COMM 4557 Communication Network Infrastructure
Autumn 2023 – Last updated 8/21/2023

Lecture:	Paige Hall 020 T/H 12:45pm – 2:05pm
Instructor:	Dr. Kelly Garrett 3016 Derby Hall Email: garrett.258@osu.edu ***Please include the "Comm 4557" in the subject line***
Office Hours:	via Zoom on Tuesdays 4-5pm + by appointment
Website:	https://carmen.osu.edu (please access Zoom from Carmen)

Rationale and objectives

How is sound transmitted over the telephone network? How does data flow across the Internet? What is the difference between a cellphone call and a FaceTime call? How and why do Internet technology pose a threat to privacy? These are a few of the questions that you should be able to answer after completing this course. The focus of the class is on developing a basic understanding of telecommunication technologies, from radio broadcasting and the PSTN to streaming audio and encrypted Internet communication. We cover a variety of contemporary telecommunication systems, addressing both what they can do and how they work. We pay particular attention to the similarities and differences between digital and analog technologies.

Specific Learning Objectives:

With these skills, you will be better prepared to

- Explain technologies to those who are less knowledgeable,
- Read tech news, and
- Think critically about key capabilities and limitations of existing and novel telecommunication systems.

Course Prerequisite:

Comm 2540: Introduction to Communication Technology

Required Text:

Newton, Harry with Steve Schoen. (2022). *Newton's Telecom Dictionary* (32th ed.). New York: Telecom Publishing. ("Newton" in schedule)

All other required readings are available through CARMEN.

Copyright Disclaimer: The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Policies and Expectations:

Class communication. I will post class updates and/or additional materials as announcements on Carmen and/or to your OSU email. Please check Carmen and read your email regularly (at least 2-3 times per week) because you are responsible for this information, just as you are responsible for information in class.

Participation is required. This class will meet in-person for the whole semester, but you also have the option to participate remotely as needed. Regardless of which modality you choose, you are still expected to be present (in-person or virtually) and to actively participate at the same time as the rest of the class (barring health issues that prevent it).

Attendance. While sickness and unexpected emergencies arise from time to time, *regular* absence will hurt your grade. I routinely evaluate participation via graded in-class activities. For example, you may be required to upload materials to Carmen or take a poll with TopHat. That said, **please do not attend class if you are feeling sick**. As important as the in-person experience is to your learning, it isn't worth spreading an illness to your classmates.

If you are unable to attend class via either modality because you are sick, don't panic! Most students should be able to complete a successful semester despite illness-induced absence. If you are absent due to illness, including but not limited to COVID, I will provide you a reasonable opportunity to make up missed work. **You do not need to provide a physician's document of illness, but you should advise me via email as soon as you are safely able to do so.**

Punctuality. Class begins on time every day so that all scheduled discussions and activities can be completed. You are expected to be punctual.

Recordings of class sessions. I plan to post lecture slides and recordings of our class sessions on Carmen. These recordings are not a substitute for the in-person learning experience. Instead, they are a tool to help those who are forced to miss class (e.g., because of illness) to catch up. As such, recordings may fail to capture in-class activities, they may be incomplete in other ways, or they be entirely missing (e.g., in the event of a problem with the recording technology).

Problem Sets. Problem set due dates are listed in the tentative schedule, below. All assignments must be turned in to Carmen by the start of class on the due date. Your answers should be submitted using Carmen's built-in text editor. I do, however, encourage you to prepare your answers in a word processor, and then copy-and-paste them into the text editor. This will make it easier for you to prepare your corrections, which I describe in more detail below. (See Course Requirements, below, for important details about the Problem Sets.)

Late Assignments. It is your responsibility to confirm that your assignment has been successfully uploaded to Carmen. Problems sets will not be accepted after the start of class time on the due date. (As noted above, I will make accommodations for illness.)

