



## Subject card

Subject name and code	Metrology I, PG_00056913						
Field of study	Electrical Engineering						
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. Marek Wołoszyk					
	Teachers	dr inż. Marek Wołoszyk dr inż. Michał Ziółko					
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	15.0		55.0		100
Subject objectives	Acquiring fundamental knowledge on the theory of measurement as well as methods and measurement systems used in electrical engineering.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W05	Student selects appropriate measurement tools for testing of various electrical parameters. Student describes the methods of evaluation of measurement faults and calculates measurement uncertainty.			[SW3] Assessment of knowledge contained in written work and projects		
	K6_U02	Student is able to work individually and in a group, knows how to estimate the time needed to carry out the task, and is able to implement the work schedule.			[SU1] Assessment of task fulfilment		
	K6_K01	Student correctly selects standard measuring instruments. Student is able to use current literature sources in order to supplement and to develop his or her knowledge.			[SK5] Assessment of ability to solve problems that arise in practice		
Subject contents	LECTURE Meaning and tasks of Metrology. Measurement services. Units in measurement. Elaboration of experiment measurement results. Measurement error theory. Systematic, random and insensibility inaccuracy. Inaccuracy classes. Measurement uncertainty definition. Analog electric meters. DC and AC measurement bridges. RLC measurements. Compensation methods. Power measurements of 1 and 3-phase devices in electric power engineering. Reactive power measurements. Electrical energy measurements. Digital and analog measurement of electronic systems. Principles of measurement of electronic systems (amplifier, standarizing devices, basic transducers and analog filters). Principles of ADC and DAC methods. Digital measurement of voltage, frequency and time. Analog and digital oscilloscope. The basics of magnetic measurement. Principles of operational tests in electrical engineering.						
Prerequisites and co-requisites	Basic knowledge of electrical engineering and electrical circuit analysis.						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		Exam	60.0%
Recommended reading	Basic literature	1. Chwaleba A., Poniński M., Siedlecki A.: Metrologia elektryczna. WNT, 2014.  2. Turmański S.: Technika pomiarowa. WNT, 2016.	
	Supplementary literature	1. Stabrowski M.: Miernictwo elektryczne. Cyfrowa technika pomiarowa. Oficyna Wydawnicza Politechniki Warszawskiej, 1999. 2. Piotrowski J.: Podstawy miernictwa. WNT, 2002.	
	eResources addresses	Adresy na platformie eNauczenie: METROLOGIA I [ET][2023/24] - Moodle ID: 36078 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=36078">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=36078</a>	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Discuss the measurement of error band Wheatstone bridge.</li> <li>2. Provide a system for the measurement of reactive power in a 3-wire electrical network.</li> <li>3. Discuss the operation of the A / D converter type compensation.</li> <li>4. Discuss the requirements for proper measurement of earth resistance.</li> </ol>		
Work placement	Not applicable		