STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
New technology in electromechanics		**1010322331010324892**
Field of study: **Electrical Engineering**	Profile of study (general academic, practical): **general academic**	Year /Semester: **2 / 3**
Elective path/specialty: **Electrical Systems in Mechatronics**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **15** Classes: **-** Laboratory: **-** Project/seminars: **-**		No. of credits: **1**
Status of the course in the study program (Basic, major, other): **major**	(university-wide, from another field): **from field**	
Education areas and fields of science and art: **technical sciences** **Technical sciences**		ECTS distribution (number and %): **1 100%** **1 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Knowledge of electromagnetic field theory, electrical engineering and electrodynamics, knowledge of construction of the energy transducers.
2	**Skills**	The skill of effective self-education in a field related to the selected field of study.
3	**Social competencies**	Skills in teamwork and proper verbal communication, the awareness of the need to broaden their competences and knowledge, a willingness to work together as a team.

Assumptions and objectives of the course:

The main goal is to get acquainted with the modern applications of the phenomena associated with the electromagnetic field. Knowledge of principles of operation, property and construction of electromechanical transducers discussed.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Know the structure of selected electromechanical and electromagnetic cyclic and acyclic transducers and systems that use the energy phenomena: superconductivity, magnetic levitation - [K_W03++ K_W10+]

Skills:

1. The student will be able to indicate the potential use of new technologies in the construction of the electromechanical transducers - [K_U01+++ K_U19+++]

Social competencies:

1. . The student is aware of the value of his work, respect the principles of teamwork, takes responsibility for collaborative work - [K_K01 + K_K02 ++]

Assessment methods of study outcomes

Lecture:
-assessment of knowledge and skills by the completion of a written test,
-continuous evaluation for each course (rewarding activity and quality of the expression).

Extra points for the activity in the classroom, and in particular for:
-discussion and proposition of additional aspects of the subjects,
- comments related to the improvement of teaching materials,
- quality and diligence of the developed reports.

Course description

Superconductivity and its applications, magnetic separators, magnetic levitation, magnetic bearings. Electrotechnology. Structure and properties of magnetic fluid. Magnetic fluid applications. Mechatronic elements: sensors and actuators. Microelectromechanical systems (MEMS): microsensors, microactuators, silicon technology applications. Nanotechnology, nanomachines. Updating 2017: Structure and properties of shape memory alloys. Shape memory alloys applications.

Methods of education:
- lecture with multimedia presentation supplemented with examples given on the board,
- interactive lecture with questions to students,
- student activity is taken into account during the course of the assessment process.

Basic bibliography:

1. 1. Stankowski J., Czyżak B., Nadprzewodnictwo, Wydawnictwa Naukowe-Techniczne; Warszawa; 1994.
2. 2. Burcan J., Łożyska wspomagane polem magnetycznym, Wydawnictwa Naukowo-Techniczne, Warszawa; 1996.
3. 3. Ławniczak A., Milecki A.: Ciecze elektro- i magnetoreologiczne oraz ich zastosowania w technice, WPP1999.
4. 4. Schmid D., Mechatronika, tłum. z niem. oprac. wersji pol. Olszewski M., Wyd. REA, Warszawa 2002.

Additional bibliography:

1. 1. Bishop R. H.,The Mechatronics Handbook, Austin, Texas, CRC Press 2002
2. 2. Gad-el-Hak M. The MEMS Handbook, CRC Press 2006
3. 3. Hoffmann K. H., Functional Micro and Nanosystems, Springer ? Verlag Berlin Heidelberg 2004.
4. 4. Stachowiak D., Kurzawa M., Charchuta I., Oprogramowanie do projektowania aktuatorów liniowych wykonanych ze stopów z pamięcią kształtu, Academic Journals Poznan University of Technology, Numer: 91/2017 Str: 355-364, 2017

Result of average student's workload

Activity	Time (working hours)
1. Lectures	15
2. Participate in the consultations on the lecture	5
3. Prepare for the completion	10
4. Participate in the completing	2

Student's workload

Source of workload	hours	ECTS
Total workload	25	1
Contact hours	30	1
Practical activities	0	0