



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of Metrology

Course

Field of study

Technical Physics

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

1/1

Profile of study

general academic

Course offered in

polski

Requirements

compulsory

Number of hours

Lecture

20

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

dr Krzysztof Łapsa

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of physics and mathematics (core curriculum for secondary schools, basic level). The ability to solve simple physical problems based on the acquired knowledge, the ability to obtain information from indicated sources. Understanding the need to expand competences.

Course objective

1. Preparing students to work with measuring instruments.
2. Theoretical preparation for analyzing and processing measurement results.

Course-related learning outcomes

Knowledge

As a result of the course, the student has basic knowledge in the field of metrology, knows and understands methods of measuring physical quantities and the analysis of measurement results.

Skills

Student:



1. can, on the basis of literature, independently make a preliminary analysis of the results of laboratory measurements and draw conclusions
2. has the ability to self-study.

Social competences

The student understands the need for continuous education.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The learning outcomes are checked during a written test (colloquium). Students must demonstrate theoretical knowledge and practical skills, such as: reading the vernier, calculating the uncertainty of simple and complex measurements, rounding up measurement results. The condition for passing is to get over 50% of the maximum number of points.

Programme content

1. Construction, principle of operation, accuracy of the following measuring instruments: caliper, goniometer, micrometer screw, micrometer sensor, ammeter, voltmeter, ohmmeter, wattmeter, digital multimeter, oscilloscope (analog and digital).
2. Measurement methods: voltage, resistance, power, magnetic field, temperature, light.
3. The idea of analog-to-digital conversion, computer as a measurement tool.
4. Classification of uncertainty and measurement errors (definitions, examples).
5. Basic concepts of measurement statistics: normal distribution (expected value, standard deviation, probability distribution), histogram, median, mode, arithmetic mean, variance, sample standard deviation, standard deviation of the mean, Student's distribution, weighted mean.
6. Calculation of the uncertainty value of complex quantities: logarithmic differential method, total differential method.
7. Rules for rounding up and recording the measurement result and its uncertainty.
8. Regression method, the use of the least squares method to calculate the parameters of the line, correlation coefficient.
9. Basic markings on electrical diagrams.
10. Graphical preparation of measurement results: correct planning of the graph, rectangles of measurement uncertainty.

Teaching methods

Multimedia presentation additionally illustrated with examples given on the board

Bibliography



Basic

1. A. Chwaleba, M. Poniński, A. Siedlecki, Metrologia elektryczna, WNT, Warszawa 2010
2. J. Piotrowski, Podstawy miernictwa, WNT, Warszawa 2002
3. J. R. Taylor, Wstęp do analizy błędu pomiarowego, PWN, Warszawa 1999

Additional

1. Pomiar, pod red. J. Piotrowskiego, WNT, Warszawa 2009
2. H. Szydłowski, Pracownia fizyczna, PWN, Warszawa 2003

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	24	1,0
Student's own work (literature studies, preparation for test) ¹	26	1,0

¹ delete or add other activities as appropriate