COURSE DESCRIPTION CARD - SYLLABUS

Course name
Coordinate measuring technique [S2MiBM2>TW]

Course

Field of study
Mechanical Engineering

Year/Semester
1/2

Area of study (specialization)
Production Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr hab. inż. Bartosz Gapiński prof. PP
bartosz.gapinski@put.poznan.pl

Lecturers

Prerequisites

The student should have knowledge of technical metrology, measurement systems, technical drawing and the basics of CAD systems. The student should demonstrate a willingness to acquire new knowledge and skills. The ability to think logically and use information obtained from various sources. The student should understand the need to learn and acquire new knowledge.

Course objective

To become familiar with coordinate measuring technique. To acquire knowledge of coordinate measuring systems (CMS), their types and areas of application, with particular emphasis on how to supervise CMS. To understand the role of modern metrology 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.
2. The student knows how to characterise coordinate measuring systems.
3. The student knows principles of checking coordinate measuring systems.

Skills:
1. Student is able to select a coordinate measuring system for a measurement task.
2. Student is able to develop a basic measurement strategy.
3. Student is able to process and analyse measurement data.
4. Student is able to identify sources of coordinate measurement errors and is able to compensate them.

Social competences:
1. Student is able to cooperate in a group.
2. Student is aware of the role of coordinate measuring technology in modern economy - Industry 4.0.
3. Student is able to independently develop knowledge in the field of metrology.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Exam / Credit based on the exam consisting of scored questions [pass if more than 50% of points are obtained:> 50% (3.0),> 60% (3.5),> 70% (4.0),> 80% (4.5),> 90% (5.0)] carried out at the end of the semester.
Laboratory: Assessment based on aims carried out during laboratory classes, oral answer in the field of research. In order to pass the laboratories, all exercises must be passed.

Programme content

Lecture:
1. Genesis of coordinate measuring technology.
2. Coordinate measuring systems (CMS) - coordinate measuring machine (CMM) (construction, principles of verification).
3. Coordinate measuring systems (CMS) - measuring arms and laser trackers (construction, principles of verification).
4. Coordinate measuring systems (CMS) - 3D optical scanners and photogrammetric devices (construction, principles of verification).
5. Coordinate measuring systems (CMS) - multisensor measuring machines (construction, principles of verification).
6. Coordinate measuring systems (CMS) - computed tomography (construction, principles of verification),
7. New trends in coordinate technology.
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 a 3D optical coordinate scanner.
5. Analysis of measurement data.
6. Preparation of measurement reports.

Course topics

none

Teaching methods

Lecture: a lecture illustrated with a multimedia presentation containing the discussed program content
Laboratory: practical exercises, team work

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	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00