



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Gauges and measuring elements [S1Mech2>CiEP]

Course

Field of study
Mechatronics

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

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 mechatronics.
2. The student should characterize the basic features and principles of operation and operation of sensors and transducers used in mechatronics.
3. Student should define the basic directions of development of measurement sensors in mechatronics.

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 consisting of 20 to 40 open as well as closed questions, conducted at the end of the semester

Laboratory: A passing grade is based on a written response within the scope established by the laboratory instructor or a positive evaluation of reports for the six completed exercises, following the designated subject matter. All exercises must be passed to receive credit for the laboratory course.

Programme content

The program covers the fundamental concepts of measuring transducer theory. It includes an introduction to their principles of operation, construction, and applications.

Course topics

Lecture:

The role and importance of measuring transducers in mechatronics. 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 mechatronics. Assessment of metrological properties of switches. Smart transmitters. Development directions of sensors and transducers.

Laboratory:

1. Evaluation of the static metrological properties of an inductive length transducer.
2. Evaluation of the dynamic properties of thermistor transducers in the time domain.
3. Determination of the metrological characteristics of a pneumatic length transducer.
4. Evaluation of the dynamic properties of piezoelectric acceleration transducers.
5. Frequency analysis of measurement signals.
6. Static and dynamic testing of proximity switches.

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.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00