means that if you use external information sources, be sure to cite them and give appropriate credit.

This in no way suggests that the college or program is opposed to your collaboration with fellow students and others; in fact, many classes create teams for some assignments specifically to encourage as much collaboration as possible. The point of this policy is that work that you submit as your own *has* to be your own! If you work with another person

or other resource that helps you learn an answer to something, that's fine — what you turn in, however, should be in your own words and clearly demonstrate **your** understanding. If you're unsure, indicate that you worked with others.

The bottom line is — there is **no** excuse for cheating. That's another reason that you should keep your communication channels with your instructor(s) and/or advisor open. If there's a problem in your life that is rippling over into school, don't let it cause you to do something that will have unintended consequences; talk to someone instead.

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## Course Calendar

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**Course calendar:** (Subject to change, of course, but you will be notified of changes...)

Week	Topic	Reading	Assignment
1 (9/4)	Introduction: TCP/IP and OSI, History of the Internet and TCP/IP, Internet administration, Internet documentation, TCP/IP and security plus base conversion.	Chaps. 1 (pg. 1-21), 2 (pg. 68-71), 9	Week 1 Homework
2 (9/11)	Network Access Protocols: Point-to-point links, dial-up, T1, SONET, DWDM, cable modem/DSL, LANs, Packet Over SONET (POS), frame relay, ATM, PPP, HDLC	Chap. 3 (pg. 101-118); Protocols.Com	Week 2 Homework
3 (9/18)			Week 3 Homework
4 (9/25)	IP Part 1: Packet format, addressing, subnetting, network design	Chap. 2; <i>IP Addressing</i> , IP Subnet Calculator(s)	Week 4 Homework
5 (10/2)	IP Part 2: Operational behavior, ICMP, ARP,	Chaps. 3 (pg. 118-150), 4,	Week 5 Homework

	routing, security implications	10	
<b>10/9</b>	<b>COLLEGE RECESS</b>		
6 (10/16)	IP Part 2 (cont.) <b>and</b> TCP & UDP: Ports, formats, normal behavior, error conditions, security implications	Chaps. 1 (pg. 21-25), 5	Week 6 Homework
7 (10/23)	Packet sniffing and protocol analysis with tcpdump/WinDump	Chap. 1 (pg. 25-32)	<b>Mid-Term distributed</b>
8 (10/30)	The Domain Name System (DNS) and Name Services	Chaps. 6 (pg. 287-288), 7, 12	
9 (11/6)	Application protocols: FTP, Telnet, SSH, HTTP, SMTP, POP3, DHCP, tftp, RADIUS, SNMP	Chaps. 6, 8, 11	<b>Mid-Term Due</b> Week 9 Homework <b>Project Distributed</b>
10 (11/13)			Week 10 Homework
11 (11/20)	Tools: Ping, traceroute, nslookup, whois, finger, Sam Spade, nmap	Chaps. 4 (pg. 187-188, 201), 8 (pg. 323-327); App. C; <i>Sam Spade, Port Scanning, RFC 2151</i>	Week 11 Homework
12 (11/27)	Abnormal TCP/IP traffic, introduction to intrusion detection	IDS papers	Week 12 Homework
13 (12/4)	Special Topics: ISPs, IPv6, and VOIP	Chap. 13; <i>IPv6, VoIP</i>	<b>Project Presentation can be posted</b>
14 (12/11)	STUDENT PRESENTATIONS		<b>Project Paper and Presentation Due</b>  <b>Final Exam distributed</b>

15 (12/18)	<b>FINAL EXAM PERIOD</b>		<b>Finale Exam Due</b>
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To be best prepared for the weekly class meetings, please read the relevant text material *before* the class meeting each week (with the obvious exception of the first week's reading).