Middle East Technical University - Department of Computer Engineering

CENG 384 – Signals and Systems for Computer Engineers

Spring 2018

Web: http://cow.ceng.metu.edu.tr

Instructor: Fatoş Yarman-Vural (Room: A-305)

Teaching Assistant: Güneş Sucu (Room: A-401), Çağlar Seylan (Room: A-409), Fatih Can Kurnaz (Room: B-200)

Lectures: ***Sect-1:*** *Tue: 08:40 & 09:40 (BMB-4), Thu: 08:40 & 09:40 (BMB-4)*
Sect-2: *Mon: 09:40 & 10:40 (BMB-4), Wed: 09:40 & 10:40 (BMB-4)*

Credits: METU: 3 Theoretical, 0 Laboratory; ECTS: 8.0

Objective: The goal of this course is to give students introduction to how to analyze signals and linear time invariant systems in the frequency and the spatial domain. With this course, the students will get background information for telecommunication networks, embedded systems, sound processing and recognition, neurocomputing, image processing, computer vision and pattern recognition.

Content: Linear time invariant systems; Frequency domain; Periodic and finite signals; Frequency response; Fourier series and transforms; Filtering; Finite impulse response filters; Sampling and reconstruction.

Textbook: We will mainly follow the following book:
"Signals & Systems" by A. V. Oppenheim, A. S. Willsky and S. H. Nawab, 1996, ISBN: 0138147574.

Grading:

* Those who do not have (i) 30% of all activities and (ii) 50% of participation activities up to the final exam date will receive NA regardless of their final exam.

5 Written Homeworks (4% each)	20%
2 Written Homework Quizzes (10% each)	20%
Midterm	25%
Final*	30%
Attendance (Class Quizzes)	5%

Cheating: Those who cheat in a homework will directly receive zero from all homeworks and be subject to disciplinary action.

Grouping: You will form groups of two people for all the homeworks and class quizzes. Your partner in the group will remain same until the end of the semester and he/she should be chosen from your own section.

Tentative Schedule:

Week	*Topic*	*Details*
1	Course overview and review of Mathematical background	○ Functions; Complex Numbers
2	Systems and Basic Operations with Signals; Useful Signals	
3	Linear Time Invariant Systems	○ Impulse Response - Convolution ○ Zero-input and Zero-state response ○ Signal Approximation by Orthogonal signal sets
4	Frequency Domain	○ Frequency Decomposition ○ Phase; Spatial frequency
5	Periodic and finite signals	○ Fourier series; Discrete-time signals
6	Frequency Response	○ LTI systems ○ Time invariance ○ Linearity; Linearity and Time-invariance
7	Finding and using the frequency response	○ Linear Difference and Differential Equations ○ The Fourier Series with Complex Exponentials
8	Determining the Fourier series coefficients	○ Frequency Response and the Fourier series ○ Frequency Response of Composite Systems
9	Filtering	○ Convolution ○ Frequency Response and the Impulse Response ○ Causality
10	The Four Fourier Transforms	○ Notation ○ The Fourier Series ○ The Discrete-time Fourier transform ○ The Discrete Fourier transform
11	The Four Fourier Transforms	○ The Discrete-time Fourier transform ○ The Continuous-time Fourier transform
12	The Four Fourier Transforms	○ The Continuous-time Fourier transform ○ Fourier Transforms vs. Fourier series
13	Sampling and reconstruction	○ Sampling; Reconstruction ○ The Nyquist-Shannon sampling theorem
14	Sampling and reconstruction	○ Sampling; Reconstruction ○ The Nyquist-Shannon sampling theorem