Challenging a Grade. I am always willing to discuss your grades with you, but I will not do so during class time. To challenge a grade, you must wait 24 hours after the assignment is graded and then email me to make an appointment *within one week* of the assignment being returned to you. When we meet, you must present your concerns in writing and attach the graded paper or exam. Please note that a challenge may result in grades being raised or lowered.

Academic integrity policy. Each student in this course is expected to demonstrate academic integrity and to abide by the *Code of Student Conduct* (https://oaa.osu.edu/academic-integrity-and-misconduct/student-misconduct). Academic misconduct includes, but is not limited to, (1) plagiarism (using others' work without citing/crediting them), (2) fabricating information or citations, (3) facilitating acts of dishonesty by others, (4) having unauthorized possession of past class work, including problem sets, (5) submitting work previously submitted to another course or work of another person, (6) tampering with the academic work of other students, and (7) cheating on quizzes/exams. You may not use generative AI, such as ChatGPT, in this class (discussion posts, problem sets, etc). It is your responsibility to be aware of the rules of academic dishonesty—ignorance is not a defense. ***When in doubt, talk to me.***

If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

Please note that although collaboration is required throughout this course and cooperation is *strongly* encouraged, any work submitted by a student for academic credit must be the student's own work. You are encouraged to study with classmates and to discuss information and concepts covered in lecture with other students. You can give "consulting" help to or receive "consulting" help from such students. However, cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e-mail, file exchange, or a hard copy.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Course Technology

This being a class about communication technology, I expect you to be able to use a variety of technologies when participating in this class. Email, CarmanCanvas, TopHat, and Zoom will be used most often, but other technologies may be introduced from time to time. I expect you to familiarize yourselves with these technologies and to be able to use them for our class. If you need help, please consult the various support services offered by OSU and the service providers (see below). If those resources are insufficient, please do not hesitate to ask me for help.

As noted above, active participation in the class is critical to your ability to learn this material. This means that you must resist the temptation to do any of the many other things that your computer makes possible. Stop checking your email, texts, and social media feeds. I know this is hard, but it will make a profound difference your ability to learn this material. Plus, it is a critical life skill. Trust me when I tell you that your friends, your family, your employer—anyone you interact with regularly—will appreciate your ability to ignore the siren song of social media for an hour and twenty minutes at a time.

Required technology.
Most, but not all, class work can be completed using a tablet. You will also find it helpful to have access to a word processor such as Google Docs or Microsoft Word. To take the exams and/or if you are participating remotely, you will also need a computer that has a webcam and microphone, and that has reliable Internet access (minimum of about 5Mbps [and by the time you've finished this class, you'll know why]).

Technology support. For help with your password, university e-mail, Carmen, or any other technology issues, please contact the OSU IT Service Desk.

- Self-Service and Chat support: http://ocio.osu.edu/selfservice
- Phone: 614-688-HELP (4357)
- Email: 8help@osu.edu
- TDD: 614-688-8743

More information about technologies we will use most often in this class is provided below.

CarmenCanvas (aka Carmen): OSU's Learning Management System, Carmen, will be used to host materials and activities throughout this course. To access Carmen, visit http://carmen.osu.edu. Log in using your name.# and password. Carmen documentation can be found here: https://teaching.resources.osu.edu/toolsets/carmencanvas.

TopHat: Some in-class activities will use TopHat to provide real-time sharing of comments, poll results, etc. The service can be accessed with a web browser (https://tophat.com/) or an app (available for both Android and iOS).

Proctorio: I plan to administer class exams remotely using Proctorio, an online proctoring tool. You are required to have a webcam (USB or internal) with a microphone and a reliable Internet connection. Proctorio will record the testing environment while you take your exam, so it is important that you find a space where disruptions are unlikely and where you can enable video recording. To use Proctorio you must be over 18 years of age. If you have concerns about using an online proctoring tool, please contact me as soon as possible so that we can find a workable alternative.

