

Electronic measuring instruments - opis przedmiotu

Informacje ogólne	
Nazwa przedmiotu	Electronic measuring instruments
Kod przedmiotu	06.5-WE-ELEKTP-EIMeasIn-S16
Wydział	Wydział Nauk Inżynieryjno-Technicznych
Kierunek	Elektrotechnika
Profil	ogólnoakademicki
Rodzaj studiów	Program Erasmus pierwszego stopnia
Semestr rozpoczęcia	semestr zimowy 2021/2022

Informacje o przedmiocie	
Semestr	6
Liczba punktów ECTS do zdobycia	5
Typ przedmiotu	obieralny
Język nauczania	angielski
Sylabus opracował	• prof. dr hab. inż. Ryszard Rybski

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
Wykład	30	2	-	-	Egzamin
Laboratorium	30	2	-	-	Zaliczenie na ocenę

Cel przedmiotu

- to familiarize students with the construction, principles of operation, metrological properties of modern multimeters, digital oscilloscopes, spectrum analyzers and sources of measurement signals

- to shape the skills in the use of electronic measuring instruments and in the estimation of the accuracy of measurements

- to become aware of the role of the microprocessor technology in signal processing circuits of modern measuring instruments

Wymagania wstępne

Fundamentals of electrical engineering, Electronics, Metrology

Zakres tematyczny

Trends in the development of modern measuring instruments. Microprocessor devices, microprocessor measuring blocks, cards and plug-in measurement modules, virtual instruments.

Digital multimeters. Characteristics of basic functional blocks of digital multimeters. Illustration of the possibility of using software procedures to improve the metrological properties of microprocessor measuring instruments on the example of selected digital multimeter solutions.

Electrical interference in the measurement of voltages and methods of eliminating them. Types of interferences and their sources. Attenuation of serial and parallel interferences. Principles of connections of signal sources to measuring instruments.

Measurement of high frequency voltages. Sources of errors in RF voltages measurement. Tests measuring probes. Measurement with using the voltmeter with high-impedance input circuit and measurement with impedance matching.

Instruments for narrowband AC voltage measurements. Selective voltmeter. Voltmeters with synchronous detection. Vector voltmeters.

Digital oscilloscopes. Classification of electronic oscilloscopes. Structure and principle of operation of a digital oscilloscope. Characteristics of operating modes. Comparative characteristics of selected types of modern digital oscilloscopes. Measurements using a digital oscilloscope.

Spectrum Analyzers and Nonlinear Distortion Meters. Classification, principle of operation, metrological and functional properties of spectrum analyzers. Digital spectrum analyzers: digital filter analyzers, FFT analyzers. Methods of measurement of the nonlinear distortion.

Instruments for impedance measurement. Automatic RLC meters, impedance analyzers, Q-meters, transformer bridges.

Electronic instruments for measuring electric power and energy. Specialized integrated circuits for measuring electric power and energy. Electronic energy meters.

Measurement signal sources. Sinusoidal voltage generation methods used in the field of small and high frequencies. Generators with digital frequency synthesis. Voltage and current calibrators.

Metody kształcenia

Lecture: conventional lecture, problem lecture, discussion

Laboratory: working with source document, group work, laboratory exercises

Efekty uczenia się i metody weryfikacji osiągnięcia efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
It can indicate the most important sources of interference accompanying the use of electronic measuring instruments and propose ways and means to minimize their impact on the measurement result		<ul style="list-style-type: none">• obserwacja i ocena aktywności na zajęciach	<ul style="list-style-type: none">• Laboratorium
Student can explain the principle of operation and characterize the metrological properties of modern multimeters, digital oscilloscopes, spectrum analyzers and signal source sources		<ul style="list-style-type: none">• egzamin - ustny, opisowy, testowy i inne	<ul style="list-style-type: none">• Wykład
It is aware of the role of the digital signal processing and microprocessor technology in the signal processing circuits of modern measuring instruments		<ul style="list-style-type: none">• egzamin - ustny, opisowy, testowy i inne	<ul style="list-style-type: none">• Wykład
Knows the general principles of using electronic measuring instruments designed to measure basic electrical quantities, can estimate the accuracy of measurements performed with taking into account the measurement and specification conditions		<ul style="list-style-type: none">• obserwacja i ocena aktywności na zajęciach	<ul style="list-style-type: none">• Laboratorium

Warunki zaliczenia

Lecture – the credit is given for obtaining positive grades in written tests carried out at least once a semester.

Laboratory – to receive a final passing grade student has to receive positive grades in all laboratory exercises provided for in the laboratory syllabus.

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

Literatura podstawowa

1. Tumanski S.: Principles of electrical measurement. Taylor & Francis, 2006
2. Bhargawa S.C: Electrical measuring instruments and measurements. CRC Press, 2012

Literatura uzupełniająca

1. Horowitz P., Hill W.: The art of electronics. Cambridge University Press, 2017

Uwagi

Zmodyfikowane przez dr hab. inż. Paweł Szcześniak, prof. UZ (ostatnia modyfikacja: 08-07-2021 21:49)

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