COURSE DESCRIPTION CARD - SYLLABUS

Course name
Sensor and non-electrical values measurement

Course

Field of study
Biomedical Engineering
Area of study (specialization)

Level of study
First-cycle studies
Form of study
full-time

Year/Semester
3/6
Profile of study
general academic
Course offered in
polish
Requirements
compulsory

Number of hours

Lecture
15
Laboratory classes
15
Other (e.g. online)

Tutorials
Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Students beginning this subject should have knowledge of mathematical analysis and statistics, technical drawing and machine parts.

Course objective

To acquaint students with theoretical basics of processing of measurement signals, spectral analysis and filtering of measurement signals, mathematical description of measuring transducers in static and dynamic states. Students gain knowledge about the physical operation principles of selected transducers. Acquire the ability to select transducers and metrological parameters for specific measurement tasks

Course-related learning outcomes

Knowledge

1. Student should be familiar with the physical and mathematical foundations of sensors used in biomedical engineering.
2. The student should characterize the basic features and principles of operation and operation of sensors and transducers used in biomedical engineering.
3. Student should define the basic directions of development of measurement sensors in biomedical engineering.

Skills

1. Student is able to analyze the measurement task for the required metrological properties of the transducer.
2. The student is able to formulate the basic principles of proper operation of the measuring transducers.
3. Student is able to choose measuring transducers for the selected technical applications.
4. Student is able to propose alternative measuring techniques and elements for their realization.

Social competences

1. Student understands the need for lifelong learning; He can inspire and organize the learning process of others.
2. Student is able to cooperate in a group.
3. The student is able to interact with specialists in other fields of science and technology.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Passing on the basis of a colloquium consisting of 2 general and 3 specific questions or a selection test of 40 questions, conducted at the end of the semester.

Laboratory: Passed on the basis of a written answer in the scope of content. Performed the laboratory exercises according to the program established by the teacher with a positive grade of the reports on the six exercises prepared according to the subject matter. In order to get a credit for the laboratories, all exercises must be passed.

Programme content

Lecture:

The role and importance of measuring transducers in biomedical engineering. Signals and their mathematical description. Frequency analysis of measuring signals. Physical and mathematical models

of sensors and transducers. Static and dynamic characteristics, quality criteria, static and dynamic errors. Principle of operation, characteristics, construction systems and use of selected sensors and transducers (force, pressure, dimensions, angle, temperature). Calibration of measuring transducers. Operation principle, parameters and application of switches in biomedical engineering. Assessment of metrological properties of switches. Smart transmitters. Development directions of sensors and transducers.

Laboratory:
Laboratory exercises of the above topics.

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.
2. Laboratory exercises: performing the tasks given by the teacher - practical exercises.

Bibliography

Basic

1. J. Piotrowski, Pomiary – czujniki i metody pomiarowe wybranych wielkości fizycznych i składu chemicznego. WNT, Warszawa 2009.
2. M. Miłek, Metrologia wielkości nieelektrycznych. Oficyna Wydawnicza Uniwersytetu Zielonogórskiego. Zielona Góra 2006.
3. Cz. Jermak, Przetworniki pomiarowe. Materiały pomocnicze do laboratorium. Wydawnictwo Politechniki Poznańskiej. Poznań, 2009

Additional

1. S. Tumański, Technika pomiarowa. WNT, Warszawa 2007.
2. R. Tadeusiewicz, Inżynieria biomedyczna, Uczelniane Wydawnictwa Naukowo-Dydaktyczne AGH, Kraków 2008

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,2
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	20	0,8

[1] delete or add other activities as appropriate