CarmenZoom (aka Zoom): Office hours will be conducted using Zoom. Zoom can be accessed via the Google Chrome web browser or using the Zoom app.

To join the lecture, please do the following:

1. Sign into the class Carmen page
2. Select "Zoom" from the menu on the left side of the screen.
3. Click the "Join" button next to the day's class session
4. Follow the prompts

Please make sure you are familiar with the full range of Zoom features, including muting audio and video, using non-verbals (raise hand, yes/no, thumb up/down), and using the text chat. Much more information about Zoom is available here: https://teaching.resources.osu.edu/toolsets/carmenzoom.

Course Requirements:

Course readings are essential to full participation. Doing the readings and reflecting on what you've read is required for this class. My lectures, our discussions, and the in-class activities all take this for granted. Required readings are listed in the tentative schedule, below. Although some of the readings come from a traditional textbook, we also make extensive use of popular web sites, including HowStuffWorks, Wikipedia, and YouTube. You should read *all* sections of the page or entry, or watch the entire video, unless I indicate otherwise. If you encounter terms you don't understand, please consult Newton's Telcomm dictionary (which is the only required textbook). I also encourage you to pursue links on these sites if there are terms or topics that you do not understand or want to know more about.

Please be aware that although I have reviewed the online sources and consider them to be reliable, the content can change without notice and the entries may sometimes contain errors. Cross checking the information you find here with the dictionary and lecture is strongly encouraged.

Discussion posts. There are two types of posts that you are required to make between class sessions. First, **any time before class** you must post a comment or question about the reading for the day. It can be a question you want help answering, or one that your classmates could answer based on what they read. You may also pose a comment connecting the technology discussed in the reading to current events. **Credit is given based on evidence that you have completed and thought about the readings.**

Second, some time **on the day after a class lecture** you must post at least one review question related to the material covered in that lecture. This can take the form of a question that you need help answering, or a question that your classmates could use to test their understanding of the material. To get credit for this post, the question must be clearly connected to the prior lecture and must illustrate your understanding of the larger topic. **Saying that you understood everything is not sufficient.**

Note that **you may <u>not</u> simply repeat a classmate's comment** when making either of these types of posts. If someone has already written what you were planning to write, you must write something else. You may post a different question, or you may reply to the post with a response to, or an elaboration on, the question.

Here's an (intentionally silly) example:

> **Student 1:** The author says that red Skittles reflect lower wavelengths than blue Skittles. I understand that wavelengths and colors are related, but what does he mean when he says that the waves are "reflected"
> **Student 2:** I had a similar question to @Student 1. I think that we see "reflected" light, but I'm not sure why the two candies don't reflect the same light.

Missed posts cannot be made up, but you can miss up to six with no penalty.

In-class exercises. There will be a variety of in-class exercises. Like the problem sets, my goal is to help you improve your understanding of the class material. They will also help me to understand what topics are most confusing to the class. Some of the exercises will be completed in small groups, but unless I say otherwise, each individual is expected to turn in their own attempt at a solution. As mentioned elsewhere in this document, we will use a variety of different technologies to submit these materials, though Carmen will be commonly used.

As with posts, missed in-class exercises cannot be made up. You can, however, miss up to three with no penalty.

Problem sets. The point of the problem sets is to help you learn, not to assess what you've learned. Because of this, grading might be a little different than you are used to so please read this section carefully!

Each problem set has two stages:

(1) In the first stage you are to answer **all** parts of the problem set to the best of your ability. If there is a question that you do not know how to answer, please seek help from me or a classmate. You may ask questions at the start of lecture, and I encourage you to come to my online office hours. If you still do not understand well enough to answer the question, **you must explain the parts you do understand**, and describe what is confusing you to the best of your ability.

