

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Przemysłowe układy napędowe**
 Name in English: **Industrial drive systems**
 Main field of study (if applicable): **Industrial Control Engineering**
 Specialization (if applicable):
 Level and form of studies: **1st level, full-time**
 Kind of subject: **optional**
 Subject code: **APR013213**
 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 LEARNING OUTCOMES*relating to knowledge:*

- PEU_W01 The student is able to describe the basic types of industrial working machines and industrial drive systems
 PEU_W02 The student is able to explain the operation of control systems applied in industrial drive systems
 PEU_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:

- PEU_U01 The student has the skills to select critically the structures of drive systems for chosen types of industrial working machines
 PEU_U02 The student has the skills to select the drive system and control system for chosen types of industrial working machines and given conditions
 PEU_U03 The student has the ability to elaborate the multimedia presentation of the industrial drive system and the control system for the selected working machine

relating to social competences:

- PEU_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: | | 30 |

| Form of classes - seminar | | Number of hours: |
|---------------------------|--|------------------|
| Sem 1 | Presentation of the principles and forms of developing and delivering a multimedia presentation. Information on the rules for passing the subject. Selection of individual seminar topics. | 2 |
| Sem 2 | Presentation and discussion on industrial drive systems for cranes, lifts and hoisting machines. | 2 |
| Sem 3 | Presentation and discussion on industrial drive systems of belt conveyors and industrial transport systems | 2 |
| Sem 4 | Presentation and discussion on electric drive systems of metallurgical machines: rolling mills, roller tables, cutting machines. | 2 |
| Sem 5 | Presentation and discussion on industrial drive systems for pumps, fans and compressors. | 2 |
| Sem 6 | Presentation and discussion concerning industrial drive systems of rewinding machines: drives of textile and paper machines. | 2 |
| Sem 7 | Presentation and discussion on industrial propulsion systems in cement plants and raw material preparation departments. | 2 |
| Sem 8 | Presentation and discussion on the applications of electromechanical actuators and industrial automation systems. | 1 |
| Total hours: | | 15 |

TEACHING TOOLS USED

- N1. Lecture with multimedia presentation
 N2. Multimedia presentation of the student and problem discussion.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

| Evaluation <i>F - forming (during semester) P - concluding (at semester end)</i> | Educational effect number | Way of evaluating educational effect achievement |
|---|--|--|
| F1(W) | PEU_W01 PEU_W02 PEU_W03 | Grading on the base of written test |
| P(W) | P=F1 | |
| F1(P) | PEU_U01 PEU_U02 PEU_U03 PEU_K01 | Grading of regularity of work and active participation in seminar discussions |
| F2(P) | PEU_U01 PEU_U02 PEU_U03 PEU_K01 | Evaluation of the developed multimedia presentation with a description of the drive and control of the selected work machine |
| P(P) | P=0,4*F1+0,6*F2 | |

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| PRIMARY AND SECONDARY LITERATURE |
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| PRIMARY LITERATURE: |
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| <ol style="list-style-type: none">1. Urbanowicz Heliodor: Napęd elektryczny maszyn roboczych, WNT, Warszawa, 1979.2. Praca zbiorowa: Technika napędu elektrycznego. Zastosowanie. WNT, Warszawa, 1970.3. Tunia H., Kaźmierkowski M.P.: Automatyka napędu przekształtnikowego. PWN, Warszawa, 19894. Praca zbiorowa: Elektryczne maszynowe elementy automatyki. WNT, Warszawa 1983.5. Suchocki R.: Mikromaszyny elektryczne. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1996 |
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| SECONDARY LITERATURE: |
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| <ol style="list-style-type: none">1. Urbanowicz H.: Napęd elektryczny dźwignic, WNT, Warszawa, 1976.2. Szklarski L., Zarudzki J.: Elektryczne maszyny wciągowe, PWN, Warszawa - Kraków 1998 r.3. Antoniuk J.: Przenośniki taśmowe w górnictwie podziemnym i odkrywkowym. Wydawnictwo Politechniki Śląskiej, Gliwice, 2010.4. Manitus J., Bisztyga K. i inni: Hutnicze napędy elektryczne. Wydawnictwo "Śląsk". Katowice 1972.5. Jędrał W.: Pompy wirowe. Wydawnictwa Naukowo-Techniczne, Warszawa, 1998.6. Łastowiecki J.: Elementy i podzespoły półprzewodnikowych układów napędowych. Oficyna Wydawn. Polit. Warsz., Warszawa 1999. |
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| SUBJECT SUPERVISOR |
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| Krzysztof Pieńkowski, krzysztof.pienkowski@pwr.edu.pl |
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