



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of metrology [S1ETI2>PM]

Course

Field of study

Education in Technology and Informatics

Year/Semester

1/2

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

0

Tutorials

0

Projects/seminars

0

Number of credit points

2,00

Coordinators

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Lecturers

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Prerequisites

Knowledge in the field of mathematical analysis and statistics, technical drawing and machine parts. Willingness to acquire new knowledge and skills. The ability to think logically and use information obtained from various sources.

Course objective

Learning the basic concepts of measurement techniques. Becoming familiar with instruments and measuring methods used in mechanical engineering. Acquiring the ability to calculate and select tolerances and the fit symbol for holes, shafts and threads. Gaining knowledge about measurement methods, error calculation and calculating the uncertainty of direct and indirect measurement.

Course-related learning outcomes

Knowledge:

1. The student knows the SI system of measurement units

2. The student knows definitions and classification of individual types of errors, their elimination or estimation
3. The student knows the statistical methods of elaborating the measurement results
4. The student knows the rules of estimating the measurement uncertainty
5. The student knows the basic measuring equipment used to measure machine parts

Skills:

1. The student is able to perform checking a measuring instrument according to the instructions
2. The student is able to calculate measurement uncertainty for direct and indirect measurements
3. The student is able to determine the measurement uncertainty of an instrument using the A and B method
4. The student is able to make a statistical analysis of the measurement results
5. The student is able to analyze the tolerances of the manufactured products and knows the rules of fitting parts

Social competences:

1. Is aware of the importance of reliably carrying out correct measurements of machine parts
2. Able to solve metrological issues independently and working in a group.
3. 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: Completion Test - Single Choice

92 - 100%: Very Good

84 - 91%: Good Plus

76 - 83%: Good

68 - 75%: Satisfactory Plus

52 - 67%: Satisfactory

0 - 51%: Unsatisfactory

Laboratory: Credit based on an oral or written answer concerning the content of each performed laboratory exercise and a written report. To obtain a credit, all exercises must be passed.

Programme content

Fundamentals of measurement theory, measurement methods and types, and the SI unit system. Participants will become familiar with length and angle measurement standards, measuring instruments, and error analysis. The topics will also cover tolerances and fits of machine parts, as well as the basics of coordinate measuring techniques.

Course topics

Lecture:

Measurement theory, measurement and its essence, measurement result, methods, types and methods of measurement, SI system of measurement units, definition of a meter, etalons, standards of length and angle measurements, gauge blocks, measuring rolls and balls, angle plates, angles, pattern hierarchy, measurement errors, definition and classification, systematic, random and excessive errors, elimination and estimation of errors, determination of measurement uncertainty, statistical analysis of measurement results, measurement tools, their division and characteristics, measurement methods, errors of indirect methods, caliper, micrometric instruments, sensors, length gauges, altimeters, microscopes, projectors, systems of tolerances and fits of machine parts, measurements of angles and cones. Basics of the coordinate technique.

Laboratory:

1. Checking measuring instruments;
2. Indirect measurements;
3. Statistical analysis of the measurement results;
4. Measurements of gears.
5. Measurements of external and internal dimensions;
6. Thread measurements.

Teaching methods

1. During the lecture, the theory is supported by examples. The lecture is conducted in an interactive way, questions
2. Laboratory exercises: conducting experiments, solving problems, discussion.

Bibliography

Basic:

1. Jakubiec W., Malinowski J.: Metrologia wielkości geometrycznych. WNT, Warszawa, 2018
2. Białas S. Humienny Z, Kiszka K.: Metrologia z podstawami specyfikacji geometrii wyrobu (GPS), Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2014
3. Paczyński P.: Metrologia Techniczna. Przewodnik do wykładów, ćwiczeń i laboratoriów, wyd. Politechniki Poznańskiej, Poznań 2003
4. Humienny Z. i inni: Specyfikacje geometrii wyrobów (GPS), Wydawnictwa Naukowo-Techniczne, Warszawa, 2004.
5. Adamczak S, Makiela W., Metrologia w budowie maszyn, WNT, Warszawa, 2010

Additional:

1. Piotrowski J., Podstawy metrologii, PWN, Warszawa, 1979
2. Sydenham P.H., Podręcznik metrologii, t1, Wyd. KiŁ, Warszawa, 1988
3. Arendarski J. Niepewność pomiarów, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2003
4. Hagel R., Zakrzewski J., Miernictwo dynamiczne, WNT, Warszawa, 1984.
5. Ratajczyk E., Woźniak A., Współrzędnościowe systemy pomiarowe, Wydawnictwo Politechniki Warszawskiej, 2016
6. Tomasiak J., Arendarski J., Gliwa - Gliwiński J., Jabłoński Z., Ratajczyk E., Żebrowska - Łucyk S., Sprawdzanie przyrządów do pomiaru długości i kąta, OWPW, 2009

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	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)	25	1,00