I know that you can find solution sets to (old versions of) these problem sets if you try. Don't do it. You will learn more by trying to answer the questions on your own. **You won't lose points for answering incorrectly.**

(2) After the submission deadline, I will provide a solution set on Carmen. You will then have **one week to correct the answers you submitted in the first stage**. When correcting your assignment, do not just copy the answers provided on the solution set. To get full credit for the correction, you must:

- **Leave your original answer.** Please indicate your errors by crossing out the mistake. (~~Like this~~.) Do not delete any part of the original.

- **Describe the problem** with the original answer, explain how your new answer fixes this problem, and indicate which class reading or slide provides the information you need to correct your answer. (In other words, do not just copy the solution set.) If your answer is correct, say this explicitly. If it is correct but differs from my answer, explain why. **Please make any text that you add bold and red.**
- **Correct and explain all your errors.**

Here's an (intentionally silly) example:

1. Cookie Monster is ~~green because of all the leafy green vegetables he eats~~. **The crossed-out text is incorrect. Cookie Monster is blue, not green. Although I don't know why he is this color, it is certainly not because of his healthy eating habits. That monster doesn't eat anything but cookies. Information confirming this correction can be found in Michael Davis's history of Sesame Street, *Street Gang*, in the section that begins "There was a brief period during which Cookie Monster had neither an obsession nor a permanent name."**

Each assignment is worth **four point**. (a) You get two points for answering all questions as completely as possible on your first attempt. If you have spoken to me, but are still stuck, then you should answer as much of the question as you can and explain what part of the question is tripping you up. Again, your answer does not have to be correct to get full credit! (b) You get two more points for correcting your first attempt and explaining all your errors.

Exams. There will be a midterm and final exam. The midterm will encompass all material covered in the class prior to the exam. The final will be a comprehensive exam, covering all the topics of the course. You should be prepared to answer multiple-choice and short-answer questions on both exams. I will provide more information about the exams later in the semester.

Both exams will be administered on Carmen with the aid of Proctorio. Please ensure that this service works on the computer that you will use to take the exam. I encourage you to test it at least two weeks prior to the scheduled exam date. This will give you some time to work out any technical difficulties that you encounter during testing.

Students may request an in-person proctoring alternative to Proctorio. The student is expected to contact the instructor as soon as possible to coordinate the accommodation. Students will not be permitted to take remotely proctored exams in their homes or residence halls unless they are willing to conduct a room scan. By choosing to take the exam in their home or residence hall, the student is consenting to the room scan of the area in which they take the exam.

Grading

In-class participation	5%
Discussion board posts	10%
Problem sets	25%

Midterm	30%
Final	30%

Grading scale

93–100: A
90–92.9: A-
87–89.9: B+
83–86.9: B
80–82.9: B-
77–79.9: C+
73–76.9: C
70–72.9: C-
67–69.9: D+
60–66.9: D
Below 60: E

Other Policies

PLEASE TAKE CARE OF YOURSELF (Mental Health Statement)

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing.

If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th floor of the Younkin Success Center and 10th floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Religious accommodations

Our inclusive environment allows for religious expression. Students requesting accommodations based on faith, religious or a spiritual belief system in regard to examinations, other academic requirements or absences, are required to provide the instructor with written notice of specific dates for which the student requests alternative accommodations at the earliest possible date. For more information about religious accommodations at Ohio State, visit odi.osu.edu/religious-accommodations.

The University Interfaith Council has a helpful, but non-exhaustive, religious holiday calendar to promote awareness and understanding of observances. For example, Ramadan the Muslim holy month observed through fasting, prayer and reflection coincides with the end of the semester and second-session classes, and students and instructors should be mindful of requests made for final projects and assignments.

Creating an environment free from harassment, discrimination, and sexual misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at equity.osu.edu,
2. Call 614-247-5838 or TTY 614-688-8605,
3. Or Email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

Accessibility accommodations for students with disabilities

The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process (slds.osu.edu/covid-19-info/covid-related-accommodation-requests/), managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

This online course requires use of CarmenCanvas (OSU's learning management system) and other online services. Information about the accessibility features supported by CarmenCanvas is available here: https://community.canvaslms.com/docs/DOC-2061. If you need additional services to use these technologies, please talk to me.

