COURSE DESCRIPTION CARD - SYLLABUS

Course name
New technologies in electrical engineering [S2Eltech2-SNPE>NTwE]

Course

Field of study
Electrical Engineering

Year/Semester
2/3

Area of study (specialization)
Drive Systems in Industry and Electromobility

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

dr hab. inż. Dorota Stachowiak
dorota.stachowiak@put.poznan.pl

Lecturers

Prerequisites

Students starting this subject should have a basic knowledge of: electromagnetic field theory, electrical engineering and electrodynamics, knowledge of energy converters. He should also have the ability to effectively self-study in the field related to the selected field of study and be aware of the need to broaden their competences and knowledge.

Course objective

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.

Course-related learning outcomes

Knowledge:
1. The student has in-depth and expanded knowledge of physics, necessary to understand the physical phenomena affecting the properties of new materials and the operation of advanced electrical systems.
2. The student has knowledge of development trends, new solutions, and dilemmas of modern engineering.

Skills:
1. The student is able to acquire information from literature, databases, and other sources, interpret, evaluate, critically analyze, and synthesize it, as well as draw conclusions and formulate and fully justify opinions.
2. The student is able to individually and as part of a team, is able to manage a team in a way that ensures the implementation of the task within the set deadline; is able to determine the directions of further learning, and organize the process of self-education and others.
3. The student is able to assess the usefulness and possibility of using new technical and technological developments in the design and manufacture of electrical systems and equipment, containing solutions of an innovative nature, and if necessary, propose their improvements.

Social competences:
1. The student recognizes the importance of knowledge in solving cognitive and practical problems and understands that in technology, knowledge and skills quickly become obsolete and, therefore, require constant replenishment.
2. The student is aware of the need to develop professional achievements and observe professional ethics, fulfill social obligations, inspire and organize activities for the benefit of the social environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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.

Programme content

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

Course topics

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

Teaching methods

- 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.

Bibliography

Basic:
1. Stankowski J., Czyżak B., Nadprzewodnictwo, Wydwanictwa Naukowe-Techniczne; Warszawa; 1994.
2. Boldea I., Linear Electric Machines, Drives, and Maglevs Handbook , CRC Press Taylor & Francis Group, 2013 .
3. Burcan J., Łożyska wspomagane polem magnetycznym, Wydawnictwa Naukowo-Techniczne, Warszawa; 1996.
4. Milecki A.: Ciecze elektro- i magnetoreologiczne oraz ich zastosowania w technice, WPP 2010.

5. Schmid D., Mechatronika, tłum. z niem. oprac. wersji pol. Olszewski M., Wyd. REA, Warszawa 2002.

Additional:
1. Bishop R. H.,The Mechatronics Handbook, Austin, Texas, CRC Press 2002
2. Gad-el-Hak M. The MEMS Handbook, CRC Press 2006
3. Stachowiak D., Demenko A., Finite Element and Experimental Analysis of an Axisymmetric Electromechanical Converter with a Magnetostrictive Rod, Energies, https://www.mdpi.com/1996-1073/13/5/1230, 2020.
4. Stachowiak D., Kurzawa M., A computational and experimental study of shape memory alloy spring actuator, Przegląd Elektrotechniczny, http://pe.org.pl/articles/2019/7/7.pdf, 2019.

Breakdown of average student's workload

	Hours	ECTS
Total workload	30	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	0,50