COURSE DESCRIPTION CARD - SYLLABUS

Course name
Metrology and measurement systems [S1IBiJ1>MiSP]

Course

Field of study
Safety and Quality Engineering

Year/Semester
2/4

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

3,00

Coordinators

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Lecturers

Prerequisites

The student starting this course should have basic knowledge of mathematical analysis and statistics, knowledge of the basics of technological processes and the basics of technical drawing. The student should be willing to acquire new knowledge and skills, be able to think logically and use information from the indicated sources, and be ready to cooperate as part of a team.

Course objective

The aim of the course is to get acquainted with the basics of metrology and control and measurement systems. Acquiring knowledge of the methods and principles of measuring selected geometric quantities and the ability to use basic control and measurement equipment. Gaining knowledge about control and measurement methods, error calculus and calculating the uncertainty of the measurement result, calculating the suitability of measurement systems and the effectiveness of control systems. Awareness of the variety of measurement tasks in modern industry and the scope of information that can be obtained on the basis of measurement.

Course-related learning outcomes

Knowledge:

1. The student has advanced knowledge of mathematical and statistical methods used in data analysis, both quantitative and qualitative [K1_W04].
2. The student has advanced knowledge of the life cycle of products, devices, objects, systems and technical systems [K1_W06].
3. The student knows at an advanced level the methods, techniques, tools and materials used in preparing to conduct scientific research and solving simple engineering tasks using information technologies, information protection and computer support in the area of metrology and control and measurement systems [K1_W11].

Skills:
1. The student is able to properly select sources and information derived from them, evaluate them, critically analyze and synthesize them [K1_U01].
2. The student is able to use analytical, simulation and experimental methods to formulate and solve engineering tasks in the area of metrology and control and measurement systems, also using information and communication methods and tools [K1_U04].
3. The student is able to design, using appropriate methods and techniques, a control and measurement system or process that meets the requirements of safety engineering [K1_U07].
4. The student is able to apply standards and norms in solving practical engineering tasks in the area of metrology and control and measurement systems [K1_U08].

Social competences:
1. The student is able to notice cause-and-effect relationships in the implementation of set goals and use ranks in relation to the importance of alternative or competing tasks [K1_K01].
2. The student is aware of the importance of knowledge in solving problems in the area of metrology and control and measurement systems and continuous improvement [K1_K02].
3. The student is able to initiate activities related to the formulation and transfer of information and cooperation in society in the area of metrology and control and measurement systems [K1_K05].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Formative assessment:
Lecture: Formative assessment of the lecture is formulated on the basis of the Student's answers to the questions related to the program content (questions concerning the material discussed in the lectures).
Laboratories: During the semester, Student performs a set of tasks to check his ability to use basic control and measurement devices as well as knowledge of selected control and measurement methods. Formative assessment based on the assessment of the current progress in the implementation of laboratory tasks.
Summative assessment:
Lecture: Credit on the basis of a test consisting of 8 general, closed questions. Passing threshold: 50% of points (passing in case of a correct answer to at least 4 questions: <4 correct answers - ndst (2.0), 4 - dst (3.0), 5 - dst + (3.5), 6 - db (4.0), 7 - db + (4.5), 8 - very good (5.0)). The test is carried out at the end of the semester.
Laboratories: Credit - Student prepares a report for each laboratory task. There is 8 points for each task. Passing threshold: 50% of points. Assessment at the end of the semester.

Programme content

Basic metrology.
Measurement theory.
The quality of measurements and decisions in an organization.
Measurement uncertainty.
Measuring tools and devices.
Calibration and legalization.
Control and measurement system.
Statistical properties of the measurement system.

Course topics

Lecture:

Basic metrological terminology.
Measurement theory, measurement and its essence.
Measurement result, methods, types and methods of measurement.
System of units of measurement SI, definition of the meter.
Measurement standards.
Measurement errors.
The quality of measurements and decisions in the organization.
Uncertainty of measurement.
Measuring tools, their division and characteristics of instruments. Metrological issues, calibration, legalization.
Organoleptic control.
Definition of the measurement system (control and measurement system). Management of control and measurement equipment.

Laboratories:
Checking measuring instruments.
Statistical analysis of the measurement results.
Testing the suitability of the measurement system.
Evaluation of the effectiveness of organoleptic control.

Teaching methods

Lecture: A multimedia presentation illustrated with examples given on the blackboard and films.
Laboratories: Performing laboratory tasks, solving problems, discussion, team work - practical exercises.

Bibliography

Basic:
1. Jakubiec W., Zator S., Majda P., Metrologia, PWE 2014
2. Arendarski J., Niepewność pomiarów, Warszawa, Instytut Metrologii i Systemów Pomiarowych Politechniki Warszawskiej, 2000
3. Diering M., Kujawińska A., MSA - Analiza Systemów Pomiarowych: przewodnik po procedurach, AR Comprint, Poznań, 2012

Additional:
1. Measurement Systems Analysis, 4th ed., Reference manual, AIAG-Work Group, Daimler Chrysler Corporation, Ford Motor Company, General Motors Corporation, 2010
2. VDA 5, Measurement and Inspection Processes, 3rd ed. revised, VDA&QMC, 2021
3. Humienny Z., Osana P.H., Tamre M., Weckenmann A., Blunt L., Jakubiec W., Specyfikacje geometrii wyrobów (GPS), podręcznik europejski, WNT, Warszawa, 2004
4. Górny A., Dahlke G., Metody pomiarowe w bezpieczeństwie pracy i ergonomii, Wydawnictwo Politechniki Poznańskiej, Poznań, 2013

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	3,00
Classes requiring direct contact with the teacher	30	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00