Additional Resources:

Walter E. Dennis Learning Center (http://dennislearningcenter.osu.edu/). This is a free service available to all OSU students, and it has a proven track record of helping students succeed in college. Need a new study strategy? Better time management skills? This is the place to go.

Student Academic Services (http://advising.osu.edu/welcome.shtml). Arts and Sciences Advising and Academic Services' website provides support for student academic success. Information on advising issues such as tutoring, transfer credits, academic standing, and contact information for Arts and Sciences advisors can be found through this website.

Student Advocacy Center (https://advocacy.osu.edu/, 614-292-1111, advocacy@osu.edu). If you are facing a crisis, such as a long-term illness, serious injuries, mental health problems, or food/housing insecurity, please reach out to the Student Advocacy Center. The Center it offers a variety of support services, including a student emergency fund, and can connect students with other resources around campus.

Food Security (https://www.buckeyefoodalliance.org/, 614-688-2508). The Ohio State University is committed to ensuring that all students have access to adequate and healthy food. Any undergraduate or graduate student with a BuckID may confidentially use the Buckeye Food Alliance food pantries. No proof of need is required. The pantry is located in Lincoln Tower, Suite 150 (1800 Cannon Dr., Columbus, OH 43210). Check the website or call for current hours.

Tentative Course Schedule

NEWTON refers to *Newton's Telcomm Dictionary*, which is required for this class
TELCOM refers to excerpts from Goleniewski's *Telecommunication Essentials*, posted on Carmen.
REMINDER: Two discussion posts are required for each class session, one before lecture and one on the following day. See the Course Requirements section for more detail.

Date	Topics	Readings	Assignment
T 8/22	Syllabus & Overview	This syllabus	See REMINDER, above
H 8/24	Waves	NEWTON: electromagnetic energy through electromagnetic wave (including all entries in between), signal, waveform, wavelength, frequency, hertz, amplitude, phase, sound, sound waves, and *any terms in the other readings that you don't know. (This is always required.)* http://www.youtube.com/watch?v=-oGwFDQNJps http://science.howstuffworks.com/humans-hear-in-space1.htm http://en.wikipedia.org/wiki/Waveform (Intro only) http://en.wikipedia.org/wiki/Frequency http://en.wikipedia.org/wiki/Amplitude (stop at "Peak-to-peak amplitude") *Optional:* Real-world expression of audio waveforms https://go.osu.edu/CcKW	
T 8/29	Signals	NEWTON: Fourier's theorem, filter (defn 1), bandpass, signal level, signal booster, signal repeater, signal decay https://www.wired.com/2014/06/the-fourier-theorem-science-of-music-acoustics/ https://youtu.be/spUNpyF58BY (through 2m 30s) https://en.wikipedia.org/wiki/Audio_filter (stop at "Self-oscillation")	

Date	Topics	Readings	Assignment
H 8/31	Modulation	NEWTON: modulation, modulated wave, modulator, modem, demodulation, demodulator, amplitude modulation, frequency modulation, bandwidth, noise, spectrum, (signal-to-noise ratio is missing in 32nd edition) TELECOM: 11 (at Spectrum) – 18 (before Transmission) http://en.wikipedia.org/wiki/Bandwidth_(signal_processing) (Introduction and Overview) http://en.wikipedia.org/wiki/Modulation (Just Introduction) http://en.wikipedia.org/wiki/Amplitude_modulation (Sections: Intro and History; look at Fig. 1) http://en.wikipedia.org/wiki/Frequency_modulation (Sections: Intro and Applications|Radio; look at animation) *Optional:* https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/cell-phones-fact-sheet	
T 9/5	Transmission Basics	NEWTON: frequency division multiplexing, signal converter, radio, radio conformance test, radio frequency, frequency band, diffraction, spectrum congestion, spectrum designation of frequency, spectrum management, propagate, propagation, propagation time TELECOM: 1 - 11 (before Spectrum), 23 (first paragraph of multiplexing), 26 (just FDM) http://en.wikipedia.org/wiki/Multiplexing (Introduction and Types|Frequency-division multiplexing) http://electronics.howstuffworks.com/radio-spectrum.htm (All three pages of entry) https://en.wikipedia.org/wiki/Cellular_frequencies_in_the_US *Optional:* https://youtu.be/FWCN_uI5ygY	Problem set 1

