

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Napęd elektryczny 2**
 Name in English: **Electrical Drive 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: **ARR043207**
 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):			30		
Form of crediting:			crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:			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		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has a knowledge on the basic converter-fed DC and AC motor drives.
2. Can calculate the basic parameters and values characterizing different operation states of electrical motors and drive systems.
3. Is able to use the known measurement methods to connect, put into the operation and test the designed measurement system, can analyze and evaluate the measurement results.

SUBJECT OBJECTIVES

- C1. Extending of previous theoretical knowledge under laboratory exercises.
- C2. Familiarizing students with application of previously known measurement techniques for testing of the DC and AC motor drives.
- C3. The acquisition of practical knowledge and skills for connection, putting into operation and testing of the electrical motor drives and elaboration of their static and dynamical characteristics.
- C4. Acquisition and fixing the social competences related to work in teams, solving engineering problems together; responsibility, honesty and fairness, observance of manners which are obligatory for academia and society.

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

PEK_U01 Can choose the suitable low voltage electric apparatus for given electrical drive of different power.

PEK_U02 Can realize the measurements of static and dynamical characteristics of different DC and AC electrical drives.

relating to social competences:

PEK_K01 Student can act independently and cooperate within a group working on a complex engineering project.

PROGRAMME CONTENT

Form of classes - laboratory		Number of hours:
Lab 1	Introduction, presentation of laboratory rules and safety requirements. Repetition the basic rules of application of analog and digital measurement devices. Introduction to laboratory stands.	2
Lab 2	Forming of characteristics of DC motor with separate excitation in different operation modes.	2
Lab 3	Testing of the electrical drive with DC series motor.	2
Lab 4	Testing of the electrical shaft with DC motors.	2
Lab 5	Testing of DC motor drive controlled by bidirectional static converter.	2
Lab 6	Testing of DC series motor drive controlled by DC chopper.	2
Lab 7	Testing of the electrical starting systems for the squirrel-cage and wounded-rotor induction motors.	2
Lab 8	Testing of the electrical braking systems for the induction motors.	2
Lab 9	Testing of abnormal and unsymmetrical operation modes in the induction motor drive.	2
Lab 10	Testing of the induction motor drive supplied form the voltage inverter - scalar control.	2
Lab 11	Testing of the induction motor drive supplied form the voltage inverter - vector control.	2
Lab 12	Testing of the induction motor cascade drive system of constant power.	2
Lab 13	Testing of the induction motor cascade drive system of constant torque.	2
Lab 14	Testing of the drive systems with BLDC motor.	2
Lab 15	Additional term. Assesment of the laboratory with grade.	2
Total hours:		30

TEACHING TOOLS USED

- N1. Laboratory exercises in student groups; testing of student knowledge with short test before laboratory exercises.
 N2. Assessment of the laboratory exercises by reports.

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_K01	Activity during laboratory exercises (including grades of short tests).
F2(L)	PEK_U01 PEK_U02 PEK_K01	Preparation of the report.
P(L)	$P=0,3 \cdot F1 + 0,7 \cdot F2$	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Napęd elektryczny - laboratorium, praca zbiorowa pod red. T. Orłowskiej-Kowalskiej, Oficyna Wyd. P.Wr., 2000

SECONDARY LITERATURE:

- [1] Napęd elektryczny, praca zbiorowa pod red. Z. Grunwalda, WNT, 1987
 [2] W. Leonhard, Control of Electrical Drives, Springer Verlag, 1990

SUBJECT SUPERVISOR

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**MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ARR043207 - Electrical Drive 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_U23	C.1 C.2 C.3 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.1 N.2
PEK_U02	K1AiR_U23	C.1 C.2 C.3	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.1 N.2
PEK_K01	K1AiR_K03 K1AiR_K04	C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.1 N.2