Metrology in mechanical and electrical II - opis przedmiotu

Informacje ogólne

Nazwa przedmiotu	Metrology in mechanical and electrical II
Kod przedmiotu	06.9-WM-ZiIP-ZL-ANG-D-22_20
Wydział	Wydział Mechaniczny
Kierunek	Management and Production Engineering
Profil	ogólnoakademicki
Rodzaj studiów	drugiego stopnia z tyt. magistra inżyniera
Semestr rozpoczęcia	semestr zimowy 2020/2021

Informacje o przedmiocie

Semestr	3
Liczba punktów ECTS do zdobycia	2
Typ przedmiotu	obowiązkowy
Język nauczania	angielski
Sylabus opracował	• dr inż. Leszek Furmankiewicz

Formy zajęć

Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Laboratorium	30	2	18	1,2	Zaliczenie na ocenę
Wykład	15	1	9	0,6	Zaliczenie na ocenę

Cel przedmiotu

- To provide knowledge about the parameters of measuring transducers and methods to describe their static and dynamic properties.
- To provide knowledge about the structure, principle of operation and properties of functional blocks of the measurement signal processing path and measuring transducers of basic non-electric quantities.
- To provide knowledge abou the principles of organization of measuring systems and computer measuring techniques.
- Developing the skills of planning and conducting experiments in the field of experimental determination of the characteristics of the components of the measurement signal processing track.
- Developing skills in setup and using measuring systems.

Wymagania wstępne

Metrology in mechanical and electrical I

Zakres tematyczny

Introduction. Transducer, sensor. The role of sensors and measuring transducers in mechanics and electronics. Classification of sensors and transducers. Static and dynamic properties of measuring transducers.
Analog measurement signal processing. Basic functional blocks of analog measurement signal processing track.

Analog-to-digital and digital-to-analog processing. General characteristics of the A / D and D / A processing process: sampling, quantizing, coding. Characteristics of the basic types of A / D and D / A converters. Parameters of A / D and D / A converters. Selected examples of A / D and D / A converters applications.

Introduction to measurements of non-electric quantities using electric methods. Classification and basic areas of sensor application. Intelligent sensors.

Measurements of the quantities describing the displacement. Linear displacement sensors: with changing electrical circuit parameters, ultrasonic, optoelectronic. Acceleration and speed sensors in linear and rotational displacement. Angular displacement sensors.

Force and pressure measurements. Strain gauges, piezoelectric, force sensors. Structures of force transducers. Membrane pressure sensors.

Temperature measurements. Thermoresistors, thermocouples, thermistors and semiconductor sensors. Measuring systems for temperature sensors.

Measuring systems. Organization and classification, basic tasks and configurations of measuring systems. DAQ systems. Measuring interfaces. Virtual measuring instruments.

Metody kształcenia

- lecture: conventional/traditional lecture
- laboratory: work in the groups, practical excersises.

Efekty uczenia się i metody weryfikacji osiągania efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
The student knows the parameters and methods used to describe and evaluate static and dynamic properties of measuring transducers. Is able to list and characterize the basic functional blocks of the analog measurement signal processing track. Is able to explain the principle of operation of basic types of analog-to-digital and digital-to-analog converters as well as measuring transducers of basic non-electric quantities and is able to present - using examples - the most important areas of their applications.	• K_W18	• kolokwium	• Wykład
Is able to plan and perform an experiment enabling experimental determination of the processing characteristics of measuring transducers	• K_U02	• aktywność w trakcie zajęć • wykonanie sprawozdań laboratoryjnych	• Laboratorium
Is able to configure and use measuring systems based on DAQ subsystems and typical measuring interfaces.	• K_U11	• aktywność w trakcie zajęć • wykonanie sprawozdań laboratoryjnych	• Laboratorium

Warunki zaliczenia

Lecture – the passing condition is to obtain a positive mark from the final test.

Laboratory – the passing condition is to obtain positive marks from all laboratory exercises to be planned during the semester.

Calculation of the final grade: lecture 50% + laboratory 50%.

Literatura podstawowa

1. Plassche, R.J. van de,: *Integrated Analog-to-digital and Digital- to-Analog Converters*, Kluwer Academic Publishers, Boston/ Dordrecht/ London, 1994.
2. Sydenham P. H. (Ed.): Handbook of Measurement Science – Vol - 1: Theoretical Fundamentals, John Wiley & Sons, Chichester,1991.
3. Bentley J. P.: *Principles of Measurement Systems*, Pearson Education Limited, Harlow, England, 2005.
4. Sansen W., Huijsing J., Plassche R.J.: Analog Circuit Design: Mixed A/D Circuit Design, Sensor Interface Circuits and Communication Circuits. Springer, 2013.
5. Huijsing J.: Operational Amplifiers: Theory and Design. Third edition, Springer, 2016.
6. Fraden J.: *Handbook of Modren Sensors. Physics, Design, and Applications.* Fifth edition. Springer - Verlag New York, 2015.
7. Pelgrom M.: Analog-to-Digital Conversion. Springer, 2016.

Literatura uzupełniająca

Uwagi

Zmodyfikowane przez dr inż. Leszek Furmankiewicz (ostatnia modyfikacja: 28-04-2020 21:40)