Date	Topics	Readings	Assignment
H 9/7	Digital basics	NEWTON: analog, analog signal, analog recording, analog transmission, digital, digital signal, digital recording, digital transmission, binary number system, binary notation, binary, bit TELECOM: 18 - 23 (including Table 1.1) http://computer.howstuffworks.com/bytes.htm (all four pages of entry) http://electronics.howstuffworks.com/analog-digital.htm (whole entry, which has five sections) http://games.penjee.com/binary-numbers-game/	
T 9/12	Digital Representation	NEWTON: analog digital converter, analog circuit (and circuit if needed), ASCII (there's a typo in the 32nd edition; this is under the heading ASCII-Assisted Routing; just ignore the first sentence), bits versus bytes, encoding, PCM, sampling, sampling frequency, sampling rate, quantization, Nyquist Theorem, codec, bit rate, bits per second TELCOM: 160-161 (Coding schemes: ASCII…) https://www.tutorialspoint.com/digital_communication/digital_communication_pulse_code_modulation.htm (stop at Basic Elements of PCM) https://youtu.be/YJmUkNTBa8s?t=6s through 2m 15s *Optional:* https://youtu.be/wn71QBApCRg (explains PCM and includes a review of several class concepts)	Problem set 1 corrections & Problem set 2
H 9/14	Digital Representation, part 2	NEWTON: bitmap, raster graphics, pixel, bit depth, bits per pixel, vector images, aliasing noise TELECOM: 390-396 (before Television Standards) http://preservationtutorial.library.cornell.edu/intro/intro-01.html (All 8 pages of "1. Basic Terminology" section) https://en.wikipedia.org/wiki/Raster_graphics https://en.wikipedia.org/wiki/Vector_graphics Try opening the sample images in a new window and zooming in as much as you can http://www.wfu.edu/~matthews/misc/DigPhotog/alias/ *Optional*: https://www.youtube.com/watch?v=1LZWCSKj45g, https://go.osu.edu/CcKh	

Date	Topics	Readings	Assignment
T 9/19	Compression & Brief intro to Cryptography	NEWTON: compression, compression algorithm, compression artifacts, digital compression, encryption, encryption algorithm, encryption key, cipher, ciphertext, non-repudiation TELECOM: 375 (at Encryption) - 381 http://computer.howstuffworks.com/file-compression.htm (whole entry, which has 3 sections) http://computer.howstuffworks.com/encryption.htm (first four pages of entry) *Optional*: https://math.berkeley.edu/~kpmann/encryption.pdf	Problem set 2 corrections & Problem set 3
H 9/21	Cryptography	NEWTON: public key encryption, challenge-response, RSA (defn 2) http://youtu.be/EPXilYOa71c *Optional:* If you want to know more about the math http://youtu.be/IY8BXNFgnyI http://youtu.be/cJvoi0LuutQ Also see the other Khan Academy encryption videos: https://www.khanacademy.org/math/applied-math/cryptography	
T 9/26	Digital data transmission	NEWTON: Parity, parity bit, Time Division Multiplexing, network, LAN, host, host computer, hub, router, Ethernet, Wi-Fi, Wi-Fi access point TELECOM: 26-27 (TDM), 164, 173-177 (stop at LAN Transport Techniques), 182-184 (stop at Shared Versus Switched), 215 - 219 (Packet-Switched Networks) http://en.wikipedia.org/wiki/Multiplexing ("Type|Time-division multiplexing" only)	Problem set 3 corrections & Problem set 4
H 9/28	Digital network performance	NEWTON: propagation delay, latency, cache, streaming, steaming audio, streaming media, streaming video	

