

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Maszyny elektryczne 2**  
 Name in English: **Electrical machines 2**  
 Main field of study (if applicable): **Control Engineering and Robotics**  
 Specialization (if applicable):  
 Level and form of studies: **1st level, full-time**  
 Kind of subject: **obligatory**  
 Subject code: **ARR043103**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):			30		
Number of hours of total student workload (CNPS):			60		
Form of crediting:			crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:			2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:			1.40		

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Students knows principles during electrical energy transformation (power loss, heating and cooling).
2. Students has knowledge about construction, parameters, properties and characteristics of transformers, induction machines and DC machines.
3. Students has knowledge about magnetic fields in electrical machines.
4. Student is able to recognize of electrical machines :transformers, AC machines (induction machines and synchronous machines).
5. Student is able to explain principles of operation of transformers and induction and synchronous machines.
6. Student is able to explain characteristics and properties of transformers and induction and synchronous machines.
7. Student is able to explain principles of operation, phenomena, characteristics and properties of shunt, series and compound DC machines.

**SUBJECT OBJECTIVES**

- C1. To familiarize the students with basic knowledge about physical phenomena in transformers and AC and DC electrical machines, their parameters, properties and characteristics.
- C2. To skill the students with measurement techniques to determine characteristics and parameters of transformers
- C3. To skill the students with measurement techniques to determine characteristics and parameters of induction and synchronous machines
- C4. To skill the students with measurement techniques to determine characteristics and parameters of shunt and series DC machines

**SUBJECT EDUCATIONAL EFFECTS***relating to knowledge:**relating to skills:*

- PEK\_U01 Students knows how to determine and interpret parameters, properties and characteristics of induction and synchronous machines.
- PEK\_U02 Students knows how to determine and interpret parameters, properties and characteristics of shunt and series DC machines
- PEK\_U03 Students are able to apply the principles of safety operation of electrical circuits, register the measurements results and prepare reports.

*relating to social competences:*

- PEK\_K01 Student are able to correctly identify and resolve dilemmas related with the profession.

PROGRAMME CONTENT		
Form of classes - laboratory		Number of hours:
Lab 1	Introduction, safety instructions.	2
Lab 2	Three-phase transformer investigation	3
Lab 3	Parallel work of transformers	3
Lab 4	Determination of induction motor characteristics by power losses.	3
Lab 5	AC three-phase generator- characteristics	3
Lab 6	AC three-phase generator directly connected to mains	3
Lab 7	Synchronous motor investigation	3
Lab 8	DC shunt motor characteristics	3
Lab 9	DC series motor characteristics	3
Lab 10	DC shunt generator investigation	3
Lab 11	Grading	1
Total hours:		<b>30</b>

TEACHING TOOLS USED
N1. Laboratory with measurement test stands

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation <i>F – forming (during semester) P – concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(L)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Laboratory preparation
F2(L)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	laboratory activity
F3(L)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	reports
P(L)	$P=0,3 \cdot F1 + 0,3 \cdot F2 + 0,4 \cdot F3$	

PRIMARY AND SECONDARY LITERATURE
<b>PRIMARY LITERATURE:</b> [1] Plamitzer A., Maszyny elektryczne, WNT, Warszawa 1989 [2] Latek W: Zarys maszyn elektrycznych. WNT W-wa 1974 r. [3] Antal L., Janta T., Zieliński P.: Maszyny elektryczne. Ćwiczenia laboratoryjne. Of. Wyd. PWr, Wrocław 2001.
<b>SECONDARY LITERATURE:</b> [1] Dąbrowski M. Projektowanie maszyn prądu przemiennego, WNT Warszawa 1994 [2] Dąbrowski M. Konstrukcja maszyn elektrycznych, WNT W-wa 1978 [3] Jezierski E.: Transformatory WNT Wa-wa 1983 r. [4] Latek W.: Maszyny elektryczne w pytaniach i odpowiedziach. WNT Wa-wa 1978 r. [5] Bajorek Z.: Maszyny elektryczne. WNT 1976 r.

SUBJECT SUPERVISOR
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT  
**ARR043103 - Electrical machines 2**  
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Control Engineering and Robotics**

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U01	K1AiR_U22	C.1 C.2 C.3	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7	N.1
PEK_U02	K1AiR_U22	C.1 C.4	Lab1 Lab8 Lab9 Lab10	N.1
PEK_U03	K1AiR_U22	C.1 C.2 C.3 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11	N.1
PEK_K01	K1AiR_K06	C.1 C.2	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11	N.1