



The University of Jordan
School of Engineering
Electrical Engineering Department
2nd Semester – A.Y. 2020/2021

Course: Signal Analysis & Systems – 0953221 (3 Cr. – Required Course)

Instructor: Dr. Yazan Albadarneh
Office: E306, Telephone: 06/5355000 ext 22857, Email: yalbadarneh@ju.edu.jo
Office Hours: Will be posted soon

Course website: <http://elearning.ju.edu.jo/>

Catalog description: Signal and system model and classification. Continuous time signals. Signals and vectors. Generalized Fourier series representation. Amplitude and phase spectra of signals. Energy and power content of signals. Bandwidth of signals. The Fourier transform and its applications. Sampling of signals. Convolution of signals. Power and energy spectral densities. Correlation functions. Time-domain analysis of continuous time systems. The system impulse response. Communication channels. Filters: LPF, HPF and BPF. Discrete time signals. The discrete Fourier transform (DFT) and the Fast Fourier transform (FFT). Spectral analysis of DFT systems. Unit sample response and response to arbitrary input sequences. Introduction to the Z-transform. Project.

Prerequisites by course:

EE	0933201	Computer Applications	(pre-requisite)
EE	0903211	Electrical Circuits (I)	(pre-requisite)

Prerequisites by topic: Students are assumed to have a background in the following topics:

- Calculus (integration and differentiation) and complex number arithmetic.
- Electric circuit analysis techniques, phasors, transfer functions and filters.
- Using MATLAB and other circuit simulation software.

Textbook: Signals, Systems & Transforms by Charles L. Phillips, John Parr and Eve Riskin, Pearson, 5th Edition, 2013.

References:

1. Signals and Systems: A MATLAB Integrated Approach by Oktay Alkin, CRC Press, 1st Edition, 2014.
2. Schaum's Outline of Signals and Systems by Hwei P Hsu, McGraw-Hill Education, 3rd Edition, 2013.
3. Linear Systems and Signals by B.P. Lathi and Roger Green, Oxford University Press, 3rd Edition, 2017.
4. Signals and Systems For Dummies by Mark Wickert, For Dummies, 1st edition, 2013.

5. Signals and Systems: A Primer with MATLAB by Matthew N. O. Sadiku and Warsame Hassan Ali, CRC Press, 1st Edition, 2015.
6. Signals and Systems by Alan V. Oppenheim, Alan S. Willsky and S. Hamid, Pearson. 2nd Edition, 1996.
7. Continuous and Discrete Signals and Systems by Samir S. Soliman and Mandyam D. Srinath, Pearson, 2nd Edition, 1998.

Schedule: 16 Weeks, 42 lectures (50 minutes each) plus exams.

Course goals: The overall objective is to introduce the student to the basics of signal analysis in time and frequency domains. The concepts of Fourier series and transform and power and energy spectra are emphasized. In addition, linear time-invariant systems are analyzed using the impulse response and transfer functions.

Course learning outcomes (CLO) and relation to ABET student outcomes (SO):

Upon successful completion of this course, a student will:		[SO]
1.	Be able to classify signals and systems into continuous and discrete types.	[1]
2.	Use Fourier series and transform to evaluate and sketch the line, density, power and energy spectra of signals.	[1]
3.	Know how to convert analog signals into discrete/digital signals and vice versa.	[1]
4.	Know the appropriate filters and communication channels suitable for signal processing and transmission.	[1]
5.	Be able to use the DFT and FFT for the analysis of signals and systems.	[1]

Course topics:	Hrs
1. Signals and system classification into continuous-time and discrete-time. Continuous-time signal characteristics (even, odd, periodic, aperiodic, etc). Properties of continuous-time systems (stability, linearity, etc).	6
2. Impulse representation of continuous-time signals. Convolution and its properties. Properties of Linear Time-Invariant (LTI) systems. Impulse response.	6
3. Generalized, complex exponential, and trigonometric Fourier series representation of periodic signals. Frequency spectra. Properties of Fourier series.	6
4. The Fourier transform and its properties (linearity, time scaling, time shifting, time transformation, duality, convolution, frequency shifting, differentiation, integration, etc).	6
5. The Fourier transform of some typical time domain signals.	3
6. Sampling and digitizing of continuous time signals and their spectra.	3
7. Line, power and energy spectra of signals. Bandwidth of signals.	6
8. Applications of the Fourier transform. Filters (ideal and practical).	4
9. Discrete-time signals. Discrete-time Fourier transform. Fast Fourier transform. Introduction to the z-transform.	2

Ground rules: Attendance is required and highly encouraged. To that end, attendance will be taken every lecture. Eating and drinking are not allowed during class, and cell phones must be set to silent mode. All exams (including the final exam) should be considered cumulative. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes.

Assessment & grading policy:	Assignments	0%	Quizzes	0%
	First Exam	30%	Projects	0%
	Midterm			
	Exam	30%	Lab Reports	0%
	Final Exam	40%	Presentation	0%
			Total	100%

Last Revised: March 2021

