



Subject card

Subject name and code	Smart Metering, PG_00042157						
Field of study	Power Engineering, Power Engineering, Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2022/2023		
Education level	first-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Metrology and Information Systems -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Anna Golijanek-Jędrzejczyk					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	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	45	5.0		25.0		75
Subject objectives	The aim of the course is to familiarize students with the properties of sensors and measuring transducers, both classic and intelligent, as well as the tasks performed in the measurement system and the basic principles of their design. The student should acquire skills in the selection, operation and configuration of transducers for a given measurement task, testing and defining their metrological properties.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W05	The student has knowledge about the role of sensors and measuring transducers in the measuring system, their types and selection criteria for a given measuring task. Student can plan research, carry out measurements and develop results to determine the properties of measuring transducers.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	K6_U03	The student understands the need to know the industrial facility and technology and to cooperate with the technologist in the selection of measuring equipment.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	K6_W06	Student knows development trends and new solutions in the field of process, intelligent measuring transducers.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
Subject contents	<p>Historical development of measuring transducers. Standards and norms related to the requirements, tests and assessment of the properties of measuring transducers. Definition and tasks of a measuring transducer in a measuring system. Requirements for measuring transducers. Construction of the measuring transducer. Classic and smart converters. Principle of operation and construction of selected measuring sensors. Electronic systems used in measuring transducers. Signal conditioning systems in measuring transducers. Measuring instrument software.</p> <p>As part of laboratory classes, students in subgroups solve a practical task in the field of intelligent measuring transducers consisting in designing, selecting hardware, software and conducting experimental research. The aim of the course is also to discuss the obtained results and their quality parameters.</p>						

Prerequisites and co-requisites	The student has the basics of metrology, measurement systems as well as electronics and electrical engineering.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Realizacja zadania	60.0%	50.0%
	Egzamin pisemny	60.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Nawrocki W., Komputerowe Systemy Pomiarowe, Księgarnia WKŁ, 2010 2. Nawrocki W., Rozproszone Systemy Pomiarowe, Księgarnia WKŁ, 2005 3. J. Piotrowski. Pomiary; Czujniki i metody pomiarowe wybranych wielkości fizycznych i składu chemicznego. WNT, Warszawa 2009. 	
	Supplementary literature	<ol style="list-style-type: none"> 1. M. Milek., Metrologia elektryczna wielkości nieelektrycznych. Oficyna Wydawnicza Uniwersytetu Zielonogórskiego, Zielona Góra, 2006. 2. Ryōji Ōba., Intelligent sensor technology. Wiley Series in Measurement Science and Technology. Wiley, 1992 3. J. Kwaśniewski., Wprowadzenie do inteligentnych przetworników pomiarowych. Wyd. WNT 1992. 	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Definition of a measuring transducer. 2. Classification of measuring transducers. 3. Construction of the measuring transducer. 		
Work placement	Not applicable		