# COMM 4557: Communication Networks

The Ohio State University
School of Communication

**Instructor:**
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Office hours:
*Please see on Carmen/Canvas Homepage*

## Course Rational and Objectives:

How is sound transmitted over the telephone network? How does data flow across the Internet? What is the difference between a telephone call and a Skype call? Between a television broadcast and a YouTube video? 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 PSTN to streaming audio and HDTV. We will cover a variety of contemporary telecommunication systems, addressing both what they can do and how they work. We will pay particular attention to the similarities and differences between digital and analog technologies. For a better understanding of communication technologies we will also go into technological details such as wave propagation, data compression, cryptography and several others.

With these skills, you will be better prepared to

- Read tech news
- Explain technologies to those who are less knowledgeable
- Think critically about key capabilities and limitations of existing and novel telecommunication systems
- Follow and participate in technology discussions with engineers and other experts when working together in development projects.

*What do I need to do for class?*
Be there, take your notes, ask questions if you are not sure about a topic, and feel free to comment on things based on your own experiences and ideas. The more you are willing to contribute to class discussions, the better the chance to make it a really good learning experience for all of us. All ICAs and assignments are based on your class participation as well as the necessary understanding of class topics. Thus, regular attendance is the key to complete this class successfully.

**Class is:** Tuesday and Thursday
2:20 to 3:40 p.m.
Room: Derby Hall 080

**Used Text (required):**
Goleniewski, Lillian. (2007). *Telecommunications Essentials* (2nd ed.). Upper Saddle River: Addison Wesley.

This book is available through the library as an eBook. If not otherwise stated, chapter numbers in the class schedule (at the end of this syllabus) relate to the book. The page numbers will only help if you should use the printed version (eBook and print version differ here). If you use the eBook use chapter numbers and topic keywords.

I also recommend using optional dictionaries for this class, e.g. the one listed here:
Newton, Harry. (2018). *Newton's Telecom Dictionary* (31th ed.). New York: Flatiron Publishing.

We will also make use of some popular web sites (e.g. HowStuffWorks and Wikipedia). Links to the relevant entries are included in this syllabus. Unless otherwise noted, you should read all sections of the articles/entries listed. I also encourage you to pursue links within the required entries 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 these sources and consider them to be quite reliable in regard to the specific topics, the content can change and

the entries may sometimes contain errors. Cross checking the information you find here with the dictionary and lecture is strongly encouraged.

**Class Web site via Carmen:**
http://telr.osu.edu/carmen
*Please be sure to check Carmen at least twice a week for news, changes,…*

## Accessibility Accommodations for Students with Disabilities

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know via email immediately so that we can privately discuss options. You are also welcome to register with Student Life Disability Services to establish reasonable accommodations. 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.

**Academic Integrity and Academic Misconduct**
It is imperative that all work you submit be your own. When you use someone else's ideas, you must give proper credit to the original author(s). Please adhere to the 5th edition of the APA manual of style when citing others' work.

According to the Committee on Academic Misconduct "Academic misconduct is defined as any activity which tends to compromise the academic integrity of the institution, or subvert the educational process." Further, the term "academic misconduct" includes all forms of student academic misconduct wherever committed and is illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). It is the responsibility of the Committee of Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of

student academic misconduct. For additional information, see the Code of Student Conduct (http://studentlife.osu.edu/csc/).

**Exams**

The information taught before an exam will be tested on this exam. It will be not tested on the following exam again (exams in this class are not cumulative).

Exams will be multiple-choice (please bring a #2 pencil on exam days), based on the material from the readings and class discussions. Make-up exams will only be offered for medical or other similar, legitimate reasons.

Failure to take any exam will result in a zero for the exam.

Late Arrival: I reserve the right to exclude students from the exam if they arrive late. Exclusion will result in a zero for the exam.

**In-Class Assignments (ICA)**

During most classes we will have (unannounced) In-Class Assignments (9 over the whole semester) where you should take a few minutes to write on an assigned topic. ICAs have to be completed during class. They should help you to reflect specific topics of the lecture.

One of them provides the opportunity of bonus points. Only 8 of the 9 ICAs are necessary to obtain the chance to score 100% in this class.
*(Example: You have completed all 9 ICAs successfully = 16 regular points + 2 bonus points; you have completed 8 ICAs successfully = 16 regular points and 0 bonus points.)*

**In-Class Exercises (ICE)**

There will be three in-class exercises where students are asked to work together on a class topic. The main goal is to apply lecture topics to real world situations. The exercises will also allow you to learn about views and attitudes of fellow students and how to take those different thoughts into consideration to discuss the topics and/or to come to a mutual decision.

**Online Assignments**

On 6 days the class will move online. Students are asked to complete online assignments which are based on class discussions, handout, students' notes, and additional scholarly work. The online assignments have to be completed on those assigned days to receive credit. We will not meet on those days but the Professor is available to discuss the assignment and to answer questions. The overall goal is to increase learning flexibility and effectiveness and to adapt the course to the changing environment of higher education.

