FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Obwody i układy**
Name in English:	**Circuits 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:	**obligatory**
Subject code:	**ELR051332**
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.

SUBJECT OBJECTIVES

C1. Getting the knowledge techniques used in synthesis of electrical circuits.
C2. Acquire skills of nonlinear circuit analysis.
C3. Getting the knowledge about state variable matrix application.
C4. Getting the knowledge about application of continuous representation of signals, transfer function in operator and frequency form.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01	Have knowledge about circuit synthesis
PEU_W02	Knows elements of nonlinear circuits analysis including stability issues
PEU_W03	ormulate general theory of system description using state variable matrix. Formulate genera theory of system description using transfer function in operator and frequency form

relating to skills:

PEU_U01	Decide and select method of circuit synthesis on the basis of immittance function
PEU_U02	Is able to analyze fundamental circuits with nonlinear elements
PEU_U03	Is able to use state variable matrix in system description. Is able to use transfer function in operator and frequency form in system description

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	Introduction to circuits and electrical systems. Properties of circuits General problems description of the circuits according to the circuit components and operating state. General issues concerning signal transfer through the system.	2
Lec 2	Selected issues of circuits synthesis. positive rational functions, immittance function of driving point impedance.	2
Lec 3	Selected issues of circuits synthesis. Techniques for synthesis of passive RC, RL, LC circuits, Foster and Cauer synthesis. Part 1.	2
Lec 4	Selected issues of circuits synthesis. Techniques for synthesis of passive RC, RL, LC circuits, Foster and Cauer synthesis. Part 2.	2
Lec 5	Selected issues of nonlinear circuits analysis. Characteristics of driving point nonlinear elements.	2
Lec 6	Selected issues of nonlinear circuits analysis. Selected methods of nonlinear circuits analysis.	2
Lec 7	Selected issues of nonlinear circuits analysis. Stability of nonlinear circuits, phase plane.	2
Lec 8	Selected issues of nonlinear circuits analysis. Stability of nonlinear circuits, stability in Lapunov theory.	2
Lec 9	Selected issues of time series and matrix functions. differential and integral operation of matrix functions.	2
Lec 10	Selected issues of time series and matrix functions. State variable, transfer matrix, excitation matrix, output matrix.	2
Lec 11	Selected issues of time series and matrix functions. Application of engine values.	2
Lec 12	Selected issues of continuous representation of deterministic signals. Two-side Laplace transform, convergence area, inverse transformation.	2
Lec 13	Selected issues of continuous representation of deterministic signals. Fourier transform, relation of two-sides Laplace and Fourier transforms, signal parameters in time and frequency domain.	2
Lec 14	Selected issues of continuous representation of deterministic signals. Transfer function of LTI circuits, elements of filter synthesis. Hilbert compound.	2
Lec 15	Selected issues of continuous representation of deterministic signals. Elements of filter synthesis.	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. Application of synthesis of linear circuit - introduction	2
Cl 2	Application of synthesis of linear circuit	2
Cl 3	Application of methods of nonlinear circuits analysis. Part 1	2
Cl 4	Application of methods of nonlinear circuits analysis. Part 2	2
Cl 5	Application of state variable matrix in analysis of the circuits analysis. Part 1	2
Cl 6	Application of state variable matrix in analysis of the circuits analysis. Part 2	2
Cl 7	Application of transfer function of LTI circuits	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_U03 PEU_K01	Crediting test
P(C)	P=F1	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] A. Papoulis – Obwody i układy, WKiŁ, 1998 (PL) / A. Papoulis – Circuits and Systems: A modern approach, The Oxford Series in Electrical and Computer Engineering (EN)
[2] S. Haykin, B. Van Veen – Signals and systems, John Wiley & Sons, Inc., 1999.
[3] S T.H. Glisson – Introduction to system analysis, McGraw-Hill, Inc, 1985.
[4] G. E. Carlson – Signal and linear system analysis, John Wiley & Sons, Inc., 1998.
[5] 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] Materiały pomocnicze: http://eportal.eny.pwr.wroc.pl/

SUBJECT SUPERVISOR

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