

- 15 Feb Week 4 – Ethernet and other Media T – Chap 2.3 – 4, Chap 4,
Assembling Some Pieces
Access Control
- 22 Feb NO CLASS – President’s Day
- 01 Mar Week 5 – Considering Multiple Systems
Multiple Systems with relays
Routing and Relaying T – Chap 5
The Network Layer Except 5.3-5.4 pp 390-423.
PNA Chap 3 pp 85 – 95
- 08 Mar NO CLASS – SPRING BREAK!!
- 15 Mar Week 6 – Naming and Addressing PNA Chap 5
Skip “Background on Naming and
Addressing” unless that interests you.
PROJECT OUTLINES DUE
- 22 Mar Week 7 – Mid-Term
- 29 Mar Week 8 – “End-to-End” Error Control T – Chap 6 except 6.4.2, 3.
TCP/IP and the Internet
Traffic Management
Congestion Control T -Chap 5.3,4
- 05 Apr Week 9 – Network Infrastructure
How Networks Work PNA Chapter 7.
Name Resolution Systems PNA Chap 4. pp 132 - 135.
- 12 Apr Week 10 – Network Management PNA Chap 4 pp. 123 – 129
Current Applications T-Chap 7, Chap 6.4.2 – 3
- 19 Apr Week 11 – Security Mechanisms I
Security Mechanisms II T-Chap 8
- 26 Apr Week 12 – Project Presentations
- 03 May Week 13 – Project Presentations
- 10 May Week 14 – Final Exam

Textbooks

There are no good networking textbooks. With one exception, they are all written for a trade school, not a university, and they are full of errors. I have found Tanenbaum the

least objectionable. Readings from my book *Patterns in Network Architecture* (PNA) are posted on Blackboard. It is not necessary to buy the on-line copy unless you want to. In addition, there is other material that I or others have written as supplemental to the course if you are interested (and might generate an idea for project). PNA will provide a basis for the principles of networking and Tanenbaum for some of the details about what is out there today. Exams will cover both Tanenbaum and *Patterns*. I guarantee that this is not an ordinary networking course. (We won't use all of *Patterns* in class, but the parts we don't use are posted if you are interested. They might provide ideas for a project.)

Tanenbaum, A; Wetherall, D.; Feamster, N. **Computer Networks**, 6th Ed. ISBN 13: 978-0-13-676402-1 Pearson, 2020. (We will have to be careful. There are known errors in the homework problem numbers. I have notified Tanenbaum of these and other errors in the book.)

Day, John. **Patterns in Network Architecture: A Return to Fundamentals**, Prentice Hall, 2008. This is only available as an e-book and the relevant chapters are posted on Blackboard.

Class: The Schedule indicates the readings for each class. It will be best if you have read the material before class. (However, I know how that works as the pressures of the semester mount.) All lecture slides will be posted the day before class. (If not, yell, I have screwed up.) There will be a homework assignment at class time. (If not, yell, I screwed that up too!) ;-) I assign homework to get you to think about the concepts and develop a “feel for the issues.” Searching the Web for answers, won't accomplish that, and it will show up in the exams. In class I will lecture based on the book. There is a lot of well-established material in this field that must be covered and we will. But at the same time we will consider these results in the current context. We will go over homework in class. I may ask one of you to explain the homework solutions. Delightfully, we have found that often the solutions provided by Chegg are wrong.

COVID-19 Policies.

Return to Campus: We are finally back to face-to-face classes and I hope it stays that way. Let us all take the necessary precautions and hopefully the situation will improve with as the semester goes on.

Compliance: All students returning to campus will be required, through a digital agreement, to commit to a set of [Health Commitments and Expectations](#) including face coverings, symptom attestation, testing, contact tracing, quarantine, and isolation. The agreement makes clear that compliance is a condition of being a member of our on-campus community.

