

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Mikromaszyny elektryczne dla automatyki przemysłowej**
 Name in English: **Electrical micromachines for industrial automation**
 Main field of study (if applicable): **Industrial Control Engineering**
 Specialization (if applicable): **Automation of Machines, Vehicles and Apparatus**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **obligatory**
 Subject code: **APR013104**
 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 :					
including number of ECTS points for direct teacher-student contact (BK) classes:	1.40				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has a basic knowledge of the construction of electrical machines and transformers.
2. Knows and understands the principles of operation of electrical machines and transformers.
3. Knows and understands the physical phenomena in electrical machines and transformers.
4. Knows the equivalent circuits and vector diagrams of electrical machines and transformers at different operating conditions.

SUBJECT OBJECTIVES

C1. To familiarize the students with the construction, principle of operation, electromagnetic phenomena and electromechanical characteristics of the electrical micromachines.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01 Has the knowledge of the construction, principles of operation of the electrical micro-machines.

PEU_W02 Has the knowledge of the electromechanical characteristics of the electrical micro-machines.

relating to skills:

relating to social competences:

PEU_K01 Understands the need for live long learning and rising qualifications

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	Familiarization with the subject, requirements, form of crediting and literature.	1
Lec 2	Physical phenomena occurring in the electric machines.	2
Lec 3	Properties, parameters and types of permanent magnets used in electric machines. Rules for solving of the circuits with permanent magnets. Stabilization of the magnetic flux.	4
Lec 4	Commutator DC machines: construction, principle of operation, operating characteristics.	2
Lec 5	Universal and repulsion motors: construction, principle of operation, operating characteristics.	2
Lec 6	Brushless DC motors (BLDC): construction, principle of operation, electromagnetic torque, torque ripples. Supplying systems, waveforms of electrical and mechanical quantities, operating characteristics. Partial crediting.	4
Lec 7	Low power synchronous motors: construction, principle of operation, electromagnetic torque, magnetic circuit structures.	2
Lec 8	Single-phase asynchronous motors: construction, principle of operation, operating characteristics.	2
Lec 9	Two-phase asynchronous motors. Linear motors. Asynchronous motors synchronized by reluctance torque.	2
Lec 10	Piezoelectric transducers. Hysteresis motors. Transformers of angular position. Phase shifters and induction voltage regulators.	3
Lec 11	Tachogenerators: construction, principle of operation, types of tachogenerators. Stepper motors: construction, principle of operation, types of stepper motors, control.	4
Lec 12	Crediting.	2
Total hours:		30

TEACHING TOOLS USED
N1. Lecture with the use of the audio-visual technology, multimedia presentations.

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	Crediting with grade
P(w)	P=F1	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] I. Dudzikowski, M. Ciurys, Komutatorowe i bezszczotkowe maszyny elektryczne wzbudzone magnesami trwałymi, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2011. [2] Glinka T., Maszyny elektryczne wzbudzone magnesami trwałymi, Wydawnictwo Politechniki Śląskiej, Gliwice 2002 . [3] Sochocki R., Mikromaszyny elektryczne, Wydawnictwo Politechniki Warszawskiej, Warszawa 1996. SECONDARY LITERATURE: [1] J. Przepiórkowski, Silniki elektryczne w praktyce elektronika, Wydawnictwo BTC, 2007.

SUBJECT SUPERVISOR
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