POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Measuring techniques [S2IMat1>TechPom]

Course

Field of study
Materials Engineering

Year/Semester
1/1

Area of study (specialization)
–

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
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of length and angle metrology, knowledge of physics and mathematics. Skills: logical thinking, using information obtained from the library and the Internet. Understanding the need to learn and acquire new knowledge.

Course objective

Learning the basic concepts of measurement techniques. Getting to know the instruments and measuring methods as well as measuring systems used in mechanical engineering . Learning about the methods of measuring surface topography in the micro and nano scale. Acquiring the ability to calculate and select a tolerance and fit symbol for holes and shafts, selection of tolerances, fits and a number of threads, estimation of measurement uncertainty using the A and B method.

Course-related learning outcomes

Knowledge:
the student knows measurement methods and measuring systems used in machine building - k_w03
the student knows the basic measuring equipment used to measure machine parts - k_w03
he has theoretically founded knowledge of surface metrology - k_w03, k_w10

Skills:
student is able to calculate and select tolerances and fitting symbols for holes and shafts, threads and other machine parts - k_u09
student is able to select measuring instruments for measuring machine parts -k_u08, k_u10
student has ability to calculate uncertainty of measurement by the type a and b methods - k_u09, k_u12
be able to calculate the uncertainty of an intermediate measurement - k_u09, k_u12

Social competences:
the student is able to work in a group - k_k03
is aware of the importance and understanding of non-technical aspects and effects of engineering activities, including its impact on the environment and the related responsibility for decisions made - k_k02

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: Credit based on a test consisting of 5 questions, conducted at the end of the semester.
Classes: Credit based on a test consisting of 2 tasks, carried out at the end of the semester.

Programme content

Lecture:
1. Measuring instruments used in length and angle measurements. System of tolerances and fits
2. Measurements of deviations in shape and position, surface roughness measurements
3. Introduction to the coordinate measuring technique
4. Contact and optical methods of surface topography measurement
5. SPM - methods of microscopy with a scanning probe
6. AFM working modes (Contact Mode, TappingMode, LFM, EFM, Force Distance Curves)
7. Measurements of surface topography - selection of the method (Stedman diagram)
8. Examination of surface defects using active thermovision
Classes :
1. Tolerances and fits
2. Calculation of measurement uncertainty
3. Introduction to dimensional analysis

Course topics

Teaching methods

1. Lecture: presentation illustrated with examples given on the blackboard, solving problems.
2. Exercises: problem solving, discussion.

Bibliography

Basic
1. Adamczak S., Makieła W.: Metrologia w budowie maszyn. Zadania z rozwiązaniami. Politechnika Świętokrzyska, Kielce 2001.
2. Arendarski J.: Niepewność pomiarów. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2000.
3. Gotszalk T. P., Systemy mikroskopii bliskich oddziaływań w badaniach mikro i nanostruktur, Oficyna Wydawnicza Politechniki Wrocławskiej, 2004
4. Humienny Z., Osanna P.H., Tamre M., Weckenmann A., Blunt L., Jakubiec W.: Specyfikacja geometrii wyrobów (GPS). WNT, Warszawa 2004.
5. Jakubiec W.: Malinowski J.: Metrologia wielkości geometrycznych. WNT, Warszawa 1999
6. Wieczorowski M.: Wykorzystanie analizy topograficznej w pomiarach nierówności powierzchni, Wydawnictwo Politechniki Poznańskiej, 2009

Additional

1. Jezierski J.: Analiza tolerancji i niedokładności w budowie maszyn. WNT, Warszawa 1994.
2. Malinowski J.: Pomiary długości kąta. Wyd. Szkol. i Pedag., wydanie 3-cie, Warszawa 1993.
3. Malinowski J., Jakubiec W., Płowucha W.: Pomiary gwintów w budowie maszyn, WNT, 2009
4. Paczyński P.: Metrologia techniczna. Przewodnik do wykładów ćwiczeń i laboratoriów. Wyd. Zakład Metrologii i Systemów Pomiarowych, Politechnika Poznańska, Poznań 2003.
5. Pawlus P.: Topografia powierzchni: pomiar, analiza, oddziaływanie, Oficyna Wydawnicza Politechniki Rzeszowskiej, 2005
6. Ratajczyk E.: Współrzędnościowa technika pomiarowa, Wyd. Politechniki Warszawskiej, 2005
7. Sładek J.: Dokładność pomiarów współrzędnościowych, Politechnika Krakowska, 2012
8. Wieczorowski M.: Wykorzystanie analizy topograficznej w pomiarach nierówności powierzchni, Wydawnictwo Politechniki Poznańskiej, 2009

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	34	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	1,00