

CMPE 352

Signal Processing and Algorithms

Spring 2019

11 February 2019

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Course Info

- Office: Engineering Building E3, Room 204
- E-mail: sedat.olcer@bilgi.edu.tr
- Lecture + Applications: 3 hours + 2 hours
- Lecture: Mon 16:00-19:00
Lab: Mon 11:00-13:00, E3-303
Fri 11:00-13:00, E3-306
- Prerequisite: EEEN 201
- Teaching Assistant: Buse Buz
- Textbook: A. V. Oppenheim, A. S. Willsky, S. H. Nawab, Signals and Systems, Prentice Hall, 2nd Edition.

Course Description

- Introduction to signals and their description in time and frequency
- Continuous versus discrete signals
- Fourier representation
- Some signal processing algorithms frequently used in audio, video and communication systems and their implementations by hardware and/or software means
- Aims for a basic understanding that is common to almost all sub-disciplines of computer engineering

Course Objectives

- Acquire and be able to apply knowledge of signal processing techniques that are being employed in the field of computer engineering
- Acquire the ability to employ the concepts, theories and techniques of computer engineering for the design and analysis of fundamental signal processing algorithms
- Acquire a deep understanding of the concept of frequency
- Understand the differences and similarities between discrete and continuous-time signals as well as signal conversion
- Be able to analyze signals in both the time and the frequency domains
- Be able to use the Fourier transform technique as a tool
- Be able to code in Matlab various algorithms and acquire in this way design skills for computer systems

Tentative Course Outline

| Nr | Week | Topic |
|----|-------------|---|
| 1 | 19 February | Introduction. Discrete and continuous signals. Periodic signals. Signal Operations. |
| 2 | 26 February | Elementary signals, special signals. Sinusoids, notion of harmonic signals. |
| 3 | 5 March | Complex numbers. Notion of frequency. The complex exponential. Sum of sinusoids. |
| 4 | 12 March | The Fourier Series. |
| 5 | 19 March | Frequency. The electromagnetic spectrum. Examples of Fourier Series. |
| 6 | 26 March | Amplitude and Phase Spectrum. Energy and power. Decibel. |
| 7 | 2 April | Review |
| 8 | 9 April | Midterm Week |
| 9 | 16 April | Signal Spectrum. Conjugate Symmetry. The Fourier Transform. |
| 10 | 23 April | Properties of the Fourier Transform. System Frequency Response. Filters. Some commonly used algorithms. |
| 11 | 30 April | Digital Processing of Analog Signals. Sampling Theorem. Signal Reconstruction. Aliasing. |
| 12 | 7 May | The Discrete Fourier Transform. |
| 13 | 14 May | The Fast Fourier Transform algorithm. |
| 14 | 21 May | Review. |

Assessment

- Homeworks: 15 %
- Quizzes: 15 %
- Midterm exam: 30 %
- Final exam: 40 %
- Class attendance and lab attendace are required (attendance list)

Requirements

1. Students must attend at least 70% of the lectures. This requirement includes illnesses as well as other types of excused absences. Lack of compliance with this attendance rule shall result in a fail (F) assessment.
2. Excused absences must be documented and their legitimacy is determined by the instructor.
3. Tardy arrivals shall be avoided. Please do not disturb the on-going lecture!
4. Adherence to the University Academic Integrity policy is required.