COURSE DESCRIPTION CARD - SYLLABUS

Course name
Coordinate techniques

Course

Field of study
Mechanical engineering

Year/Semester
2 / 3

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
12	8	
Tutorials	Projects/seminars	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
Ph.D., D.Sc., Eng. Bartosz GAPIŃSKI
email: bartosz.gapinski@put.poznan.pl
tel. 61 663 35 95
Faculty of Mechanical Engineering

Responsible for the course/lecturer:
Ph.D., Eng. Lidia MARCINIAK-PODSADNA
email: lidia.marciniak-podsadna@put.poznan.pl
tel. 61 663 35 69
Faculty of Mechanical Engineering

Prerequisites

Knowledge of basics of metrology and measurement systems, technical drawing and 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 acquainted with the coordinate measurement technique. Gaining knowledge about coordinate measurement systems (CMS), their types and areas of application. Awareness of the role of modern metrological devices in Industry 4.0, their impact on manufactured products and the ability to correctly select measurement solutions aimed at obtaining metrologically correct results.

Course-related learning outcomes

Knowledge

1. The student knows principles of coordinate measurement. [K_W13]

2. The student knows how to characterize the coordinate measuring systems. [K_W13]

3. The student knows the rules of acceptance and reverification of coordinate measurement systems. [K_W13]

Skills

1. The student is able to choose the coordinate measuring system for the measuring task. [K_U17]

2. The student is able to develop a measurement strategy on the basic level. [K_U17]

3. The student is able to develop and analyze the measurement data. [K_U17]

4. The student is able to determine sources of coordinate measurement errors and is able to reduce them. - [K_U17]

Social competences

1. The student is able to work in a group. - [K_K03]

2. The student is aware of the role of coordinate measurement technique in the modern economy - in Industry 4.0. - [K_K07]

3. The student can independently develop knowledge in the field of metrology - [K_K04]

Methods for verifying learning outcomes and assessment criteria

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. The essence of the coordinate measuring technique.

2. Types of coordinate measuring systems.

3. Coordinate measuring machines - construction and equipment.

4. Measuring arms - construction and equipment.

5. Laser trackers - construction and equipment.

6. Laser trackers - construction and equipment.

7. Multisensor measuring machines.

8. Coordinate 3D optical scanners and photogrammetric devices.

9. Coordinate optical devices for dynamic measurements.

10. Computed tomography.

11. New trends in the coordinate technique.

12. Principles and procedures for checking coordinate measurement systems.

Laboratory:

1. Measurements on a coordinate measuring machine - manual and CNC measurements.

2. Measurements on a coordinate measuring machine - programming for CNC measurements.

3. Measurements on a coordinate measuring machine - measurements with a 3D CAD model.

4. Measurements on the 3D optical coordinate scanner

5. Analysis of measurement data.

6. Development of measurement reports.

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

Standards: ISO 10360 - parts 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	50	2,0
Classes requiring direct contact with the teacher	25	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	25	1,0

[1] delete or add other activities as appropriate