You have a critical role to play in minimizing transmission of COVID-19 within the University community, so the University is requiring that you

make your own health and safety commitments. Additionally, if you will be attending this class in person, you will be asked to show your [Healthway](#) badge on your mobile device to the instructor in the classroom prior to starting class, and wear your face mask over your mouth and nose at all times. If you do not comply with these rules you will be asked to leave the classroom. If you refuse to leave the class, the instructor will inform the class that they will not proceed with instruction until you leave the room. If you still refuse to leave the room, the instructor will dismiss the class and will contact the academic Dean's office for follow up.

Boston University is committed to offering the best learning environment for you, but to succeed, we need your help. We all must be responsible and respectful. If you do not want to follow these guidelines, you must participate in class remotely, so that you do not put your classmates or others at undue risk. We are counting on all members of our community to be courteous and collegial, whether they are with classmates and colleagues on campus, in the classroom, or engaging with us remotely, as we work together this fall semester.

Course Mechanics

- **Attendance** – I don't take attendance. You are all adults and responsible for yourselves. There is material I will cover in class that may be on the exam that is not in the book or the lecture slides. If something comes up, that is out of the ordinary and requires you to miss class, please let me know.
- **Grading:** The course will be based on homework (20%), exams (40%) and projects (40%). Homework and projects are expected to be submitted by their due dates. Late submission grades will be scaled accordingly. Exams will be open book, open notes.
- **Homework:** There will be approximately eight homework assignments. Homework will be due at the beginning of class the week after it was assigned. (Exams and holidays may modify that slightly.) Homework may be submitted in class or via Dropbox on Blackboard. (Email is okay, but has proved unreliable. Hence, dropbox is preferred.) (Don't use spaces or “#” in file names submitted to Dropbox. The Blackboard programming staff weren't that good.) Also file names should be more descriptive than “homework1” or “hw1”. You aren't the only one submitting homework! ;-)

Late homework will be penalized as appropriate. You are encouraged to work together to learn the material and to discuss approaches to solving homework problems. However, *you must come up with and write up the solutions on your own.*

Nota Bene: With homework being 20% your grade, it does not affect your grade much. The purpose of the homework is to help you ensure that you understand the material. Cutting and pasting answers from the web may be quick and you may get a good grade, but it won't matter much if you haven't understood the material and don't score well on the exams. If I find you copying from Tanenbaum's answers or other blatant examples, that homework will get a zero. A second time, it will be reported as plagiarism to the University. The University does not go easy on such infringements.

Administration

- **Office Hours:** Before or after class is best. I will generally be on campus well before class. Contact me by email if you wish to see me before class.
- **Email:** You are required to periodically check your email for unexpected occurrences like errors in assignments, cancellations, etc. Check blackboard frequently as well.. Questions via email are always good. If the question/answer has general interest, I will answer you but probably ask you to bring it up in class; if the solution is very involved, we may need to go over it in person.
- **Course Web Site:** We will use Blackboard (blackboard.bu.edu). I will use it to post class notes, lab and homework assignments, homework solutions, and other course information.
- **Incompletes:** Incompletes will only be granted in accordance with university policy, which (broadly) requires a major crisis near the end of the semester.
- **Course Notes:** Class notes will be posted before the class. You are encouraged to annotate them during class.
- **Academic Honesty:** Please read the university academic code of conduct. If something is not clear, then ask. In particular, plagiarism is regarded as a serious offence and students engaging in this activity will be reported. If you use a source, cite it. . (Not related to academic Honesty, but germane. I do not consider wikipedia an authoritative source on any subject. It may be used to find more primary sources or cite it to illustrate opinions. But it cannot be considered definitive.)
- **In Class Distractions:** Please turn off cell phones and close laptops at the start of class. If you must text during class, please leave the class to do it. If you need to leave the class to text, there is no need to return to the class.
- **Instructor Errors:** Don't be shy! If you see me make a mistake, please let me know right away. If you are not sure, that's even better – it will give me

a chance to clarify something. Class lecture is a test to see if you are listening.
;-)

Keys to Success in this (and most other) Course(s)

Attendance! Coming to class is important. Some of the material (and much of the perspective) in this course will be found nowhere else.

