Course Profile

Degree Program:

☒ECE - Electrical & Computer Engineering
☐ME - Mechanical Engineering
☐General Courses for Both ECE & ME Degree Programs

Course Name: Introduction to Signals and Systems

Course Code: VE451

Course Credits: 4

Course Category: ☒ Required ☐ Elective

Terms Offered:

☒Fall 2016-2017 (YYYY-YYYY)
☐Spring _____ (YYYY-YYYY)
☐Summer _____ (YYYY-YYYY)

Course Pre/Co-requisites:

VE216 Introduction to Signals and Systems

Textbook:

Text: Digital Signal Processing: Principles, Algorithms, and Applications, 4/e, by John G. Proakis and Dimitris G. Manolakis, Pearson Education, 2007.

Instructor:

MA Dianguang (马殿光), dgma@sjtu.edu.cn
Office Hours: All Mondays and Wednesday, 11:40-12:30, Dong Xia Yuan 207

Teaching Assistants:

LIU Yuxuan (刘聿轩), hsnu1286@gmail.com
WANG Sihan (王思瀚), yamatehwsh@sjtu.edu.cn

Grading Policy:

VE451 has 9 problem sets and 2 exams:
Homework: 20%
Midterm Exam: 40%
Final Exam: 40%

Academic Integrity:

Problem sets (homework assignments) may be done with partners, but I believe that you do not fully understand the technical material unless you work on enough problems by yourself. No late homework will be accepted. Exams will be given under the JI's Honor Code and will require individual efforts. The exams will be closed book, even though you can take one and two pieces of cheating paper for your Midterm Exam and Final Exam, respectively. Scientific calculators can be used for the exams. The use of other electronic devices such as electronic dictionary and cell phone during exams will constitute an Honor Code violation. If you miss an exam, real documentation is required stating why you could not attend (severe disease, for example).

Course Description:

Introduction to digital signal processing of continuous and discrete signals. The family of Fourier Transforms including the Discrete Fourier Transform (DFT). Development of the Fast Fourier Transform (FFT). Signal sampling and reconstruction. Design and analysis of digital filters. Correlation and spectral estimation.

Tentative Teaching Schedule:

Week	Date	Teaching Activities (Topics and Exams)
1	Sept 12	Signals, systems, and signal processing (1.1), Classification of signals (1.2), The concepts of frequency in continuous-time and discrete-time signals (1.3)
	Sept 14	Analog-to-digital and digital-to-analog conversion (1.4), Discrete-time signals (2.1), Discrete-time systems (2.2)
2	Sept 19	Analysis of discrete-time LTI systems (2.3), Discrete-time systems described by difference equations (2.4)
	Sept 21	Implementation of discrete-time systems (2.5), Correlation of discrete-time signals (2.6)
	Sept 23	The z-transform (3.1), Properties of the z-transform (3.2), Rational z-transforms (3.3)
3	Sept 26	Inversion of the z-transform (3.4), Analysis of LTI systems in the z-domain (3.5)

	Sept 28	The one-sided z-transform (3.6), Frequency analysis of continuous-time signals (4.1), Frequency analysis of discrete-time signals (4.2)
4	Oct 3	National Day Holiday, no class
	Oct 5	
	Oct 7	
5	Oct 10	Frequency-domain and time-domain signal properties (4.3), Properties of the Fourier transform for discrete-time signals (4.4)
	Oct 12	Frequency-domain characteristics of LTI systems (5.1), Frequency response of LTI systems (5.2), Correlation functions and spectra at the output of LTI systems (5.3)
6	Oct 17	LTI systems as frequency-selective filters (5.4), Inverse systems and deconvolution (5.5)
	Oct 19	Frequency-domain sampling: the discrete Fourier transform (7.1), Properties of the DFT (7.2)
	Oct 21	Linear filtering methods based on the DFT (7.3)
7	Oct 24	Frequency analysis of signals using the DFT (7.4)
	Oct 26	Efficient computation of the DFT: fast Fourier transform (8.1)
8	Oct 31	Applications of FFT algorithms (8.2)
	Nov 2	A linear filtering approach to computation of the DFT (8.3), Structures for the realization of discrete-time systems (9.1), Structures for FIR systems (9.2).
	Nov 4	Midterm Exam
9	Nov 7	Structures for IIR systems (9.3)
	Nov 9	Design of digital filters: general considerations (10.1), Symmetric and antisymmetric FIR filters (10.2.1)
10	Nov 14	Design of linear-phase FIR filters using windows (10.2.2)
	Nov 16	Design of linear-phase FIR filters by frequency-sampling method (10.2.3)
	Nov 18	IIR filter design by approximation of derivatives (10.3.1), IIR filter design by impulse invariance (10.3.2)
11	Nov 21	IIR filter design by the bilinear transformation (10.3.3)
	Nov 23	IIR filter design by the bilinear transformation (10.3.3)
12	Nov 28	Characteristics of commonly used analog filters (10.3.4)
	Nov 30	
	Dec 2	Some examples of digital filter designs based on the bilinear transformation (10.3.5)
13	Dec 5	Frequency transformations (10.4)
	Dec 7	Review
14	Dec 12	Exam week, no class
	Dec 14	
	Dec 16	