

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Napęd elektryczny 1**  
 Name in English: **Electrical Drive 1**  
 Main field of study (if applicable): **Electrical Engineering**  
 Specialization (if applicable):  
 Level and form of studies: **1st level, part-time**  
 Kind of subject: **obligatory**  
 Subject code: **ELR053261**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	20				
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 :					
including number of ECTS points for direct teacher-student contact (BK) classes:	1.40				

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

- Has a basic knowledge in the field of electrical machines, their construction, way of operation, knows equivalent schemes, mathematical models and basic characteristics of DC and AC motors.
- Has a basic knowledge on the basic low voltage apparatus, their parameters and applications indifferent electrical systems.
- Has a basic knowledge on description of linear control systems, their performance and analysis.
- Is able to use the knowledge of differential and integral calculus in the problems connected with the engineering studies.
- Can solve the problems related to the analysis of linear controlled systems; knows how to use the proper mathematical methods for time-domain analysis of controlled plants.
- 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.
- Understands the necessity of taking part in student laboratories and exercises to obtain new knowledge and skills.

**SUBJECT OBJECTIVES**

- C1. Familiarizing students with the basic problems of steady-state and dynamics of electrical drives.  
 C2. Familiarizing students with the basic DC and AC motor drives and speed shaping methods in various operation conditions.  
 C3. Gaining skills for understanding, interpretation and analysis of steady state and dynamical performance of basic electrical drives.

**SUBJECT LEARNING OUTCOMES***relating to knowledge:*

- PEU\_W01 Has matured knowledge on basics of the DC and AC motor drives and their operation modes.  
 PEU\_W02 Can define and describe basic elements of converter-fed electrical drives and can describe and characterize basic speed shaping methods of the DC and AC motors in open and closed-loop systems, in various operation modes.

*relating to skills:**relating to social competences:*

- PEU\_K01 Student can act independently

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	Introduction. Electrical drive system - basic definition, components, steady state characteristics of different types of motors and loading machines, regions of operation.	2
Lec 2	Motion equation of electrical drive system, static and dynamic states, stable steady-state operation conditions. Influence of different types of mechanical connections to equation of motion. Basic rules of electrical motor choice depending on different load types.	2
Lec 3	DC motor drive systems: mathematical model of the motor, speed control methods, starting and braking methods.	2
Lec 4	Forming of DC motor characteristics using different feedbacks.	2
Lec 5	Speed and torque control of DC motor in the cascade structure. One and two-directional converter-fed DC drive systems.	2
Lec 6	Induction motor drives - methods of speed control, starting and braking methods for squirrel-cage and wound-rotor machines.	2
Lec 7	Frequency scalar speed and torque control method of the induction motor drive, basics of vector control methods.	2
Lec 8	Speed control methods of wound-rotor induction machines; constant torque and constant power cascade systems.	2
Lec 9	Electrical drives with permanent magnet synchronous motors. Future trends in electrical drive systems.	2
Lec 10	Crediting with grade.	2
Total hours:		<b>20</b>

TEACHING TOOLS USED
N1. Lecture with multimedia tools combined with classical lecture (problem oriented).
N2. Consultations.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(w)	PEU_W01 PEU_W02 PEU_K01	Participation in lectures.
F2(w)	PEU_W01 PEU_W02 PEU_K01	Test.
P(w)	$P=0,1 \cdot F1 + 0,9 \cdot F2$	

PRIMARY AND SECONDARY LITERATURE
<b>PRIMARY LITERATURE:</b> [1] Napęd elektryczny, praca zbiorowa pod red. Z. Grunwalda, WNT, 1987 [2] Napęd elektryczny – laboratorium, praca zbiorowa pod red. T. Orłowskiej-Kowalskiej, Oficyna Wyd. P.Wr., 2000 <b>SECONDARY LITERATURE:</b> [1] W. Leonhard, Control of Electrical Drives, Springer Verlag, 1990

SUBJECT SUPERVISOR
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