Date	Topics	Readings	Assignment
T 10/3	Connecting to the Internet	NEWTON: Internetworking, broadband, cable Internet, cable modem, Internet cable access, fiber, fiber to the curb, fiber to the most economical point, FTTA-FTTx TELECOM: 388 - 390 (stop at Digital Video), 529 http://computer.howstuffworks.com/cable-modem.htm (whole entry, which has 10 sections) http://computer.howstuffworks.com/fiber-to-the-home.htm (whole entry, which has 3 sections) https://en.wikipedia.org/wiki/Fiber_to_the_x (stop at "Deployments") https://broadbandmap.fcc.gov/home (Note: Doesn't always work) https://www.fcc.gov/reports-research/maps/tract-level-residential-fixed-connections-jun-2019/	Problem set 4 corrections & Problem set 5
H 10/5	Review & exam prep	Wrap up unfinished topics Review for midterm	
H 10/10		**Midterm**	
H 10/12	Autumn Break	No Class	
T 10/17	Internet Protocol stack	NEWTON: protocol, protocol stack, OSI reference model, OSI standards TELECOM: 165 (OSI Reference Model) - 171, 264 - 269 (before Addressing Schemes) *Optional:* Recreating the 1990s dialup Internet experience https://go.osu.edu/CcKj ELI5-How is it that just 400 cables under the ocean provides all the internet to entire world? https://go.osu.edu/CcKd	
H 10/19	The Internet: IP	NEWTON: Internet, Internet address, Internet Protocol, IP, IP address, IP router, IP subnet, network address, Internet Assigned Numbers Authority TELECOM: 245 - 256 (Stop at TCP) http://computer.howstuffworks.com/internet-infrastructure.htm (First six pages) http://en.wikipedia.org/wiki/Internet_Protocol (stop before "Version history")	Problem set 5 corrections & Problem set 6

Date	Topics	Readings	Assignment
T 10/24	The Internet: TCP, UDP	NEWTON: transport layer, TCP/IP, UDP TELECOM: 256 - 257 (TCP and UDP) http://en.wikipedia.org/wiki/Transmission_Control_Protocol (Introduction, Historical origin, Network function, and all four subsections of "Protocol operation|Data transfer") http://en.wikipedia.org/wiki/User_Datagram_Protocol (just introduction) http://compnetworking.about.com/od/networkprotocols/l/aa071200b.htm	
H 10/26	The Internet: DNS, Firewalls	NEWTON: DNS, DNS name resolution, firewall, proxy server TELECOM: 280 (DNS) - 285 (stop at Evolution of the POP Architecture) https://computer.howstuffworks.com/internet/basics/internet-infrastructure6.htm (Pages 7-9) http://www.iana.org/gtld/gtld.htm http://www.whois.com/whois/osu.edu http://en.wikipedia.org/wiki/Firewall_(computing) (Introduction, History, Types|Packet filter, and Types|Appliction Layer)	Problem set 6 corrections
T 10/31	The Web: HTTP	NEWTON: HTTP, HTTP referrer, HTTPS http://en.wikipedia.org/wiki/Http (Introduction, Technical overview, and History [stop after the table listing the dates each version was introduced]) https://developer.mozilla.org/en-US/docs/Web/HTTP/Headers	
H 11/2	The Web: HTML, XML, CSS, JavaScript	NEWTON: HTML, HTML tag, HTML 5.0, XML, XML attributes, XML element, cascading style sheets https://www.w3schools.com/html/html_intro.asp (Only first page is required) https://en.wikipedia.org/wiki/HTML5 (Introduction) http://computer.howstuffworks.com/javascript.htm	Problem set 7
T 11/7	Advanced Web: Cookies & Query parameters	NEWTON: URL, URL shortening service, cookie, cookie blocking, cookie file http://computer.howstuffworks.com/cookie.htm (all 6 pages) https://en.wikipedia.org/wiki/Query_string https://developers.google.com/maps/url-encoding	

