Department of Electrical & Computer Engineering

EE 465A – Intro Communication Sys

Fall 2021

Course Name:	Intro Communication Sys
Credits:	3
Classroom:	Burchard– room 714
Class Hours:	Friday, 6:30 PM – 9:05 PM
Office Hours:	Friday, 5:00 – 6:30 PM or by appointment
Instructor:	Yousef Abdelmalek
Office:	Burchard Building 413B
Phone:	(908) 239-1378
Email:	**yabdelma**@Stevens.edu

Required Textbook

B.P. Lathi; Zhi Ding, Modern Digital and Analog Communication Systems, 5th edition
Simon Haykin, Communication Systems, 5th edition, Wiley Inc, 2009

Materials

All other materials and slides will be uploaded to course website

Prerequisite Course and Knowledge

ENGR 243(Probability and statistics), EE 348 (signals and systems)

Course Description

Review of probability, random processes, signals and systems; continuous-wave modulation including AM, DSB-SC, SSB, FM and PM; super heterodyne receiver; noise analysis; pulse modulation including PAM, PPM, PDM and PCM; quantization and coding; delta modulation, linear prediction and DPCM; baseband digital transmission, matched filter and error rate analysis; pass band digital transmission including ASK, PSK and FSK.

Learning Objectives

The objectives are to

- Study the fundamental concepts of generation and reception of signals
- Learn the principles of analog and digital modulation
- Learn the principles of analog and digital demodulation
- Study the transmitter and receiver block diagrams level design of communication systems
- Understand the noise impact in the reception of AM, FM, pulse-modulated, and digital signals
- Describe the basic principles of error-control coding and use them in block diagram level design of communication systems
- Describe the basic tenets of information theory as pertaining to communications, and perform basic calculations of relevant properties

Format and Structure

This course is comprised of weekly lectures, course projects, and final project presentations.

Course Requirements

Attendance. Students are required to attend all lectures. Four random attendance signoffs will be performed. Each student is permitted one absence per semester without penalty. Excused absences (religious or medical, noted in via email to the professor prior to the absence occurring) accompanied by proper documentation will not lead to point deductions.

Quizzes. Pop up in class quizzes. **100 points possible.**

Homework. There will be ten (10) homework assignments throughout this course. Each assignment counts for 25 points. The due date of each assignment is usually two weeks after the date when the homework is assigned. 5 points will be deduced each day after the due date. **250 points possible.**

Course Project. There will be an individual/team project of the course. For team projects, the tasks and contributions of each team member must be clearly documented. There will be three milestones for the project: *proposal*, *mid-stage report*, and *final report & presentation*. The proposal will be up to 1-page description of the problem of the project and tentative plan. The mid-stage report will be at least three pages to summarize the progress. At the end of the semester each team will deliver a presentation and a final package (one per team), which includes the final report (in one PDF file, 6 pages minimum) and the source code (in one .zip file). The course project will be graded as follows:

- 1-page proposal, 15 points
- 3-page mid-stage report, 25 points
- Presentation, 40 points
- The writing of the final report, 20 points

The course project has totally **100 points possible**.

Exams. There will be two mid-term exams and final exam for this course. There is no makeup exam. Excused absence from any exam shall seek consent from the instructor before the exam day; rearrangement can be scheduled only if a student has a physical problem evidenced by Doctor's prescription. 450 points possible.

Grading Procedures

Grades will be based on:

- Quizzes (10 %) 100 points
- Homework (25 %) 250 points
- Matlab labs and Course Project (20 %) 200 points
- Mid-term Exams (20 %) 200 points
- Final Exam (25 %) 250 points

Tentative Course Schedule

The following is a tentative course schedule. Any changes to this schedule will be communicated to students via email or during the lecture.

1. Review of fundamentals concepts and mathematical preliminaries
Elements of communication systems
Characteristics of communication channel and their mathematical models
Random signal, random process, probability
Correlation, covariance, power, and energy

2. Analog communication systems
Concept of modulation and demodulation
Continuous wave modulation (AM, DSB, DSBSC, SSBSC, PM, FM)
Narrow band noise, receiver model
Signal to noise ratio, noise figure, noise in (AM, DSB, DSBSC, SSBSC, PM, FM)

3. Pulse modulation
Sampling process, sampling theorem
Basic pulse modulation schemes (PAM, PWM, PPM, PCM)
Delta modulation, adaptive DM
Noise in PAM, PCM analysis

4. Basic digital modulation schemes and signaling over AWGN
Channel allocation problem
Basic digital modulation schemes (PSK, FSK, ASK, QPSK)
Probability of error
Coherent demodulation and detection
Representation of digital modulated signals

5. Hands on circuit design, assembly, and measurements
Matched filter
Generation and detection of signals for BPSK and BFSK
PN sequence generation

Academic Integrity

All Stevens graduate students promise to be fully truthful and avoid dishonesty, fraud, misrepresentation, and deceit of any type in relation to their academic work. A student's submission of work for academic credit indicates that the work is the student's own. All outside assistance must be acknowledged. Any student who violates this code or who knowingly assists another student in violating this code shall be subject to discipline.
All graduate students are bound to the Graduate Student Code of Academic Integrity by enrollment in graduate coursework at Stevens. It is the responsibility of each graduate student to understand and adhere to the Graduate Student Code of Academic Integrity. More information including types of violations, the process for handling perceived violations, and types of sanctions can be found at www.stevens.edu/provost/graduate-academics.

Learning Accommodations

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies. For more information about Disability Services and the process to receive accommodations, visit https://www.stevens.edu/office-disability-services. If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at pgehman@stevens.edu or by phone (201) 216-3748.

Inclusivity

Name and Pronoun Usage. As this course includes group work and in-class discussion, it is vitally important for the class to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

Inclusion Statement. Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements. Students in this class are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

Questions to Your Grades

You may request the instructor to reevaluate your homework, examinations, course project, and other course materials if you have any question to your course grade. Written request must be submitted to the instructor within seven (7) calendar days after the grade was assigned.