COURSE DESCRIPTION CARD - SYLLABUS

Course name
Measurement techniques

Course

Field of study
Management and Production Engineering

Year/Semester
2 / 4

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	15	
Tutorials	Projects/seminars	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Knowledge of the basics of metrology and of mathematical analysis and statistics, technical drafting and machine parts. The desire to gain new knowledge and skills. The ability of logical thinking and making use of information acquired from various sources.

Course objective

The acquisition of the basic terms from the scope of measurement techniques and the coordinate measuring technique. Learning of the measurement instruments and methods, and of the measurement systems used in mechanical engineering. The acquisition of the skills to select instruments for measurement tasks in industrial and laboratory conditions. Raising the awareness of the role of metrology in 4.0 Industry and of its influence on manufactured products.

Course-related learning outcomes

Knowledge

1. The student knows the basic terms from measurement techniques [K_W01, K_W03]

2. The student knows the measurement methods and systems, used in mechanical engineering [K_W11]

3. The student knows the basic measurement equipment, used for the measurements of machine parts [K_W10]

4. The student knows and is able to determine the scope of using the coordinate measurement systems [K_W10]

5. The student knows the instruments, used, among others, for the measurements of surface roughness and shape errors [K_W10]

Skills

1. The student is able to calculate and select the tolerances and fit symbols to holes and shafts, threads and other machine parts [K_U02]

2. The student knows the hierarchy of patterns and is able to select measurement instruments to machine part measurements [K_U01]

3. He/she is able to carry out measurements with universal measurement instruments [K_U04]

4. The student is able to selects an instrument that is adequate for a given measurement task [K_U04]

Social competences

1. The student has the awareness of performing proper measurements of machine parts - [K_K01]

2. He/she is able to defend performed metrological calculations - [K_K02]

3. He/she is able to develop on his/her own knowledge in the field of metrology and measurement systems - [K_K04]

4. The student has an awareness of the role of metrology in 4.0 Industry [K_K04]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written examination credit

Laboratory: Credits from oral or written answers to questions in the scope of each performed laboratory exercise plus drawing up of report. In order to obtain a credit, all the exercises shall be completed.

Programme content

Lecture:

1. Measurement equipment, the classification and metrological properties.

2. The basic measurement instruments, used in length and angle measurements - callipers, micrometre gauges and sensors

3. Thread types and their measurements

4. Measurements of the basic parameters of gear wheels

5. The basic parameters and the instruments used to measure surface roughness.

6. Measuring machines - distance meters, altimeters, microscopes and projectors.

7. The coordinate measuring technique and coordinate measurements systems

Laboratories:

1. Coordinate measurement machines and shape deviation measurements

2. A coordinate optical scanner

3. An analysis of spatial measurement data.

4. Processing of 3D measurement data

5. Surface roughness measurements

6. Computed tomography

Teaching methods

Lecture: a multimedia presentation, illustrated by examples on the board and films.

Laboratory exercises: performing experiments, solving exercises, discussions, team work.

Bibliography

Basic

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

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

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

Sładek J.: Dokładność pomiarów współrzędnościowych, Kraków 2013.

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

Additional

Adamczak S., Makieła W., Metrologia w budowie maszyn. Zadania z rozwiązaniami, Kielce, Politechnika Świętokrzyska 2001

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

Przewodnik ISO. Wyrażanie niepewności pomiaru, Warszawa, GUM 1999

Arendarski J., Niepewność pomiarów, Warszawa, Instytut Metrologii i Systemów Pomiarowych Politechniki Warszawskiej 2000

Paczyński P., Podstawy metrologii. Przewodnik do wykładów, ćwiczeń i laboratoriów, Wyd. Politechniki Poznańskiej 2003

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	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	20	1,0

[1] delete or add other activities as appropriate