FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Metody matematyczne w elektrotechnice**
Name in English:	**Mathematical methods in electrical engineering**
Main field of study (if applicable):	**Electrical Engineering**
Specialization (if applicable):	
Level and form of studies:	**1st level, full-time**
Kind of subject:	**obligatory**
Subject code:	**ELR051304**
Group of courses:	**NO**

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has basic knowledge of mathematics and physics.
2. Has a basic knowledge of electrical circuits analysis.
3. Is able to implement basic knowledge of mathematics, physics and electrical circuits analysis in order to define and solve basic engineering tasks.

SUBJECT OBJECTIVES

C1. Getting the knowledge about description and calculation of electrical engineering task with application of matrix calculation, differential and integral equations as well as operator theory.

C2. Getting the skills of practical applications of matrix calculation, differential and integral equations as well as operator theory in electrical engineering.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01 Has a knowledge about application of matrix calculation, differential and integral equations as well as operator theory in electrical engineering

PEU_W02 Has a knowledge about application of methods of electrical circuits analysis

relating to skills:

PEU_U01 Has a skill of application of matrix calculation, differential and integral equations as well as operator theory in electrical engineering.

PEU_U02 Has a skill of selection and application of circuit analysis method for given electrical engineering problem.

relating to social competences:

PEU_K01 Is responsible for correctness results of engineering solutions

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours:**
Lec 1	Matrix operation in electrical engineering. Definition of structural matrix. Impedance and admittance matrix. Calculation of voltage and currents using matrix approach and Gauss method of reduction. Thevenin theorem.	2
Lec 2	Transformation of phasors. Application of complex numbers and phasors in analysis of 3-phase circuits in stars and delta connections. Symetrical and asymmetrical conditions. Transformation of 3-phase configuration (ABC) into symmetrical components circuits (012).	2
Lec 3	Transformation of phasors. Calculation of voltage and currents in asymmetrical conditions. Modeling of power system distortion using symmetrical components	2
Lec 4	Selected issues of deferential and integral calculations. Application of differential equation for identification of parameters of transients in series and parallel RL, RC, RLC structures.	2
Lec 5	Selected issues of deferential and integral calculations. Application of differential and integral calculation in electrical engineering used for description of rotation of rotor of asynchronous and synchronous machines as well as process of conductor heating.	2
Lec 6	Selected isses of operator calculation. Application of Laplace transform for transfer function of electrical circuits. Stability of electrical structures.	2
Lec 7	Selected isses of operator calculation. Relations of Laplace transfer function and frequency transfer function. Frequency characteristics (resonances) two-terminal and four-terminal networks.	2
Lec 8	Crediting test	1
	Total hours:	**15**

Form of classes - class		**Number of hours:**
Cl 1	Application of matrix operation in electrical engineering. Creation of structural matrix as well as impedance and admittance matrix. Calculation of voltage and currents using matrix approach and Gauss reduction theorem. Individual task and calculations.	2
Cl 2	Application of transformation of phasors. Analysis of power distribution in 3-phase circuits in symmetrical and asymmetrical conditions using complex number and phasors. Individual task and calculations.	2
Cl 3	Application of transformation of phasors. Transformation of 3-phase configuration (ABC) into symmetrical components circuits (012) in 3-phase systems under fault condition. Calculation of phase voltage and currents. Individual task and calculations.	2
Cl 4	Application of selected issues of deferential and integral calculations. Application of differential equation for identification of parameters of transients in series and parallel RL, RC, RLC structures. Individual task and calculations.	2
Cl 5	Application of selected issues of deferential and integral calculations. Application of differential and integral calculation in electrical engineering used for description of rotation of rotor of asynchronous and synchronous machines as well as process of conductor heating. Individual task and calculations.	2
Cl 6	Application of selected issues of deferential and integral calculations. Application of differential and integral calculation process of conductor heating. Individual task and calculations.	2
Cl 7	Application of selected isses of operator calculation. Application of Laplace transform for transfer function of electrical circuits. Application of the transfer function in analysis of stability. Frequency characteristics. Individual task and calculations.	2
Cl 8	Discussion and assessment of individual tasks and calculations	1
	Total hours:	**15**

TEACHING TOOLS USED
N1. Lectures with multimedia presentation supplemented by traditional form
N2. Classes with individual tasks and calculations.

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**
F(W)	PEU_W01 PEU_W02	Crediting test
P(W)	P=F1	
F1(C)	PEU_U01 PEU_U02 PEU_K01	Evaluation of individual tasks and calculations
P(C)	P=F1	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] S. Bolkowski - - Teoria Obwodów Elektrycznych –WNT 1995.
[2] R. Kurdziel – Podstawy Elektrotechniki – WNT 1972.
[3] M. Uruski, W. Wolski – Teoria Obwodów t. I, II – skrypt PWr.
[4] E. Tarnawski, Matetmatyka dla elektryków, PWT – wydanie dowolne
[5] W.Żakowski, W.Leksiński, Matematyka- cz. IV, Seria: Podręczniki Akademickie, WNT Warszawa.

SECONDARY LITERATURE:

[1] J. Osiowski, J. Szabatin – Podstawy Teorii Obwodów t. I, II, III – WNT 1992 - 1998.
[2] A. Papoulis – Obwody i Układy - WKŁ 1988.
[3] J. Osiowski, Zarys rachunku operatorowego. Teoria i zastosowania w Elektrotechnice, WNT wydanie dowolne
[4] K. Mikołajuk, Z. Trzaska – Elektrotechnika Teoretyczna – PWN 1984.
[5] Materiały pomocnicze do przedmiotu http://eportal.eny.pwr.wroc.pl/

SUBJECT SUPERVISOR

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