**Team Assignment – Final Paper**

There will be a team assignment that needs to be completed together with other students. Every team member will get the same score.
Detailed instructions and deadlines will be announced in class. Late submissions will be penalized.

**Grade Distribution**

| | |
|---|---|
| In-Class Assignments | 15% (16 points – 8*2) |
| In-Class Exercises | 8% (9 points – 3*3) |
| Online Assignments | 17% (18 points – 6*3) |
| Team Assignment (Final Paper) | 9% (10 points) |
| Exams (weighted equally) | 51% (54 points – 2*27) |
| *Total* | *100% (107 points)* |

**Grade Change Requests**

Students are strongly encouraged to check posted points for all assignments and exams regularly on Carmen. The deadline for requesting any score changes (in case of score posting errors) for assignments or exams taken during the semester is the first day of the last week of regular classes, Monday, 4/20/2020. However, any missing points have to be reported 14 days after posting of the score in question. Later requests will not be considered.

**Makeup of missed Assignments**

Taking missed assignments late will only be allowed for serious, legitimate reasons (documentation needed like doctor's note). Students are required to inform the instructor before the originally scheduled assignment/exam time. Otherwise, a makeup opportunity cannot be granted. If a student is missing more than 3 assignments throughout the semester, make-up opportunities cannot be granted even if documentation is presented.

## Class Schedule and Reading List

| Day | Date | Topic | Reading |
|---|---|---|---|
| **January** | | | |
| T | 7 | Introduction & Overview | |
| R | 9 | Waves and Signals | Telekom Introduction + Chapter 13: p. 550 (start at history) – 557 (stop before phased array)<br>http://science.howstuffworks.com/humans-hear-in-space1.htm<br>http://www.youtube.com/watch?v=-oGwFDQNJps<br>http://en.wikipedia.org/wiki/Waveform<br>http://en.wikipedia.org/wiki/Frequency<br>(stop before examples)<br>http://en.wikipedia.org/wiki/Amplitude |
| T | 14 | Modulation and Spectrum | Chapter 1: p. 11 (start at Spectrum) – 18, Chapter 1: Multiplexing 23 – 26 (stop before TDM)<br>http://en.wikipedia.org/wiki/Modulation<br>(Just intro, stop before content)<br>http://en.wikipedia.org/wiki/Amplitude_modulation<br>(just introduction and figure 1)<br>http://en.wikipedia.org/wiki/Frequency_modulation<br>(Introduction, "radio", and associated figures)<br>http://en.wikipedia.org/wiki/Bandwidth_(signal_processing) (just introduction)<br>http://en.wikipedia.org/wiki/Multiplexing<br>(introduction and frequency-division multiplexing) |
| R | 16 | Transmission Basics | Chapter 1: p. 1-11 (stop before Spectrum)<br>http://electronics.howstuffworks.com/radio-spectrum.htm<br>(first three pages of entry) |
| T | 21 | Digital Basics | Chapter 1: Analog/Digital Transmission p. 20-23 (esp. table 1.1), Chapter 5: Coding Schemes p. 160-162<br>http://computer.howstuffworks.com/bytes.htm<br>(first four pages of entry)<br>http://electronics.howstuffworks.com/analog-digital.htm<br>(first four pages of entry) |
| R | 23 | Online Assignment 1 | |
| T | 28 | Digital Representation | http://www.library.cornell.edu/preservation/tutorial/intro/intro-01.html<br>(Just "Basic Terminology" section, 8 pages in all<br>http://www.wfu.edu/~matthews/misc/DigPhotog/alias/<br>https://en.wikipedia.org/wiki/Raster_graphics<br>https://en.wikipedia.org/wiki/Vector_graphics |

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|---|---|---|---|
| R | 30 | Compression & Cryptography | Chapter 9: p. 375 (start with encryption) - 381, Chapter 10: Digital Video p. 390-396<br>http://computer.howstuffworks.com/file-compression.htm<br>http://computer.howstuffworks.com/encryption.htm<br>(first four pages of entry) |
| **February** | | | |
| T | 4 | Digital Data Transmission | Chapter 1: p. 26-27 (TDM), Chapter 3: Networking and Switching Modes p. 83-87, Packet Switching 92-94, Chapter 6: p., 173-187 (stop before LAN interconnection), Chapter 7: Packet Switched Networks p. 215-219<br>http://en.wikipedia.org/wiki/Circuit_switching (introduction)<br>http://en.wikipedia.org/wiki/Multiplexing (time-division multiplexing)<br>http://en.wikipedia.org/wiki/Packet_switching (Stop at X.25 vs. Frame Relay packet switching) |
| R | 6 | Online Assignment 2 | |
| T | 11 | Digital Network Performance | Chapter 5: Modems and Modulation p. 154-156, Forms of Data Transmission 159-160, Chapter 15: Bluetooth p. 661-664, Chapter 10: Broadband Applications p. 388-390 (stop before digital video), Chapter 15: WiMax p. 621-622 and Table 15.3<br>http://computer.howstuffworks.com/cable-modem.htm (All)<br>http://electronics.howstuffworks.com/dsl.htm (All)<br>http://computer.howstuffworks.com/wimax.htm<br>http://en.wikipedia.org/wiki/Bitrate (first section only) |
| R | 13 | Online Assignment 3 | |
| T | 18 | In-Class Exercise 1 Communication Technology - Use and Dependency | |
| **R** | **20** | **Exam I** | |

