Faculty of Eng. & Natural Sci.

EE311-202401
Introduction to Signal Processing and Information Systems

Name	Role	Email	Office	Phone	Office Hours
Çağlar Tunç	Instructor	caglar.tunc@sabanciuniv.edu	FASS 2029	9279	Tue 14.40-15.30
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Course Content
Discrete-time Fourier transform. Discrete-time processing of continuous-time signals. Basic communication concepts, modulation, AM, FM, pulse amplitude modulation. Laplace transform, system response. Z-transform. Systems characterized by differential and difference equations. Control systems and feedback. Uncertainty and randomness in signals and systems.

Objectives
To provide a broad introduction to signal processing and information systems, following upon basic signals and systems knowledge. To provide exposure to basics and selected topics in communication, control, and random signals, with links to practical applications.

Recommend or Required Reading
Textbook
Signals, Systems and Inference, Oppenheim, Alan, and George Verghese, Pearson, 2017.
https://www.homerbooks.com/urun/signals-systems-and-inference
Readings
Introduction to Stochastic Signal Processing by I.Young and R. Ligteringen (online)
WEB: https://sites.google.com/socraticsoftware.org/socraticsoftware/
Apple: https://apps.apple.com/tr/app/stochastic-signal-processing/id1450268179 Android:
https://play.google.com/store/apps/details?id=org.SocraticSoftware.iSSP&gl=NL

Assessment Methods and Criteria

	Percentage (%)	Number of assessment methods
Final	30	1
Quiz	30	3 highest out of 5
In-class participation	15	-
Team Project	25	1

Course Outline

Overview of Signals and Systems basics.

Deterministic Signals

- Continuous-time Fourier Series
- Continuous-time Fourier Transform
- Laplace Transform
- Unified understanding of signal processing, communications, and control (a systems perspective)
- Sampling and relationship between continuous- and discrete- transforms

Random Signals

- Review of Probability Theory and Statistics
- Inference/ Estimation of continuous random signals
- Hypothesis Testing, Neyman Pearson criterion
- Wiener filter
- Kalman filter

Learning Outcomes

- Discuss the fundamental concepts in signal processing and information systems,
- Exhibit and express a unified view of problems in communication, control, and signal processing,
- Describe the process of input-output characterization of linear time invariant systems,
- Correctly perform calculations involving transforms including continuous and discrete-time Fourier transforms, as well as Laplace and z-transforms,
- Perform computer simulations demonstrating main concepts in signal processing including sampling, transforms, and modulation.

Course Policies

The syllabus and course outline is subject to change, if necessary. Please check and read the announcements on SUCourse carefully before coming to the class.

Proficiency in MATH203 is expected. The second half of the course deals with random variables and processes.

Use of AI tools (such as ChatGPT) is allowed. However, for the project components (reports, codes, etc.), students are expected to do the entire work by themselves and disclose the use of AI tools, specifically mentioning which parts are prepared with the help of which AI tools. Otherwise, in the case of strong suspicion of the use of AI tools without proper disclosure, students will get a letter grade of "F" immediately.

We will have (bi-weekly) exams. In total, 5 exams will be administered during lecture hours. For each student, highest 3 exam scores out of 5 will be counted towards the final grade. There will be no make-ups for bi-weekly exams, as any missed exam will be counted as one of the two lowest-graded ones. The exam duration will be 15-30 minutes, depending on the difficulty of the exam questions. The week before the exam, there will be a homework assignment. The exam questions will be related to the assignment. A final comprehensive exam will be given at the end of the

semester. There will be one programming assignment, which will be completed in groups of 2 students and in multiple phases. TA will give a brief tutorial at the beginning of the semester and always be available for your computer-related questions. You will prepare a final report of your findings in this programming assignment. You will also do a short demo (5-10 minutes) to present the project's findings and each student's contribution. Uneven allocation of the workload between group members will be accounted for in the final grade.