Do the readings! Work out the examples as you read. If you do not believe that you completely understand something, try inventing and solving your own problems. If that doesn't work, come see me! And we will figure it out.

Take notes! In particular, print out the course notes ahead of time and annotate them during class.

Participate! Ask questions; talk with your fellow students. Be active.

Keep up! Before each class, read over the notes from the previous class.

Allocate enough time! Much of the material is time-consuming to master. There is a big difference between "kind of" understanding a subject and "really" understanding it.

How do you know that you know the material? A good metric is whether you would feel comfortable standing in front of a class explaining it. Another is whether you think that you could explain it to a job interviewer!

(Not So) Picky Things I REALLY Care About

- **Punctuality.** Please come to class on time. Unfortunately, unlike coming late to a movie, coming in late to class distracts the presenter as well as the presentees. Unfortunately, given some of you are coming from work and Boston traffic being what it is, this may be hard. Let me know if you *can't* make it. We will assume you are coming!
- **Preparation.** Come to class prepared. If you haven't reviewed new terminology, etc. it makes it very difficult to follow what's going on. (The six Ps: Proper Preparation Prevents Poor Performance)
- **Presence.** Frankly, I don't care. If you can pass the exams without coming to class that is fine. (I know I shouldn't say this. But it was our attitude when we were in school so I can't in all honesty require it from you.) However, in this class especially, much of the important information isn't in the textbook and it could show up on an exam. If I test you on what was said in class (and I am likely to) and you weren't there, that was your decision. If you decide to take me up on this, you better be good. Like showing your work with homework, if I know who you are I can better gauge your work. If you make yourself just a number, I will tend to see you that way.

- **Participation.** The best way to learn is to be involved. Conversely, being distracted is the worst. In particular, working on homework during class the day it is due is unacceptable. Get involved. I think this subject is really fascinating from a number of perspectives: scientific, historical, social, political, epistemological, etc. This stuff is fun.
- **Powers of 2 and logs.** Know them up to 2^{16} (at least) and why this is important.
- **Your success!! If you are having problems, arrange a conference wth! (and sooner rather than later.)**

Projects

By the end of Lecture 4, we will have discussed the common structures in protocols and developed a general model of a layer. The project paper should be about 10 pages single-spaced along with a presentation to the class of 5-10 minutes of the major points in your paper.

For a project, one might take a protocol or group of protocols from the lower four layers or a relaying application protocol and apply this structure to it. Identify and document the mechanisms and policies in the protocol, what aspects are error and flow control and what aspects are relaying and multiplexing, does this protocol follow the structure outlined in class? If not, how does it differ, why does it differ, and should it? Does your example contradict the theory? Is the protocol wrong or is the theory wrong? If you choose a protocol that was discussed in class, then you must go well-beyond what was covered, e.g., actually defining the policies that the protocol uses. I will provide a list of the policies.

Possible protocols: 802.11, SCTP, Bluetooth, X.25, HDLC, Ethernet and its LLCs, Transaction Processing, ATM, ISDN, MPLS, etc.

Or a project of your interest. Possible topics might include:

A specific application with unique properties: p2p, process control in an electric grid, or a refinery or chemical plant, air traffic control, on-line trading, etc.

A specific aspect of networking: error detection/correction, flow control, security, multiplexing, re-transmission strategies, routing, congestion control, wireless protocol performance, distributed calculations, updating multiple copies, etc. I do tend to discourage projects on security. Many of you will be pursuing a security concentration. You will be taking plenty of security courses. Use those idea there.

This is an opportunity to broaden your knowledge, use it! ;-). However, there are security projects that would be interesting for the class, so run the idea by me.

An area of networking relevant to your interests, or a project of your choosing.

Generating an outline is key, not only to organize your thoughts but I might be able to suggest sources.