

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Przemysłowe układy napędowe**  
 Name in English: **Industrial drive systems**  
 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: **optional**  
 Subject code: **ARR043213**  
 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):	60			30	
Form of crediting:	crediting with grade			crediting with grade	
For group of courses mark (X) final course:					
Number of ECTS points:	2			1	
including number of ECTS points for practical (P) classes :				1	
including number of ECTS points for direct teacher-student contact (BK) classes:	1.40			0.70	

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

1. Student has the knowledge of general laws of mechanical engineering and electrical engineering.
2. Student has the basic knowledge in the scope of the construction and operation of electrical machines.
3. Student has the basic knowledge in the scope of theory of electrical drives and power electronics.
4. The student understands the need to improve their skills and acquire new knowledge.

**SUBJECT OBJECTIVES**

- C1. Presentation of electrical drive systems of selected working machines applied in industry  
 C2. Understanding of the control systems of industrial drives of working machines  
 C3. Presentation of the structure and principles of operation of electromechanical actuators used in industrial automatics  
 C4. Presentation of principles of design and selection of industrial drive systems and control systems of industrial automation.

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

- PEK\_W01 The student is able to describe the basic types of industrial working machines and industrial drive systems  
 PEK\_W02 The student is able to explain the operation of control systems applied in industrial drive systems  
 PEK\_W03 The student is able to present and define the standards and the rules applied for design, selection and operating of industrial drive systems

*relating to skills:*

- PEK\_U01 The student has the skills to select critically the structures of drive systems for chosen types of industrial working machines  
 PEK\_U02 The student has the skills to select the drive system and control system for chosen types of industrial working machines and given conditions  
 PEK\_U03 The student has the ability to elaborate and prepare of technical documentation of the preliminary design of the drive system and the control system for the chosen industrial working machine

*relating to social competences:*

- PEK\_K01 The student obtains the social competences in the development of multi-disciplinary knowledge and improving of self-education and skills

## PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Classification of industrial production processes. The types of industrial working machines.	2
Lec 2	Principles of design and selection of industrial drive systems	2
Lec 3	The systems of electrical drives and control of crane machines and elevators	2
Lec 4	The systems of electrical drives and control of hoisting machines	2
Lec 5	The systems of electrical drives and control of belt conveyors in the mines and raw material processing	2
Lec 6	The systems of electrical drives and control of metallurgical machines	2
Lec 7	The systems of electrical drives and control of pumps, fans, compressors and centrifuges	2
Lec 8	The systems of electrical drives and control of textile, paper and rewinding machines	2
Lec 9	The systems of electrical drives and control of press machines and machines with surge changing load	2
Lec 10	Converter control systems of high-power industrial drives	2
Lec 11	Classification and review of electromechanical actuators and industrial automation systems	2
Lec 12	Construction and control systems of electromagnetic actuators	2
Lec 13	Construction and control systems of piezoelectric actuators	2
Lec 14	Construction, operation and applications of sensors and electromechanical actuators in industrial automation	2
Lec 15	Test	2
Total hours:		<b>30</b>

Form of classes - project		Number of hours:
Proj 1	Presentation of individual project topics. Presentation of the rules and the form of completion of the project.	2
Proj 2	Performing of the calculations of the driving force and the determination of the required demand of drive power for the selected type of working machine	2
Proj 3	Preliminary selection of the components of drive system and power supply system. Critical analysis of the variant selection of the drive motor	2
Proj 4	Selection of rated power, construction type and mechanical size of the motor, the work duty, the degree of protection and other factors of the motor	2
Proj 5	Selection of the type of speed control system of working machine. Selection of the method of starting and braking of drive system	2
Proj 6	Critical analysis of the variant selection of control system and selection of optimal solution. Catalog selection of power electronics converters, elements of primary circuits and switches	2
Proj 7	Elaboration of the final form of the project for the considered drive system of working machine.	3
Total hours:		<b>15</b>

## TEACHING TOOLS USED

- N1. Lecture with multimedia presentation  
N2. Subject consultations

## 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(W)	PEK_W01 PEK_W02 PEK_W03	Grading on the base of written test
P(W)	P=F1	
F1(P)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Grading of project advances during project classes
F2(P)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Grading of the final form of project
P(P)	P=0,4*F1+0,6*F2	

<b>PRIMARY AND SECONDARY LITERATURE</b>
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<b>PRIMARY LITERATURE:</b>
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| <ol style="list-style-type: none"><li>1. Urbanowicz Heliodor: Napęd elektryczny maszyn roboczych, WNT, Warszawa, 1979.</li><li>2. Praca zbiorowa: Technika napędu elektrycznego. Zastosowanie. WNT, Warszawa, 1970.</li><li>3. Tunia H., Kaźmierkowski M.P.: Automatyka napędu przekształtnikowego. PWN, Warszawa, 1989</li><li>4. Praca zbiorowa: Elektryczne maszynowe elementy automatyki. WNT, Warszawa 1983.</li><li>5. Suchocki R.: Mikromaszyny elektryczne. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1996</li></ol> |
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<b>SECONDARY LITERATURE:</b>
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| <ol style="list-style-type: none"><li>1. Urbanowicz H.: Napęd elektryczny dźwignic, WNT, Warszawa, 1976.</li><li>2. Piątkiewicz A., Sobolski R.: Dźwignice, WNT, Warszawa, 1969.</li><li>3. Szklarski L., Zarudzi J.: Elektryczne maszyny wyciągowe, PWN, Warszawa - Kraków 1998 r.</li><li>4. Antoniak J.: Przenośniki taśmowe w górnictwie podziemnym i odkrywkowym. Wydawnictwo Politechniki Śląskiej, Gliwice, 2010.</li><li>5. Manitus J., Bisztyga K. i inni: Hutnicze napędy elektryczne. Wydawnictwo "Śląsk". Katowice 1972.</li><li>6. Jędrał W.: Pompy wirowe. Wydawnictwa Naukowo-Techniczne, Warszawa, 1998</li><li>7. Wróbel T.: Silniki skokowe. WNT, Warszawa 1993.</li><li>8. Glinka T.: Maszyny elektryczne wzbudzone magnesami trwałymi. Wydawnictwo Politechniki Śląskiej, Gliwice, 2002.</li></ol> |
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<b>SUBJECT SUPERVISOR</b>
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Krzysztof Pieńkowski, krzysztof.pienkowski@pwr.edu.pl
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT ARR043213 - Industrial drive systems 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_W01	K1AIR_AMPU_W04 K1AIR_AMPU_W09	C.1 C.2 C.3	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N.1
PEK_W02	K1AIR_AMPU_W04 K1AIR_AMPU_W09	C.1 C.2 C.3	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N.1
PEK_W03	K1AIR_AMPU_W04 K1AIR_AMPU_W09	C.1 C.2 C.3	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec14 Lec15	N.1
PEK_U01	K1AIR_AMPU_U04	C.1 C.2 C.3 C.4	Proj1 Proj2 Proj3 Proj4 Proj5 Proj6 Proj7	N.2
PEK_U02	K1AIR_AMPU_U04	C.1 C.2 C.3 C.4	Proj1 Proj2 Proj3 Proj4 Proj5 Proj6 Proj7	N.2
PEK_U03	K1AIR_AMPU_U04	C.1 C.2 C.3 C.4	Proj1 Proj2 Proj3 Proj4 Proj5 Proj6 Proj7	N.2
PEK_K01	K1AiR_K09	C.1 C.2 C.3 C.4	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15 Proj1 Proj2 Proj3 Proj4 Proj5 Proj6 Proj7	N.2