EENG226 : Signals and Systems

Department: Electrical and Electronic Engineering

Program Name: Electrical and Electronic Engineering / Information Systems Engineering | **Program Code:** 27

Course Code: EENG226 / INFE226 | **Credits:** 4

☒ Required Course ☐ Elective Course (click and check the appropriate box)

Prerequisite(s): EENG223 - Circuit Theory I

Catalog Description:

Continuous-time and discrete-time signals and systems. Linear time-invariant (LTI) systems: system properties, convolution sum and the convolution integral representation, system properties, LTI systems described by differential and difference equations. Fourier series: Representation of periodic continuous-time and discrete-time signals and filtering. Continuous time Fourier transform and its properties: Time and frequency shifting, conjugation, differentiation and integration, scaling, convolution, and the Parseval's relation. Representation of aperiodic signals and the Discrete-time Fourier transform. Properties of the discrete-time Fourier transform.

Course Web Page: opencourses.emu.edu.tr → courses → EENG226

Textbook(s): S. Haykin and B. Van Veen, Signals and Systems, 2nd edition, John Wiley & sons, Inc 2003.

Indicative Basic Reading List:

1) Signals & Systems, 2nd Edition, by Alan Oppenheim, Alan Wilsky, S. Nawab. Published by Prentice Hall, 1997
2) Sanjit K. Mitra, " *Digital Signal Processing, A Computer-Based Approach*", Mc Graw-Hill International Ed., 1998.
3) James H. McClellan, C.S. Burres, A.V. Oppenheim, T.W. Parks, R.W. Schafer, H. W. Schuessler, "Computer Based Experiments for Signal Processing Using Matlab", Prentice Hall, 1998.

Course Outline:

Week 1:	Course introduction. Basic CT and DT signals and systems, system properties
Week 2:	Elementary complex signals. Unit impulse and unit step functions Periodic signals
Week 3-5:	Fundamental properties of systems. LTI systems and the convolution sum and integral
Week 6:	Properties of LTI systems
Week7:	Difference and differential equations.
Week8-9:	Fourier series analysis of CT and DT signals. Properties of CT and DT Fourier series
Week10:	Mid-Term Examination
Week 11:	Fourier series and LTI systems, filtering
Week 12:	CT Fourier transform. Representation of aperiodic and periodic signals, Properties of the CT Fourier transform
Week13-14:	DT Fourier transform, Representation of aperiodic and periodic signals, Properties of the DT Fourier transform
Week 15:	**Final Examination**

Course Learning Outcomes:

On successful completion of this course, all students will have developed **knowledge** and **understanding** of:

a) the concept of signal and system classifications and their properties for both analog and discrete cases.
b) the concept of impulse response and convolution in both analog and discrete time domain.
c) analog and discrete linear time-invariant systems in time by using differential and difference equations, block diagrams,
d) the concept of Fourier representation of analog and discrete signals and learn about different forms and properties of Fourier transforms.
e) the concept of frequency response in analog and discrete systems.
f) analog and discrete signals and systems using computer-aided design and analysis tools (MATLAB).

Class Schedule: 4 hrs of lectures per week			**Lab Schedule:** 2 hrs lab. per week
Assessment	**Method**	**No**	**Percentage**
	Midterm Exam(s)	1	30%
	Lab Work(s)	7	15 %
	Quizes	3-4	15%
	Homework(s)	4	5%
	Final Examination	1	35%

Attendance Requirement:
Please note that you need to have at least 60% attendance to be eligible for taking make-up or re-sit exam.

Contribution of Course to Criterion: 5
Credit Hours for
Mathematics & Basic Science: 2
Engineering Design: 2
General Education: 0

Relationship of Course to Student Outcomes

The course has been designed to contribute to the following student outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

Contribution of Course Learning Outcomes to Student Outcomes

	Student Outcome:					
Course Learning Outcome	**1**	**2**	**4**	**5**	**6**	**7**
a) the concept of signal and system classifications and their properties for both analog and discrete cases.	●	●			●	
b) the concept of impulse response and convolution in both analog and discrete time domain.	●	●			●	
c) analog and discrete linear time-invariant systems in time by using differential and difference equations, block diagrams,	●	●			●	
d) the concept of Fourier representation of analog and discrete signals and learn about different forms and properties of Fourier transforms.	●	●				
e) the concept of frequency response in analog and discrete systems.	●	●			●	
f) analog and discrete signals and systems using computer-aided design and analysis tools (MATLAB)	●	●			●	

Updated by: Prof. Dr. Hasan Amca	**Updated on:** 1st March 2023