Course unit title:	Signals Systems and Transforms		
Course unit code:	AEEE310		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	2		
Semester when the unit is delivered:	5 (Fall)		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Prof. Michael Komodromos		
Learning outcomes of the course unit:	1. Categorize the various types of signals. Recognize and manipulate special signals. Understand and calculate quantities such as average value, RMS value, instantaneous power and average power of signals. Perform mathematical operations on signals such as amplitude scaling, time scaling, addition and subtraction. 2. Classify continuous time systems based on linearity, time invariance and causality. Derive the convolution integral. Use convolution to calculate the output of a system, graphically and analytically, given its impulse response and the input. Compute the impulse response of cascaded systems. 3. Compute the Fourier series of periodic waveforms and the Fourier transform of non-periodic waveforms. Employ the Fourier series and the Fourier transform to obtain the frequency spectra of signals. 4. Compute the Laplace Transform of signals. Analyze LTI systems using the Laplace transform and the Fourier transform. Obtain the transfer function, frequency response and test their stability. Derive the impulse response of LTI systems from the transfer function using partial fraction expansion. 5. Integrate the knowledge attained to compute the impulse response, the transfer function and the frequency response of simple electrical systems. Derive the impulse response of ideal filters. Specify, design and analyze simple analog filters. Classify filters in terms of their frequency response.		
Mode of delivery:	Face-to-face		
Prerequisites:	AMAT204	Co-requisites:	
Recommended optional program components:	None		
Course contents:	***Signals:*** Classifications. Operations on signals: amplitude and time scaling, addition. Special signals: Unit step, Unit impulse, sinusoidal, exponential, complex exponential. ***Systems:*** Classification of continuous-time systems and their properties. Linearity, time invariance, causality and stability. Description of continuous-time systems using differential equations. General forms. Impulse response. Input output description and the convolution integral. Graphical interpretation of convolution. ***Fourier series:*** Derivation of the trigonometric Fourier series. Calculation of the Fourier coefficients. Combined trigonometric and exponential forms of the Fourier series. Harmonics and frequency spectra. Average value, RMS value, instantaneous and average power of periodic signals. ***Laplace Transform:*** Definition. Laplace transform of functions. Properties. Inverse Laplace transform using partial fraction expansion. Application of the Laplace transform to continuous-time linear systems analysis. Transfer function, poles and zeros, BIBO stability. ***Fourier Transform:*** Definition. Properties. Fourier transform of functions. Frequency spectra of signals. Frequency response of LTI systems. Magnitude and phase responses.		

	Analog filters: Ideal filters. Specification of filters in terms of their frequency response. Magnitude and phase responses of filters. Group delay.
Recommended and/or required reading:	
Textbooks:	C. Philips, J. Parr, E. Riskin, Signals, Systems, and Transforms, Pearson Education International, 4th edition, 2008.
References:	1. L. Balmer, *Signals and Systems*, Prentice – Hall International, 1997. 2. Leland B. Jackson, *Signals, Systems and Transforms,* Addison Wesley, 2001. 3. Al. Oppenheim, Al. Willsky, *Signals and Systems,* 2nd edition, Prentice Hall, 1997.
Planned learning activities and teaching methods:	Teaching of the course is based on lectures (3 hours per week) in a classroom, using a mixture of traditional teaching with notes on the white board and slide presentations using a projector where appropriate. Topic notes are compiled by students, during the lectures which serve to cover the material of the course. Students are urged to use the textbook assigned to the course. Homework problems are assigned from the textbook as a turn-in assignment or for interactive homework practice. Additionally, students are advised to use the reference books for further reading and practice in solving related exercises. Example problems are solved during lectures or privately during the lecturer's office hours. Students are assessed continuously and their knowledge is checked through tests and assignments.
Assessment methods and criteria:	• Assignments 10% • Tests: 30% • Final Exam 60%
Language of instruction:	English
Work placement(s):	No