

§ GDAŃSK UNIVERSITY § OF TECHNOLOGY

Subject card

Subject name and code	Metrology - laboratory, PG_00049311								
Field of study	Biomedical 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			
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			2.0			
Learning profile	general academic profile		Assessment form			assessment			
Conducting unit	Department of Metrol	Department of Metrology and Optoelectronics -> Faculty of Electronics,				elecommunications and Informatics			
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Sylwia Babicz-Kiewlicz						
	Teachers		dr inż. Sylwia	CZ					
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Project S		Seminar	SUM	
of instruction	Number of study hours	0.0	0.0	30.0	0.0		0.0	30	
	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 hours		Self-study		SUM	
	Number of study hours	30		0.0		20.0		50	
Subject objectives	The aim is to teach: performing measurements of basic electrical quantities: voltage, current, frequency, resistance, capacitance, inductance; operating and making measurements with an analogue and digital oscilloscope; setting up, making measurements, processing of measurement data on computer-controlled measurement systems.								
Learning outcomes	Course out	Subj	Subject outcome			Method of verification			
	[K6_U06] can analyse the operation of components, and systems related to the study, measure their para and examine technical specifications		Student calibrates analogue and digital electric meters. Measures basic electrical values: voltage, current, resistance, power and electricity. Examines the measuring capabilities of an analog and digital oscilloscope. Measures signal parameters: time, frequency, phase shift. Student measures parameters of selected a / c converters. Measures high and low resistances and impedance parameters of RLC elements. Analyzes the measurement results and evaluates the accuracy of the measurement.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task			
	[K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions		Student understands the concept of the measurement system. Can improve the measurement system. It measures basic electrical values: voltage, current, resistance, power and electricity. It measures high and low resistances and impedance parameters of RLC elements.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task			

Subject contents	1. Introduction: syllabus, characteristic of lab (one student - one stand, computer monitoring of student"s activity), principles of work and re-ports 2. Familiarization with basic instruments 3. Investigation and calibration of basic measuring instruments of electrical quantities, analog and digital having a PC link 4. Measurements of basic electrical quantities: voltage, current, resistance, power and electrical energy (using electronic P/f converter) 5. Study of analog and digital storage oscilloscope 6. Use of oscilloscopes to measure basic electrical quantities: voltage, pulse parameters, observation of device characteristics, observation of waveforms in digital circuits 7. Investigation of electronic timer-counter features 8. Use of digital methods and oscilloscope for measurements of time, frequency and phase 9. Investigations of properties and modes of operation of measuring sys-tem: bench multimeter, arbitrary function generator, hand-held multimeter 10. Investigation and calibration of AC/DC transducers: average-responding, peak-responding, AC low and high frequencies 12. Measurement of the RMS value of different types of waveforms with true RMS/DC conversion technique, average-responding instrument and with DSP method 13. Measurements of high and very low resistances with Wheatstone and Thomson bridges as well as using DMM with 4-wire Kelvin connectors 14. Measurements of impedance parameters of RLC components 15. Work out of outstanding exercises 16. Acceptation of student"s works						
Prerequisites and co-requisites	It is obligatory to read the Health and Safety Rules and the Regulations of the Metrology Laboratory. Teacher determines the form of verification. Without familiarizing yourself with the Health and Safety Rules and the Laboratory Regulations, it is not possible to start classes in the metrology laboratory.						
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade				
	Preliminary tests and reports for each exercise	50.0%	100.0%				
Recommended reading	Basic literature 1. Stabrowski M.: Cyfrowe przyrządy pomiarowe. PWN. 2. Nawro W.: Komputerowe systemy pomiarowe, WKiŁ 3. Materiały pomoci do wykładu na www.eti.pg.gda.pl/katedry/kose/dydaktyka						
	Supplementary literature	1. Dusza J. i inni: Podstawy miernictwa. Wyd. Politechniki Warszawskiej 2. Guide to the Expression of Uncertainty in Measurement. Wydanie polskie:Wyrażenie niepewnosci pomiaru, Przewodnik, Główny Urząd Miar					
	eResources addresses	ources addresses Adresy na platformie eNauczanie:					
Example issues/ example questions/ tasks being completed							
Work placement	Not applicable						