COURSE DESCRIPTION CARD - SYLLABUS

Course name
Metrology

Course

Field of study
Construction and Exploitation of Means of Transport

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
part-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
9	9	
Tutorials	Projects/seminars	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
Ph.D. Michał Jakubowicz
email: michal.jakubowicz@put.poznan.pl
tel. 616653568
Faculty of Mechanical Engineering
st. Piotrowo 3 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Students beginning this subject should have knowledge of mathematical analysis and statistics, technical drawing and machine parts.

Course objective

Learning the basic concepts of measurement techniques. Getting to know the measuring instruments and methods used in machine construction. Acquiring the ability to calculate and select the tolerance and fit symbol for holes, shafts and threads. Acquiring knowledge about measurement methods, error calculation and calculation of uncertainty of direct and indirect measurement.

Course-related learning outcomes

Knowledge

1. has knowledge in the field of metrology and measuring systems that includes basics of measurement theory, measurement methods and tools for assessing the accuracy of dimensions. Has a knowledge

about sensors and measuring transducers, coordinate measuring technique, measurements of machine components with a complex form dedicated to use measuring equipment, workshop metrology and estimation methods measurement errors.
2. has an extensive knowledge, essential for understanding specialized subjects, and an expert knowledge of design, operation of measuring instruments and devices.
3. has basic knowledge of metrology. Knows: conditions of measurement, essence of metrology in mechanical engineering, and goals and tasks of metrology.

Skills

1. is able to use the language at a level sufficient for understanding technical manuscripts (technical terminology).
2. is able to self-educate using modern educational tools, such as online lectures, online websites and databases, educational software, and ebooks.
3. is able to analyze objects and technical solutions, is able to assess the usefulness of routine methods and tools for solving a simple engineering task of a practical nature, as well as choose and apply the appropriate measurement method.

Social competences

1. understands the need of critical approach towards own knowledge and the need of constant self-education.
2. understands and is aware of non-technical aspects and effects of engineering activity, including its impact on the environment and the resulting responsibility for these decisions.
3. is able to inspire and organize the educational process of other people.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Passing on the basis of a colloquium consisting of 2 general and 3 specific questions, conducted at the end of the semester

Laboratory: Passed on the basis of a written answer in the scope of content. Performed the laboratory exercises according to the program established by the teacher with a positive grade of the reports on the six exercises prepared according to the subject matter. In order to get a credit for the laboratories, all exercises must be passed.

Programme content

Lecture: Measurement theory, measurement and its essence, measurement result, methods, types and means of measurement, SI units, meter definition, length and angle standards, gauge blocks, angle blocks, bevels, standards hierarchy, measurement errors, definition and classification, systematic, random and gross errors, error estimation and elimination of outliers, estimation of measurement uncertainty, statistical analysis of measurement results, measuring tools - classification, measurement methods, direct and indirect methods, errors in indirect methods, caliper devices, micrometer devices, indicators, microscopes, projectors, engineering tolerances and fits, statistical quality control,

geometrical surface structure, form, location and run-out tolerances, surface roughness measurements, basics of coordinate measurement.

Laboratory :
1. Indirect Measurements.
2. Statistical analysis of measurement results.
3. Inside and outside measurements.
4. Measurement of threads.
5. Measurement of gears.
6. Measurement of form deviations.

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.

2. Laboratory exercises: performing the tasks given by the teacher - practical exercises.

Bibliography

Basic

1. Adamczak S., Pomiary geometryczne powierzchni: zarysy kształtu, falistość i chropowatość, WNT, Warszawa, 2008.
2. Adamczak S., Makieła W., Podstawy Metrologii i inżynierii jakości dla mechaników, WNT, Warszawa, 2010.
3. Arendarski J., Niepewność pomiarów, Wyd. OWPW, Warszawa, 2013.
4. Białas S., Humienny Z., Kiszka K., Metrologia z podstawami specyfikacji geometrii wyrobów (GPS), Wyd. OWPW, Warszawa, 2014.
5. Jakubiec W., Malinowski J., Metrologia wielkości geometrycznych, WNT, Warszawa, 2018.
6. Jakubiec W., Zator S., Majda P., Metrologia, PWE, ,Warszawa, 2014.
7. Jezierski J., Analiza tolerancji i niedokładności pomiarów w budowie maszyn, WNT, Warszawa, 1994.
8. Paczyński P., Metrologia techniczna. Przewodnik do wykładów, ćwiczeń i laboratoriów, Wyd. PP, Poznań, 2003.
9. Zawada J., Metrologia wielkości geometrycznych, Wyd. Politechniki Łódzkiej, Łódź, 2011.
10. Zięba A., Analiza danych pomiarowych w naukach ścisłych i technice, Wyd. PWN. Warszawa, 2014.

Additional

Breakdown of average student's workload

	Hours	ECTS
Total workload	65	3,0
Classes requiring direct contact with the teacher	46	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	33	1,0

[1] delete or add other activities as appropriate