FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Sygnały i Systemy**
Name in English:	**Signal and Systems**
Main field of study (if applicable):	**Electrical Engineering**
Specialization (if applicable):	**Renewable Energy Systems**
Level and form of studies:	**2nd level, full-time**
Kind of subject:	**optional**
Subject code:	**ELR051334**
Group of courses:	**NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	30	15			
Number of hours of total student workload (CNPS):	90	30			
Form of crediting:	examination	crediting with grade			
For group of courses mark (X) final course:					
Number of ECTS points:	3	1			
including number of ECTS points for practical (P) classes :		1			
including number of ECTS points for direct teacher-student contact (BK) classes:	2.10	0.70			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knows basic lows of electrical engineering and recognize electrical quantity.
2. Knows differential and integral calculus of one variable function, linear algebra and mathematic calculation in complex domain.
3. Can implement basic differential calculation, linear algebra and calculation on complex number.
4. Can recognize fundamental electrical problems and tools for its solution.
5. Understands the need and possibility of lifelong learning, achieving new skills professional as well as personal and social.

SUBJECT OBJECTIVES

C1. Getting the knowledge about using of delta Dirac function and step function in description of system
C2. Learn possible application of state variable matrix, system matrix and engine values.
C3. Getting the knowledge about graphical representation of circuit’s equations.
C4. Getting the knowledge about of stability formulation.
C5. Acquire skills of digital circuit description.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01	Have a knowledge in using of delta Dirac function and step function in description of system. Knows methods of system descriptions using state variable matrix.
PEU_W02	Knows methods of graphical representations of system equations Knows the methods of define system stability criterions
PEU_W03	Knows the techniques of digital systems description

relating to skills:

PEU_U01	Apply delta Dirac function and step function in description of system. Use the method of system description based on state variable matrix.
PEU_U02	Select the method of graphical system representation using graph and block scheme techniques. Is able to select stability criteria and conclude about the stability.

relating to social competences:

PEU_K01	Is responsible for entrusted task, exhibits creative attitude in selection of calculation techniques

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours:**
Lec 1	Selected issues of system description. The basic properties of systems. The basic signals used in the system analysis. Elements of the theory of distribution. Step and Dirac impulse. Differentiation in terms of distribution theory.	2
Lec 2	Selected issues system description. Impulse and step response of linear time-invariant systems. Duhamel integral and convolution. Calculation of convolution of positive-time side signals.	2
Lec 3	Selected issues of description. Determination of impulse response, step response, and response for given excitation.	2
Lec 4	Selected issues of time series and matrix functions. Differential and integral operation of matrix functions.	2
Lec 5	Selected issues of time series and matrix functions. State variable, transfer matrix, excitation matrix, output matrix.	2
Lec 6	Selected issues of time series and matrix functions. Application of engine values.	2
Lec 7	Selected issues of graphical representation of circuit equations. flow graphs, block schemes, reduction of scheme blocks. Part 1.	2
Lec 8	Selected issues of graphical representation of circuit equations. flow graphs, block schemes, reduction of scheme blocks. Part 2.	2
Lec 9	Selected issues of graphical representation of circuit equations. flow graphs, block schemes, reduction of scheme blocks. Part 3.	2
Lec 10	Selected issues of system stability. Definition of stability of transmission element, stability conditions, Hurwitz polynomial.	2
Lec 11	Selected issues of system stability. Algebraic criteria, frequency criteria of linear stationary systems. Part 1.	2
Lec 12	Selected issues of system stability. Algebraic criteria, frequency criteria of linear stationary systems.Part 2.	2
Lec 13	Selected issues of digital system description. Impulse signal and his meaning in digitalization process, two-side ‘Z” transform, relation of ‘Z” transform with Laplace and Fourier technique.	2
Lec 14	Selected issues of digital system description. sampling theory, spectrum of digital signals, stationarity, causality, stability of digital systems.	2
Lec 15	Selected issues of digital system description. Frequency characteristic of digital systems.	2
	Total hours:	**30**

Form of classes - class		**Number of hours:**
Cl 1	Information about the regulation of time schedule and requirements for passing the course. Determination of impulse and step response of the systems.	2
Cl 2	Application of theory of distribution in determination of step, impulse response and response for given excitations.	2
Cl 3	Application of state variable matrix in determination of step and impulse response	2
Cl 4	Application of state variable matrix in determination of system response for given excitations. Application of engine values for stability criterion.	2
Cl 5	Application of graphical system representation using flow graphs	2
Cl 6	Application of graphical system representation using block schemes	2
Cl 7	Application of stability criterions	2
Cl 8	Crediting test	1
	Total hours:	**15**

TEACHING TOOLS USED
N1. Lectures with multimedia presentation
N2. Classes work in subgroup

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation *F – forming (during semester)* *P – concluding (at semester end)*	**Educational effect number**	**Way of evaluating educational effect achievement**
F1(W)	PEU_W01 PEU_W02 PEU_W03	Examination
P(W)	P=F1	
F1(C)	PEU_U01 PEU_U02 PEU_K01	Crediting test
P(C)	P=F1	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] S. Haykin, B. Van Veen – Signals and systems, John Wiley & Sons, Inc., 1999.
[2] S T.H. Glisson – Introduction to system analysis, McGraw-Hill, Inc, 1985.
[3] G. E. Carlson – Signal and linear system analysis, John Wiley & Sons, Inc., 1998.
[4] Ch.T. Chen – System and signal analysis, Oxford University Press, 1994.

SECONDARY LITERATURE:

[1] A. D. Poularikas - The .handbook of formulas and tables for signal processing, CRC Press, 2000.
[2] Additional educational supplies http://eportal.eny.pwr.wroc.pl/

SUBJECT SUPERVISOR

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