



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Workshop metrology [S1MiBP1>MW]

### Course

Field of study

Mechanical and Automotive Engineering

Year/Semester

3/6

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

dr inż. Karol Grochalski

karol.grochalski@put.poznan.pl

### Lecturers

### Prerequisites

Knowledge: Knowledge of mathematical analysis and statistics, technical drawing and machine parts Skills: Logical thinking, using information obtained from the library and the Internet Social competences: Understands the needs of learning and acquiring new knowledge

### Course objective

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

### Course-related learning outcomes

Knowledge:

Has knowledge in the field of physics, including the basics of classical mechanics, optics, electricity and magnetism, solid state physics, quantum and nuclear physics, necessary to understand specialist lectures in the field of the theory of construction materials and materials science, theory of machines and mechanisms, theory of electric drives and mechatronic systems.

Has ordered basic knowledge of the main divisions of technical mechanics: statics, kinematics and dynamics of a material point and a rigid body.  
Has basic knowledge of the basics of machine design and the theory of machines and mechanisms, including mechanical vibrations.

#### Skills:

Can search in catalogs and on manufacturers' websites ready-made machine components to be used in his own projects.

Can properly use modern equipment for measuring major physical quantities, used in machine research and production control.

Has the ability to self-educate with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books.

#### Social competences:

Is ready to critically assess his knowledge and received content.

Is ready to fulfill social obligations and co-organize activities for the benefit of the social environment.

Is ready to fulfill professional roles responsibly, including:

- observing the rules of professional ethics and requiring this from others,
- caring for the achievements and traditions of the profession.

### 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: Final test

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

### Programme content

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, measurements of deviations in shape and position, measurements of basic parameters of gears, surface roughness measurements. Basics of the coordinate technique.

Laboratory.

Checking measuring instruments. Indirect measurements, angle measurements. Statistical analysis of the measurement results. Measurements of external and internal dimensions. Thread measurements.

Gear wheel measurements. Shape error measurements.

### Course topics

none

### Teaching methods

Information and problem lecture,

Laboratories

### 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.

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.

### 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 |