



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Measurement systems [S1MiBM1>SP]

Course

Field of study

Mechanical Engineering

Year/Semester

3/5

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 (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

3,00

Coordinators

Lecturers

Prerequisites

Knowledge of basics of metrology and basics of technological processes, technical drawing and the basics of CAD systems. Willingness to acquire new knowledge and skills. The ability to think logically and use information obtained from various sources.

Course objective

Getting to know measuring systems used in mechanical engineering. Acquiring knowledge about measuring systems based on coordinate measuring technique, their types and areas of applications. Awareness of the variety of measurement tasks in modern industry and the scope of information that can be obtained on the basis of measurement.

Course-related learning outcomes

Knowledge:

1. The student is able to characterize the measurement systems used in mechanical engineering

[K_W14]

2. The student is able to characterize basic devices included in the measurement systems.

[K_W14]

Skills:

1. Student is able to select the measurement system for the measurement task. [K_U20]
2. Student is able to develop a measurement strategy on the basic level. [K_U20]
3. Student is able to develop and analyze measurement data. [K_U20]
4. Student is able to determine the sources of coordinate measurement errors and is able to eliminate them. - [K_U20]

Social competences:

1. Student is able to work in a group. - [K_K03]
2. Student is aware of the role of measurement systems in the modern economy - [K_K07]
3. Student can independently develop knowledge in the field of metrology – [K_K04, K_K05]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

Lecture: written test

Laboratory: crediting on the base of an oral or written answer concerning the content of each performed laboratory exercise and preparation of reports. In order to pass the classes, all exercises must be completed.

Programme content

Lecture:

1. Definition, structure and tasks of measurement system
2. Measurement systems that perform tasks in the area of mechanical engineering.
3. Classification and applications of measuring devices.
4. The essence of the coordinate technique in machine parts measurements.
5. Coordinate measuring machines, classification, principle of operation.
6. Optical measuring systems.
7. Measurements of form deviations.
8. Measurements of surface roughness and topography.
9. Industrial computed tomography.

Lab:

1. Measurements on a coordinate measuring machine - manual measurements.
2. Measurements on an optical measuring scanner
3. Measurements of surface roughness.
4. Thermovision measurements.
5. Measurements on a computed tomography
6. Analysis of measurement data

Teaching methods

Lecture: multimedia presentation illustrated with examples given on the whiteboard and films.

Laboratory exercises: performing experiments, case study, discussion, working in a group.

Bibliography

Basic

Ratajczyk E., Woźniak A.: Współrzędnościowe systemy pomiarowe, Warszawa 2016

Sładek J.: Dokładność pomiarów współrzędnościowych, Kraków 2013

Jakubiec W., Malinowski J., Metrologia wielkości geometrycznych, Warszawa, WNT 2018

Humienny Z., Osana P.H., Tamre M., Weckenmann A., Blunt L., Jakubiec W.: Specyfikacje geometrii wyrobów (GPS), podręcznik europejski, WNT, Warszawa 2004

Jakubiec W., Zator S., Majda P.: Metrologia, PWE 2014

Normy ISO 10360 - części 1-13

Additional

Ratajczyk E.: Współrzędnościowa technika pomiarowa. Maszyny i roboty pomiarowe, Warszawa 1994.

Ratajczyk E.: Współrzędnościowa technika pomiarowa, Warszawa 2005. Jezierski J., Analiza tolerancji i niedokładności w budowie maszyn, Warszawa, WNT 1994

Białas S., Humienny Z., Kiszka K.: Metrologia z podstawami specyfikacji geometrii wyrobów (GPS) WPW 2014

Przewodnik ISO. Wyrażanie niepewności pomiaru, Warszawa, GUM 1999
Arendarski J., Niepewność pomiarów, Warszawa, Instytut Metrologii i Systemów Pomiarowych
Politechniki Warszawskiej 2000
Specyfikacje geometrii wyrobów (GPS), red. Z. Humienny, Warszawa, Oficyna Wydawnicza Politechniki
Warszawskiej 2001

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	35	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	2,00