FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Wybrane zagadnienia teorii obwodów**
Name in English:	**Selected problems of circuit theory**
Main field of study (if applicable):	**Electrical Engineering**
Specialization (if applicable):	**Industrial Electrical Engineering**
Level and form of studies:	**2nd level, full-time**
Kind of subject:	**obligatory**
Subject code:	**ELR051310**
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. The student knows the mathematical analysis and the linear algebra as well as some theory of complex functions upon the fundamental level.
2. The student knows the electric – magnetic field theory and the circuit theory upon the fundamental level.
3. The student is able to obtain some scientific information

SUBJECT OBJECTIVES

C1. The purpose of this education is to be able to form the stability problem for the phase space.
C2. The purpose of this education process is to be able to solve some selected nonlinear problems in electrical engineering
C3. The purpose of this education is to be able to form the stability problem for the number sequence field used to the digital system.
C4. The purpose of this education is to be able to find some results of discrete problems for the circuit theory
C5. The purpose of this education process is to be able to make use of the improper Fourier integral for the circuit synthesis – analysis problem.
C6. The purpose of this education process is to be able to form and to solve some differential matrix equations for the circuit theory.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01	The student has the knowledge in terms of the nonlinear circuit stability problem and of an analysis of nonlinear phenomenon
PEU_W02	The student has the extensive theoretical and particular knowledge in terms of the discrete analysis for the circuit theory
PEU_W03	The student knows the particular mathematical methods in terms of the circuit synthesis - analysis problem

relating to skills:

PEU_U01	The student is able to solve the stability problem for the nonlinear systems and he can analyse some phenomena in these systems
PEU_U02	The student can realize some analysis - synthesis problem for the given circuit
PEU_U03	The student can make use of the Zet and Fourier transformation

relating to social competences:

PEU_K01	The student is able to think in a creative way.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours:**
Lec 1	The Liapunov stability	2
Lec 2	The first approximation method, the phase plane	2
Lec 3	A chaotic system, the orbital stability, the small signal method,	2
Lec 4	The linearized equation problem, the voltage ferroresonance effect	2
Lec 5	The current ferroresonance effect, the nonlinear resistance circuit problem.	2
Lec 6	The periodicity operator , the continuous function filter theorem and the Zet transformation	2
Lec 7	The input – output distribution and the impulse (digital) system	2
Lec 8	The initial state – stability - stationary state problem for the impulse systems,	2
Lec 9	The Dirichlet – Cauchy conditions, the generalized form of the Zet transformation	2
Lec 10	Some continuous Fourier analysis problems : the fundamental continuous spectrums	2
Lec 11	Some applications of the Cauchy theorem	2
Lec 12	A calculus of residuum in terms of the continuous spectrum theory	2
Lec 13	Indeterminacy principle, the Gibbs effect	2
Lec 14	Some state parameter vector problems : the own vector and a norm of a matrix, the matrix series and the matrix functions, the Sylvester relationship, the Cayley – Hamilton identity	2
Lec 15	The differential and integral operations for the matrix functions, the state parameter vector and the differential matrix equations	2
	Total hours:	**30**

Form of classes - class		**Number of hours:**
Cl 1	The state parameter vector method.	2
Cl 2	The unit – dimension stability problem	2
Cl 3	The block diagram method	2
Cl 4	The RLC circuit synthesis	2
Cl 5	The Foster method	2
Cl 6	The flow graph method	2
Cl 7	The Zet transformation, the Fourier transformation	2
Cl 8	Test	1
	Total hours:	**15**

TEACHING TOOLS USED
N1. The problem lecture
N2. Traditional class form

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	Test
P(C)	P=F1	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Uruski M, Wolsk R, Wybrane zagadnienia z teorii obwodów, PWr., Wrocław 1984
[2] Kudrewicz J., Nieliniowe obwody elektryczne, WNT, 1996
[3] Kurdziel R, Podstawy elektrotechniki, WNT, 1973
[4] Osiowski J., Zarys rachunku operatorowego, WNT, 1981

SECONDARY LITERATURE:

[1] Bolkowski S., Elektrotechnika teoretyczna, WNT, Warszawa, 1995
[2] Krakowski M., Elektrotechnika teoretyczna, PWN, Warszawa, 1980

SUBJECT SUPERVISOR
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