COURSE DESCRIPTION CARD - SYLLABUS

Course name
Metrology [S1Eltech1>Metr2]

Course

Field of study
Electrical Engineering

Year/Semester
2/3

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
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematics, physics, electrotechnics, electronics and metrology. Ability to realize the efficient self-education in the area related to the chosen field of studies. Awareness of the necessity of broadening of the competencesin the field of electrical engineering and willingness to cooperate in a team.

Course objective

Knowledge of measurement methodology, attributes of modern measuring devices and equipment, principles of using analog and digital measuring devices, and evaluation of measurement results

Course-related learning outcomes

Knowledge:
1. Ability to describe principles of methodology of electrical quantities measurements made with basic analog and digital devices.
2. Ability to explain a principle of the proper choice of elements of a simple set for measurements of

electrical quantities

Skills:
1. Ability to use the basic electrical measuring devices in accordance with operating manuals and to explain appropriate operation of the simple measuring systems.
2. Ability to made a simple measuring task and evaluate the inaccuracy of the obtained results

Social competences:
1. Ability to think and act in the enterprising way in the area of measuring engineering.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lectures: Assessment of the knowledge demonstrated on the written or oral exam in the field of the lectures content. Passing threshold: 50% of points. Rewarding grades from laboratory exercises and the presence, activity and quality of perception during the lecture.
Laboratory: Assessment of classes on the basis of:
- tests and bonuses for knowledge necessary to implement the problems posed in the area of laboratory tasks,
- continuous assessment during each class
- rewarding the increase in the ability to use the learned rules and methods,
- assessment of knowledge and skills related to the implementation of the measurement task, assessment of the report on the performed exercise.

Programme content

The issues covered are related to basic issues related to planning and implementing measurement tasks related to electrical quantities. Issues related to the calculation of errors and uncertainty of measurement results and the measurement of electrical signals using an oscilloscope and other measurement methods will be presented.

Course topics

Lecture:
Theoretical issues presented in close connection with practice include:
1. Measurement transducers: alternating voltage detectors, measurement amplifiers, a/c and d/a converters.
2. Static and dynamic properties of measuring instruments and tools.
3. Introduction to the structure and organization of measurement systems.
4. Examples of measurements of electrical quantities and assessment of the inaccuracy of their results.
Laboratory:
Theoretical issues presented in close connection with practice include:
1. Measurement methodology: definitions, concepts, standards, units of measurement.
2. Planning and implementation of the measurement task.
3. Elements of the theory of errors and uncertainty of measurement results.
4. Measurement methods.
5. Measurement transducers: alternating voltage detectors, measurement amplifiers, a/c and d/a converters.
6. Analog and digital measurements of electrical quantities.
7. Oscilloscope measurements.
8. Introduction to the structure and organization of measurement systems.
9. Examples of measurements of electrical quantities and assessment of the inaccuracy of their results.

Teaching methods

Lectures: Multimedia presentations expanded by examples shown on a board.
Laboratory: Multimedia presentations expanded by examples shown on a board and realization of experiments

Bibliography

Basic
1. A. Cysewska-Sobusiak - Podstawy metrologii i inżynierii pomiarowej, Wyd. Politechniki Poznańskiej, Poznań 2010.
2. A. Chwaleba, M. Poniński, A. Siedlecki - Metrologia elektryczna, WNT, Warszawa 2014.
3. J. Rydzewski - Pomiary oscyloskopowe, WNT, Warszawa 2007.
4. A. Cysewska-Sobusiak, Z. Krawiecki, A. Odon, P. Otomański, D. Turzeniecka, G. Wiczyński - Laboratorium z metrologii elektrycznej i elektronicznej, Wydawnictwo Politechniki Poznańskiej, Poznań 2000.
5. P. Otomański, Z. Krawiecki: Wykorzystanie środowiska LabVIEW do oceny niepewności rozszerzonej wyniku pomiaru rezystancji, Pomiary Automatyka Kontrola nr 12/2011, str. 1561 – 1563, 2011.
6. P. Otomański, M. Lepczyk: Niepewność rozszerzona jako miara niedokładności w pomiarach wybranych wielkości elektrycznych, Poznan University of Technology Academic Journals, Electrical Engineering, vol. 89, pp. 249 – 258, 2017.
7. Hulewicz A., Rozwiązania układowe oraz parametry detektorów wartości szczytowej, Elektronika, nr 7 2014, s. 149-153.
8. Hulewicz A., Krawiecki Z., Narzędzia statystyczne w procesie normalizacji wyników pomiarów, Poznan University of Technology Academic Journals, Electrical Engineering No 88, Computer Applications in Electrical Engineering 2016, Poznan 2016, s. 251-260.
Additional
1. S. Bolkowski - Elektrotechnika, Wydawnictwa Szkolne i Pedagogiczne, Warszawa 2009
2. S. Tumański - Technika pomiarowa, WNT, Warszawa 2007
3. T. Zieliński - Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań, WKŁ, Warszawa 2007
4. T. Skubis, Podstawy metrologicznej interpretacji wyników pomiarów, Wydawnictwo Politechniki Śląskiej, Gliwice, 2004
5. Międzynarodowy Słownik Podstawowych i Ogólnych Terminów Metrologii, Główny Urząd Miar, Warszawa, 1996
6. www.bipm.org
7. www.gum.gov.pl

Breakdown of average student's workload

	Hours	ECTS
Total workload	110	4,00
Classes requiring direct contact with the teacher	60	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	50	2,00