GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Measurements and Measurement Systems, PG_00042054		
Field of study	Power Engineering		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
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	English
Semester of study	4	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Partment of Metrology and Information Systems -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor		
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	30.0	0.0	0.0	60

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	60	10.0	55.0	125

Subject objectives

Familiarize students with issues related to metrology and measurement systems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U02] is able to apply the learned mathematical methods to the analysis and design of elements, systems and energy systems		
[K6_W05] has structured knowledge in the field of electrical engineering and electronics, necessary to understand the basics of operation and selection of electrical machines, electricity transmission systems and power electronic devices		

Subject contents

Course content – lecture
LECTURE: Basic concepts of measurement. Measurement methods. The theory of measurement errors and uncertainty. Converters. The structure of measuring instruments. Analog and digital measuring instruments. Ways of extending the measuring ranges. Measurement bridges. Measurements of basic electrical quantities (voltage and current, resistance, inductance, capacity, frequency, phase shift, power and energy in single and three-phase circuits). Measurements of non-electrical quantities by electrical methods. Analog-to-digital converters of mechanical quantities. Electrical temperature measurements. Stress measurement. Measurement and diagnostic systems. Measurement software. Interfaces in measurement systems. Measurement data transmission methods: wired and wireless. Vision and infrared measurement systems. Virtual measuring instruments. The use of virtual instruments in the measurement and design of basic measurement systems.

LABORATORY: Calibration of measuring devices. Measurements using an oscilloscope. Measurements of RLC elements parameters. Measurements of frequency and rotational speed. Measurement of earth resistance and short circuit loop impedance. Power measurement in three-phase circuits. Temperature measurement. Computer measuring systems.

Prerequisites and co-requisites		
Assessment methods and criteria		

Subject passing criteria	Passing threshold	Percentage of the final grade
Entry tests nad reports- lab.	60.0%	50.0%
28 / 5000 Wyniki tłumaczenia Written test - lecture.	60.0%	20.0%
Homework and presentations - lecture.	60.0%	30.0%

Recommended reading	Basic literature	1. Alan S Morris Reza Langari: Measurement and Instrumentation. Theory and Application. Elsevier, 2012. ISBN: 978-0-12-381960-4. 2. Handbook of Measurements: Benchmarks for Systems Accuracy and Precision. CRC Press, 2015. PrintISBN: 978-1-4822-2522-8. 3.Raghavendra, N.V.; Krishnamurthy, L.: Engineering Metrology and Measurements. Published by OxfordUniversity Press, 2013. ISBN 9780198085492.
	Supplementary literature	1. Parchański J.: Miernictwo elektryczne i elektroniczne, WSiP, Warszawa, Wydanie ósme 2006. 2. Chwaleba A., Poniński M., Siedlecki A.: Metrologia elektryczna, WNT, Warszawa 1979, 2003. 3. Gawędzki W.: Pomiary elektryczne wielkości nieelektrycznych, Wydawnictwo AGH, Kraków, 2010. 4. Czabanowski R.: Sensory i systemy pomiarowe, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2010
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Causes of errors: systematic, random and coarse. Ways to reduce these errors. 2 How to estimate the measurement uncertainty as type A and type B? 3. Derive the diagram and the method of balancing the Wheatstone bridge. 4. Active and reactive power measurement systems in a three-phase, four-wire system. 5. Systems for measuring active and reactive power in a three-phase three-wire system.	
Practical activites within the subject	Not applicable	

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