GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of metrology of electrical quantities, PG_00063395						
Field of study	Nanotechnology						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2026/2027			
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	3		Language of instruction	Polish			
Semester of study	6		ECTS credits	4.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Division of Magnetic Properties of Materials -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Marek Chmielewski				
	Teachers						

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	45.0	0.0	0.0	45
	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	45	5.0	50.0	100

Subject objectives	The purpose of the course is, first of all, to familiarize the student with the operation of basic power and control-measurement tools, based on modern digital technology, used in electronic laboratory practice as well as in non-laboratory conditions, to familiarize students with the technique of digital data processing and the determination of measurement uncertainty. The next objective will be the task of using control and measurement tools in the field of independent electronic prototyping. The student will get acquainted with the meaning and importance of constructing conditioning modules, understand the basic laws that apply in electronic metrology.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W09] Has knowledge of the structure and operation of scientific instruments, measuring and test equipment and in the field of planning and conducting a physical experiment and critical analysis of its results.	Students will learn about the operation and construction of measuring devices used in scientific research. They will become familiar with the capabilities and limitations of basic measuring and generating devices, and will be able to effectively assemble a simple measuring system consisting of several basic functional modules. They will be able to use software control of measuring systems.	[SW1] Assessment of factual knowledge
[K6_U05] can design and build a simple measuring device or instrument.	While performing tasks related to laboratory topics, he acquires the skills to conduct experiments correctly. He is able to design a dedicated measurement system and is capable of, at least, building its functional modules. Student is proficient in the use of construction tools.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
[K6_U04] can plan and conduct experiments, critically analyze their results, draw conclusions and formulate opinions. Has laboratory experience.	When performing tasks related to laboratory topics, he learns the correct method of conducting experiments. He performs and understands the need for multi-faceted analysis of the results obtained. He correctly performs calibration procedures and effectively applies their results to determine the parameters of unknown test elements.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
[K6_U07] can conduct preliminary economic analysis of proposed solutions and undertaken engineering activities within the scope of nanotechnology.	The student is familiar with the possibilities offered by the market for measuring devices used in nanotechnology research and is able to effectively select the appropriate design solution for a measuring system. They are able to effectively minimise the costs of the designed system, including conducting the necessary negotiations with suppliers of measuring equipment, thus selecting the optimal solution.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment

Subject contents

The content of the course is, first, to acquire the student's ability to operate and use the following laboratory equipment: multi-section laboratory power supplies, digital universal multimeters, multi-channel digital oscilloscopes, function and arbitrary generators. In the second place, the student will obtain practical knowledge of the construction of electronic, simple prototype circuits using contact board-based techniques and PCB prototype boards, practice the process of planning an experiment, selecting the right measurement equipment, producing appropriate, content-compatible studies from the realized measurement experiment.

Prerequisites and co-requisites

Not Required

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lab	80.0%	100.0%

Recommended reading

Basic literature	Podstawy elektrotechniki i elektroniki, Marian Doległo; Wydawnictwa Komunikacji i Łączności WKŁ Podstawy pomiarów; Grzegorz Tarapata, Jacek Dusza, Paweł Gąsio; Oficyna Wydawnicza Politechniki Warszawskiej Pomiary elektryczne i elektroniczne; Daniel Wilczkowski Michał Cedro; Wydawnictwa Komunikacji i Łączności
Supplementary literature	Not Required
eResources addresses	

Example issues/ example questions/ tasks being completed

Analog-to-digital processing

Digital universal meters

Frequency analysis and electrical interference.

Work placement

Not applicable

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