GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Metrology I, PG_00038336					
Field of study	Automation, Robotics and Control Systems					
Date of commencement of studies	October 2023		Academic year of realisation of subject		2023/2024	
Education level	first-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		4.0	
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. Beata Pałczyńska				
	Teachers	dr inż. Beata Pałczyńska				

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	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	10.0	60.0	100

Subject objectives	Acquiring fundamental knowledge on the theory of measurement as well as methods and measurementsystems used in automatics

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W03] has structured knowledge of tools and methods for measuring electrical quantities, documenting their results and assessing errors and uncertainties	The student configures the measuring equipment for automation systems.	[SW3] Assessment of knowledge contained in written work and projects
	[K6_U04] has the ability to self-educate, among other things, in order to improve professional qualifications	The student correctly selects standard analog and digital instruments.	[SU4] Assessment of ability to use methods and tools

Subject contents	LECTURE Definitions of measurement, sensor, transducer, measurement standard. Measurement errorsand their types. Inaccuracy: systematic, random, insensibility. Definition of uncertainty type A and type B.Elaboration of experimental measurement results. The static and dynamic transducers properties. Principlesof analog measurements of current, voltage, power, energy, RLC, frequency. Standards of base electricalquantities. Bridge and compensation methods. ADC methods. Digital measurements of voltage, frequencyand time. Digital multimeters. The basis of electrical measurements of non-electrical quantities. Analog anddigital oscilloscope. Smart transducers.

Prerequisites and co-requisites	Basic electrical circuits analysis and physics theory knowledge.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	60.0%	100.0%

Recommended reading	Basic literature	1. 1. Chwaleba A., Poniński M., Siedlecki A.: Metrologia elektryczna. WNT, warszawa 2014 2. 2. Stabrowski M.: Miernictwo elektryczne. Cyfrowa technika pomiarowa. Warszawa: Oficyna Wydawnicza Politechniki Warszawskiej 3. 3. Maśnicki R., Mindykowski J., Metrologia, Wydawnictwo Akademii Morskiej w Gdyni, Gdynia 2015 4. 4. Nawrocki W.: Sensory i systemy pomiarowe. Poznań: Wydawnictwo PP 5. 5. Miłek M.: Pomiary wielkości nieelektrycznych metodami elektrycznymi. Wyd. Pol. Ziel.
	Supplementary literature	1. 1. Praca zbiorowa.: Przetworniki cyfrowe sygnałów elektrycznych. Podstawy teoretyczne. Warszawa: WNT 2. 2. Skubis T., Podstawy metrologicznej interpretacji wyników pomiaru, Wydawnictwo Politechniki Śląskiej, Gliwice 2004 3. 3. Świsulski D., Komputerowa technika pomiarowa, Agenda Wydawnicza PAK, Warszawa 2005
	eResources addresses	Adresy na platformie eNauczanie: METROLOGIA I [2023/24] - Moodle ID: 36007 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36007
Example issues/ example questions/ tasks being completed	1. Causes of errors: systematic, random and thick. Ways to reduce these errors. 2. How is the measurement uncertainty type A and type B defined? 3. Enter the diagram and method of balancing a Wheatstone bridge. 4. What is a two-channel oscilloscope phase measurement by comparison? 5. Introduce systems for measurement of active and reactive power in three-phase four-wire unbalancedcircuit. 6. Introduce systems for measurement of active and reactive power in three-phase three-wire balancedcircuit. 7. Describe the principle of operation of an effective transmitter of multiply-dividing system.	
Work placement	Not applicable	