Date	Topics	Readings	Assignment
H 11/9	TLS & Email	NEWTON: Secure Socket Layer, Transport Layer Security, all entries beginning "email", IMAP, POP3, SMTP, phishing https://en.wikipedia.org/wiki/Transport_Layer_Security (Introduction and Description) http://www.howtogeek.com/56002/htg-explains-how-does-email-work/	
T 11/14	Telephony:	NEWTON: telephony, PSTN, POTS, circuit, circuit switching, circuit switched network, LEC (defn 1), IXC, point of presence, signaling, Signaling System 7, Captain Crunch, voice over IP, SIP (defn 3), digital convergence TELECOM: 334 (start at SIP) - 339 (stop at ENUM) http://electronics.howstuffworks.com/telephone.htm (all 8 sections) http://en.wikipedia.org/wiki/Local_exchange_carrier (Introduction, Duties) http://electronics.howstuffworks.com/ip-telephony.htm (First 9 sections) http://en.wikipedia.org/wiki/Session_Initiation_Protocol (Introduction, History, Protocol operation) *Optional:* How photographs were sent by wire in the 1930s https://go.osu.edu/CcKa	Problem set 7 corrections & Problem set 8
H 11/16	Mobile Telephony	NEWTON: cell phone, cell phone range, ESN (defn 2), frequency reuse, SIM card, SIM lock, GSM, MTSO, roaming TELECOM: 580-1 https://docs.fcc.gov/public/attachments/DOC-374726A1.pdf https://fcc.maps.arcgis.com/apps/webappviewer/index.html?id=6c1b2e73d9d749cdb7bc88a0d1bdd25b	
T 11/21	Mobile Standards	NEWTON: 3G, 4G, 4G/LTE, 5G (sadly out of date considering it was published in '21) https://en.wikipedia.org/wiki/5G (Introduction, Overview, Performance, and Deployment|Spectrum) https://www.zdnet.com/home-and-office/networking/what-is-the-state-of-6g-and-when-will-it-arrive-heres-what-to-look-out-for/ (NOTE: Don't take this too seriously. 6G is a long way off and anything written now is very speculative.)	Problem set 8 corrections & Problem set 9
H 11/23	Thanksgiving	No Class	

Date	Topics	Readings	Assignment
T 11/28	Privacy & Surveillance	NEWTON: Internet of Things, firmware over-the-air, robocall, vishing https://privacyrights.org/resources/somebodys-watching-me-employee-monitoring https://mashable.com/2016/08/11/webcam-texas-hack/#6EK0UDEGk5qc http://www.usnews.com/news/articles/2015/08/25/the-illusion-of-online-privacy *Optional:* See if your account information is on the dark web: https://haveibeenpwned.com/ Take Google's phishing quiz: https://phishingquiz.withgoogle.com/ Learn about Internet security from OSU https://cybersecurity4you.osu.edu/ (authentication w/ OSU credentials required)	
H 11/30	Malware	NEWTON: malware, virus, worm (defn 2), trojan horse, trojan horse attack, ransomware, adware, black hats https://en.wikipedia.org/wiki/Malware (Reading the whole thing. It is worth it.) https://www.consumer.ftc.gov/articles/0011-malware	Problem set 9 correction
T 12/5		Wrap up unfinished topics Review for midterm	
T 12/12 2:00pm-3:45pm		**Final exam *** Note the date and time *** **	