Sabancı University
Faculty of Engineering and Natural Sciences

EE 314- Digital Communications

Spring 2023-2024

Course Information

Lecturer : Mohaned Chraiti, FENS G044, Phone: x7044.
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Teaching Assistants : Sina Jorjani Totonchian (sina.jorjani@sabanciuniv.edu)

Textbook : *Digital Communications: Fundamentals and Applications, B. Sklar Prentice Hall, 2000.*
Digital Communications, I.A. Glover, P.M. Grant, Prentice Hall, 1999.

Lecture Hours : Monday 10:40-13:30 L035, Wednesday 10:40-11:30 L030

Office Hours : Mohaned Chraiti: Monday 13:40-14:30
Teaching assistants: In recitations or appointments by e-mail.

Course Objectives : The course aims to provide students with a comprehensive understanding of communication systems, from theoretical foundations to practical implementation, while emphasizing the role of mathematics as a fundamental tool in engineering. The primary objectives of this course are as follows:

1- **Understanding Signal Processing Blocks:** Students will learn about the various components or blocks involved in processing signals within communication systems, whether they operate at baseband (low-frequency range) or passband (high-frequency range).

2- **Mathematical Tools and Theories**: This objective involves providing students with the mathematical foundations necessary for analyzing and designing communication systems.

3- **Building and Simulating Communication Systems**: Students will gain practical experience by designing and simulating communication systems to fulfill specific requirements or objectives. This hands-on approach allows students to apply theoretical knowledge to real-world scenarios and understand the practical challenges involved in system implementation.

4- **Using Mathematics as a Language for Engineering**: Mathematics serves as a universal language for expressing and understanding engineering concepts, including communication systems. This objective emphasizes the importance of mathematical rigor in engineering problem-solving and highlights its role in describing and analyzing communication systems effectively.

Prerequisite : Signals and Systems (ENS211); Probability and stochastic processes are a great plus

Grading Policy : Midterm, 35%; Final, 35%; Assignments and Projects 30%.
[Note that your overall level of participation in the course will certainly have a consequence.]

Midterm Dates : Midterm — Week 7
Final — Week 13

Recitations

Attendance and participation in recitations are necessary for you to do well in the course, and are critical to mastering the materials.

Lectures

It is highly recommended to attend the classes: the lecture notes will be interposed with spaces/blanks

that the student will fill in during the lecture in order to balance the content coverage and active learning. **Students who miss more than three sessions will receive an F grade.**

Exams

There will be one midterm and a final. All the exams will be closed-book. **A substantial difference (exceeding 30 points) between assignment scores and exam scores will lead to an "F" grade.**

Simulink-MATLAB

We will gradually introduce Simulink/MATLAB as a tool to build and simulate communication systems. Recitations will provide the necessary tutorial and guidance on MATLAB when needed.

Assignments

There will be four assignments and one project. It is recommended to submit the assignments electronically through SU-Course (exceptions may apply). We encourage students to discuss and collaborate to solve assignments. However, collaborations are not risk/cost-free. The scoring policy may change with the number of collaborators: for a given exercise, a wrong answer will result in -z points, if the question is solved by one student, plus an extra -20%(#collaborators-1)z, in the case of collaboration (right answers come with no penalty). The penalty could go up to the exercise's total score (the latter scoring policy does not apply to the project). The adopted policy will only encourage fruitful collaborations, given that the right answers come with no penalty. Moreover, it prevents passive collaboration such as copying a colleague's solution since it comes with a risk of penalty for both. You must write your solutions **independently**, and, at the top of your assignments paper, you must **write the names of the individuals you have collaborated with**. We also encourage discussion with the teaching assistants about the assignment problems during recitations/office hours. We will not accept any late submissions (except for the most compelling reasons), because we believe that the habit of late submissions can make it difficult for the students to keep up with the course and cause them to fall behind.

I may have to revise the course plan according to the countrywide reassessment to be made regarding higher education. This is expected to happen at the beginning of April. The content to be delivered is certain but the method of course delivery, the number and dates of exams, and some other details are subject to change.

Make-up Policy

Only proven health emergencies will be accepted as valid reasons to qualify you for a make-up exam.

SUCourse

We will use SUCourse to distribute assignments and their solutions and as a communication medium between you and the staff. If you have any problems accessing the course material on SUCourse, please let us know as soon as possible so we can have such problems fixed.

Topics:

- Course Overview, Introduction to Digital Communications (*Chapter 1*)
- Formatting: from analog to digital (*Chapter 2*)
- Baseband Modulation (*Chapter 3*)
- Channel and Noise (*Chapter 4*)
- Baseband Demodulation (*Chapter 5*)
- Bandpass Modulation and Demodulation (*Chapter 6*)
- Source Coding (Chapter 7)
- Channel Coding, Channel Capacity (Chapter 8)