

Name of the subject: Sensors and signal analysis (Sensors and Actuators)		NEPTUN-code: KMXJEBAMNE	Contact hours/week: 1 lecture + 0 practice + 2 simul. lab. practice
Credits: 3 Requirement: semester mark evening course, 2. semester		Prerequisite: Selected topics of Electricity KAXVIBAMNE	
Lecturer: ???	Beosztás: ???	Kar és intézet neve: Kandó Kálmán Faculty of Electricity Institute of Telecommunication	

Subject		
<i>Aim of the course:</i> Analysing signal types measured in industrial applications. Basic transformation methods of signals. Principles of technical sensors and actuators.		
Thematics:	Week	Cont. hours
Signals in time domain. Parameters of periodic signals. Simulation: measuring average-type parameters.	1.	2
Definition of linear systems. Classical form of Fourier-series of periodic signals Simulation: synthesis of signals, based on classical Fourier-series	2.	2
Measurement form of Fourier-series. Application for signal transportation in a linear system. Simulation: : synthesis of signals, based on measurement-form of Fourier-series	3.	2
Complex form of Fourier-series. Method of calculation, using Laplace-transformation. Simulation: rotating complex vectors, resulting real function of time.	4.	2
Fourier transform of aperiodic signals. Calculation method, using Laplace-transformation. Simulation: relation between Fourier and Laplace transformations.	5.	2
Sampling theory basics. Shannon-theorem of mathematical sampling method.	6.	2
Physical sampling method: effect of real filter characteristics, application of sample-and-hold units for signal reconstruction.	7.	2
Physical sampling method: effect of sampling signal waveform, of window functions.	8.	2
Discrete Fourier Transformation. Possibilities and limitations. Fast Fourier Transformation methods.	9.	2
Digital filter basic blocks. FIR and IIR type filters. Speciality of frequency response function.	10.	2
Basics of stochastic signals: stationarity, ergodicity. Amplitude distribution and density functions. Auto- and cross-correlation functions. Spectral density functions. Wiener-Chinchin theorem.	11.	2
Transducer basics: signal types, power supply methods, characteristics. Resistor-type sensors and their measuring circuits. Sensors for measuring temperature.	12.	2
Examples of inductive and capacitive sensors. Optical sensors. Magnetostrictive sensor of length. Sensors of mechanical acceleration. Electrical and pneumatic actuators.	13.	2
Literature:		
Compulsory:		
Optional: S. Mallat: A Wavelet Tour of Signal Processing, https://wavelet-tour.github.io/files/01-FM-P374370.pdf A. V. Oppenheim, R. W. Shafer: Discrete-Time Signal Processing, Prentice-Hall, 1989. https://haseebsohail.files.wordpress.com/2013/02/discrete-time-signal-processing-by-alan-v-oppenheim.pdf S. Beeby, G. Ensell, M. Kraft, N.White: MEMS Micromechanical Sensors		