

## GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

Subject name and code	Measurements and Measurement Systems, PG_00055884								
Field of study	Power Engineering								
Date of commencement of studies	October 2024		Academic year of realisation of subject			2025/2026			
Education level	first-cycle studies		Subject group			Obligatory subject group in the field of study 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	2		Language of instruction			Polish			
Semester of study	3		ECTS credits			4.0			
Learning profile	general academic profile		Assessment form			assessment			
Conducting unit	Department of Metrol	ogy and Inform	ation Systems	-> Faculty of E	lectrica	I and Co	ontrol Engineer	ing	
Name and surname	Subject supervisor		dr inż. Anna Golijanek-Jędrzejczyk						
of lecturer (lecturers)	Teachers				1				
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory Project		t	Seminar	SUM	
of instruction	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 classes includ plan	n didactic ed in study	Participation in consultation h	ticipation in Isultation hours		udy	SUM	
	Number of study hours	45		6.0				100	
Subject objectives	Familiarizing students	with issues re	lated to metrolo	ogy and measu	irement	system	IS.		
Learning outcomes	Course outcome Subject outcome Method of verification						ication		
	[K6_U02] is able to apply the learned mathematical methods to the analysis and design of elements, systems and energy systems		Student explains the structure and principle operation of measurement systems. The student explains the rules of selection tools and measurement methods relevant to the task measuring. Student discusses development of the results measurement, evaluates errors and measurement uncertainty.			[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment			
	[K6_W05] has structu knowledge in the field engineering and elect necessary to underst basics of operation a of electrical machine: transmission systems electronic devices	i) has structured ge in the field of electrical ing and electronics, y to understand the operation and selection cal machines, electricity sion systems and power c devices		Student uses correctly with standard instruments analog and digital. The student carries out projects size measuring systems electric and non-electric. Student presents physical principles of operation and properties basic metrology transducers for measurements non-electrical quantities.			[Sw3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge		
Subject contents Prerequisites	Basic metrological concepts. Measurement methods. Fundamentals of the calculus of errors i development of measurement results. Measuring converters for electrical quantities. Analog and digital meters. Ways of extending the measuring ranges. Measurements of basic electrical quantities (voltage and current, resistance, inductance, capacitance, frequency, phase shift, power and energy in single and three-phase circuits). Measurements of non-electrical quantities by electrical methods. Electrical temperature measurements. Resistance and thermoelectric thermometers, pyrometers. The use of thermovision in measurements. Tensometric measurements of mechanical quantities. Measurement systems - classification, structure and application. Basic knowledge of electrical engineering and physics.								
and co-requisites									

Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade				
and criteria	Laboratory.	60.0%	50.0%				
	Written test - lecture.	60.0%	50.0%				
Recommended reading	<ul> <li>Basic literature</li> <li>1. Parchański J.: Miernictwo elektryczne i elektroniczne, WSiP, Warszawa, Wydanie ósme 2006.</li> <li>2. Chwaleba A., Poniński M., Siedlecki A.: Metrologia elektryczn Warszawa 2012.</li> <li>3. Gawędzki W.: Pomiary elektryczne wielkości nieelektrycznycł Wydawnictwo AGH, Kraków, 2010.</li> <li>4. Czabanowski R.: Sensory i systemy pomiarowe, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2010</li> </ul>						
	Supplementary literature	<ol> <li>Alan S Morris Reza Langari: Measurement and Instrumentation. Theory and Application. Elsevier, 2012. ISBN: 978-0-12-381960-4.</li> <li>Handbook of Measurements: Benchmarks for Systems Accuracy and Precision. CRC Press, 2015. PrintISBN: 978-1-4822-2522-8.</li> <li>Raghavendra, N.V.; Krishnamurthy, L.: Engineering Metrology and Measurements. Published by OxfordUniversity Press, 2013. ISBN 9780198085492.</li> </ol>					
	eResources addresses	Adresy na platformie eNauczanie:					
Example issues/ example questions/ tasks being completed	<ol> <li>Causes of errors: systematic, random and gross. Ways to reduce these mistakes.</li> <li>How is the measurement uncertainty of type A and type B defined?</li> </ol>						
	3. Give the diagram and the method of balancing the Wheatstone bridge.						
	4. What is phase measurement with a dual-channel oscilloscope by comparison method?						
	5. Present the systems for measuring active and reactive power in a three-phase, four-wire system unbalanced.						
	<ol><li>Present the systems for measuring active and reactive power in a three-phase, three-wire system symmetrical.</li></ol>						
Work placement	Not applicable						