Name of the subject: Signal Analysis, Sensors and Actuators	***NEPTUN-code:*** KHTJE1ENNM	***Contact hours/week:*** 1 lecture + 0 practice + 1 simul. lab. practice
Credits: 3 ***Requrement:*** semester mark evening course, 2. semester	***Prerequisite: Selected topics of Electricity*** BGRVI11NNM, BGRVI11NEC	
Lecturer: ???	***Beosztás:*** ???	***Kar és intézet neve:*** Kandó Kálmán Faculty of Electricity Institute of Telecommunication

Subject		
Aim of the course: 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