



Subject card

Subject name and code	, PG_00058642						
Field of study	Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Metrology and Information Systems -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Michał Ziółko				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		0.0		0.0	30
Subject objectives	Acquiring knowledge on the theory of acquisition and processing measurement signals as well as methods and measuring instruments used for nonelectrical measurements.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U04] is able to plan and perform experiments using measurements and computer simulations, together with interpretation of results, is able to present and evaluate the course and results of work in a team realizing an advanced engineering project, is able to use technical documentation and to create it independently	The student recognizes the methods and equipment used to measure non-electrical quantities. The student selects the tools appropriate to the measurement task. The student applies the rules of eliminating the influence of external factors on the accuracy of measurements. Student calibrates sensors and measuring paths. The student analyzes the obtained measurement results.	[SU4] Assessment of ability to use methods and tools
	[K7_W06] knows the extended issues of reliability of power equipment and diagnostics of defects in this equipment	The student analyzes the obtained measurement results.	[SW1] Assessment of factual knowledge
	[K7_U03] has the necessary preparation to work in an industrial environment, is prepared to undertake third degree studies, applies the principles of safety and hygiene	The student recognizes the methods and equipment used to measure non-electrical quantities. The student selects the tools appropriate to the measurement task. The student applies the rules of eliminating the influence of external factors on the accuracy of measurements. Student calibrates sensors and measuring paths. The student analyzes the obtained measurement results.	[SU3] Assessment of ability to use knowledge gained from the subject
	[K7_U05] is able to integrate technical and economic analysis of the use of various energy technologies, including technologies using renewable energy sources and conventional and nuclear energy	The student recognizes the methods and equipment used to measure non-electrical quantities. The student selects the tools appropriate to the measurement task. The student applies the rules of eliminating the influence of external factors on the accuracy of measurements. Student calibrates sensors and measuring paths. The student analyzes the obtained measurement results.	[SU2] Assessment of ability to analyse information
	[K7_U71] is able to apply knowledge from humanistic, social, economic or legal sciences in order to solve problems	The student analyzes the obtained measurement results.	[SU1] Assessment of task fulfilment
[K7_K71] is able to explain the need to apply knowledge from humanistic, social, economic or legal sciences in order to function in a social environment	The student analyzes the obtained measurement results.	[SK3] Assessment of ability to organize work	
Subject contents	<p>LECTURE Classification of sensors and converters used in non-electrical quantities measurement. Static and dynamic properties of measurement sensors and converters. Sensors out-signal standards and rules of matching the signals with measurement systems. Elimination of external noises that disturb work of measurement sensors. Electrical measurement of temperature. Geometrical quantities measurement (dimension, displacement, level...). Movement parameters measurement (linear and rotational speed, vibration...). Electrical measurement of forces and stresses. Measurement of pressure, flow and volume. Electrical measurement of physical and chemical parameters of materials (conductivity, pH, viscosity, turbidity...).</p> <p>TUTORIALS Principles of development and documentation of measurement results. Elimination of the influence of external factors on the sensor - auto-calibration and linearization of characteristics. Water level measurements. Inclino-metric measurements. Pressure measurements. Temperature measurements.</p>		
Prerequisites and co-requisites	Basic metrology knowledge.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written test	50.0%	50.0%
	Laboratory exercises	60.0%	50.0%

Recommended reading	Basic literature	<p>1. Praca zbiorowa pod red. J. Piotrowskiego: Pomiary czujniki i metody pomiarowe wybranych wielkości. Warszawa, WNT, 2009.</p> <p>2. Zakrzewski J.: Przetworniki i czujniki pomiarowe. Wyd. Politechniki Śląskiej, Gliwice 2004.</p> <p>3. Nawrocki W.: Sensory i systemy pomiarowe. Wyd. Politechniki Poznańskiej, 2006.</p>
	Supplementary literature	1. Miłek M.: Pomiary wielkości nieelektrycznych metodami elektrycznymi. Wyd. Politechniki Zielonogórskiej, 1998.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	<p>Temperature measurement using a thermocouple.</p> <p>Measurement of the water level using the hydrostatic method.</p> <p>Inclinometer deviation measurements.</p>	
Work placement	Not applicable	