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|---|---|---|---|
| T | 25 | The Internet: Protocol Stack, IP | Chapter 5: OSI Reference Model p. 165-171, Chapter 8: Internet Infrastructure and IP p. 245-256 (stop before TCP)<br>http://computer.howstuffworks.com/internet-infrastructure.htm<br>http://computer.howstuffworks.com/osi.htm<br>http://en.wikipedia.org/wiki/Internet_Protocol |
| R | 27 | The Internet: TCP, UDP, Firewall | Chapter 8: p. 256-257 (TCP and UDP), Internet Network Architecture 264-275 (stop before IPv6)<br>http://en.wikipedia.org/wiki/Transmission_Control_Protocol (introduction, "historical origin", "network function", and "data transfer")<br>http://en.wikipedia.org/wiki/User_Datagram_Protocol (just introduction)<br>http://compnetworking.about.com/od/networkprotocols/l/aa071200b.htm |
| **March** | | | |
| T | 3 | The Internet: DNS, HTTP | Chapter 8: p. 280 (DNS) - 289 (stop before Internet challenges)<br>http://en.wikipedia.org/wiki/Http<br>http://www.iana.org/gtld/gtld.htm |
| R | 5 | Online Assignment 4 | |
| M-F | 9-13 | *Spring Break*<br>*No Class* | |
| T | 17 | Advanced Internet Topics: Cookies, SSL, Email | http://computer.howstuffworks.com/cookie.htm (all pages)<br>http://computer.howstuffworks.com/encryption4.htm (this is the fifth page of the encryption entry)<br>http://computer.howstuffworks.com/question369.htm<br>http://communication.howstuffworks.com/email.htm |
| R | 19 | In-Class Exercise 2<br>Privacy and Security Issues Online | |
| T | 24 | Team Assignment<br>*Final Paper* | |
| R | 26 | Telephony: PSTN & Voice Over IP | Chapter 4: PSTN p. 103-113, Signaling Systems p. 129 – 135<br>http://electronics.howstuffworks.com/telephone.htm<br>http://en.wikipedia.org/wiki/Local_exchange_carrier<br>Chapter 4: p. 140-142, Chapter 9: p. 334 (start at SIP) - 342 (stop before IPTV)<br>http://electronics.howstuffworks.com/ip-telephony.htm |

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|---|---|---|---|
| T | 31 | Mobile Telephony | Chapter 12: Wireless Broadband p. 529, Chapter 14: Wireless WAN's p. 579-614<br>https://en.wikipedia.org/wiki/Mobile_telephony<br>https://en.wikipedia.org/wiki/4G<br>https://en.wikipedia.org/wiki/5G |
| **April** | | | |
| R | 2 | Online Assignment 5 | |
| T | 7 | Audio and Video Broadcasting | http://electronics.howstuffworks.com/radio8.htm (this page only -- this is review)<br>http://electronics.howstuffworks.com/question323.htm<br>http://electronics.howstuffworks.com/hd-radio.htm<br>http://electronics.howstuffworks.com/satellite-radio.htm http://www.howstuffworks.com/internet-radio.htm<br>http://www.howstuffworks.com/dtv.htm<br>http://electronics.howstuffworks.com/cable-tv.htm<br>http://www.howstuffworks.com/satellite-tv.htm<br>http://en.wikipedia.org/wiki/IPTV (Stop before "markets", but you can skim "History") |
| R | 9 | Online Assignment 6 | |
| T | 14 | In-Class Exercise 3<br>Future Technologies | |
| **R** | **16** | **Exam II** | |
| **W** | **22 (11:59 p.m.)** | **Deadline Final Paper** | |

**Caveat**

I reserve the right to update or change portions of this syllabus in order to make the class a better experience for everyone. Any changes will be posted to Carmen.

**Student Academic Services**

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 obtained through this website. The site is: http://advising.osu.edu/welcome.shtml

**Student Services**

The Student Service Center assists with financial aid matters, tuition and fee payments. Please see their site at: http://ssc.osu.edu

**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.

**Diversity**

The School of Communication at The Ohio State University embraces and maintains an environment that respects diverse traditions, heritages, experiences, and people. Our commitment to diversity moves beyond mere tolerance to recognizing, understanding, and welcoming the contributions of diverse groups and the value group members possess as individuals. In our School, the faculty, students, and staff are dedicated to building a tradition of diversity with principles of equal opportunity, personal respect, and the intellectual interests of those who comprise diverse cultures.

**Title IX**
Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at titleix@osu.edu

**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 are or someone you know is 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.

If you are thinking of harming yourself or need a safe, non-judgmental place to talk, or if you are worried about someone else and need advice about what to do, 24 hour emergency help is also available through the Suicide Prevention Hotline (Columbus: 614-221-5445 / National: 800-273-8255); or text (4hope to 741741); or at suicidepreventionlifeline.org