GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of Electronics and Metrology, PG_00047648		
Field of study	Informatics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Sylwia Babicz-Kiewlicz	
	Teachers	dr inż. Sylwia Babicz-Kiewlicz dr inż. Marcin Strąkowski dr hab. inż. Wiesław Kordalski dr inż. Maciej Wróbel dr inż. Michał Rycewicz dr inż. Stanisław Galla	

Lesson types and methods of instruction

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

Additional information:
The subject is divided into 2 Blocks: Electronics and Metrology.Within each Block, the Student passes the lecture and laboratory part:

- lecture in Electronics: 25% of the final grade,
- laboratory in Electronics: 25% of the final grade,
- lecture in Metrology: 25% of the final grade,
- laboratory in Metrology: 25% of the final grade - each of the two exercises is 10 points (total 20 scaled to 25) = 4 points preliminary test + 4 points work in class + 2 points report

It is not necessary to pass (get 50% of points) any part or Block. The total sum of points determines the score.

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	2.0	13.0	75

Subject objectives

Acquirement of basic knowledge and skills in the field of electronics and metrology

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U12] is able, to an advanced degree, to analyze the operation of components and systems related to the field of study, and to measure their parameters and study their technical characteristics, as well as to plan and carry out experiments related to the field of study, including measurements and computer simulations, and to interpret the obtained results and draw conclusions	Student examines the basic working circuits of the transistor. Measures the frequency characteristics of operational amplifiers. It measures basic electrical quantities: voltage, current, resistance, power and electricity.	[SU1] Assessment of task fulfilment
	[K6_W10] knows and understands to an advanced degree the basic processes occurring in the life cycle of equipment, objects and technical systems, as well as methods of supporting processes and functions, specific to the field of study	Student examines the measurement capabilities of an analog and digital oscilloscope. Measures signal parameters: duration, frequency, phase shift. Analyzes the measurement results and assesses the measurement uncertainty.	[SW1] Assessment of factual knowledge
	[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	Student is aware of the pace and directions of the development of electronics and metrology.	[SW1] Assessment of factual knowledge
	[K6_U02] can perform tasks related to the field of study in an innovative way as well as solve complex and nontypical problems, applying knowledge of physics, in changing and not fully predictable conditions	Student performing experiments on a analyzes their course and effect in real time. Is able to predict the expected result of the measurement and react in case of the wrong course of the experiment. Understands the basic electrical phenomena occurring in electronic systems and can use this knowledge during the experiment.	[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

Subject contents	Electronics: 1. Passive elements and independent sources in the DC, frequency and time domains 2. Ohm's and Kirchhoff's laws 3. Norton's theorem 4. Method of circuit currents and node voltages 5. Analysis of elementary circuits in the frequency domain 6. Electronic signals: types of signals and their time courses 7. Properties and Ebers-Moll model of bipolar transistor (BJT) 8. Static characteristics 9. DC and AC analysis of BJT amplifier 10. Properties and Shichman-Hodges model of unipolar transistor (MOS) 11. Static characteristics 12. DC and AC analysis of MOS amplifier 13. Elementary electronic circuits; operational amplifier, generator 14. Basic logical functors: Invert, Nand, Nor Metrology: 1. Basic metrology concepts: measurement, transducer, device, measurement system 2. Digital oscilloscope: operating principle, triggering methods, applications 3. Oscilloscope measurement methods: phases, pulse parameters, X/Y characteristics of elements and systems 4. Digital methods of measuring time intervals, discretization error 5. Digital methods of measuring low and high frequencies 6. Digital phase measurements 7. Characteristics of digital voltage measurement methods 8. Integration A/C converters with double integration 9. Measurements of alternating voltages: measured parameters, AC/DC converters of effective value (True RMS)

10. Digital multimeters: resistance/voltage converters

11. Digital methods of measuring impedance parameters R, L, C, |Z|

Prerequisites and co-requisites

It is obligatory to read the Health and Safety Rules and the Regulations of the Metrology Laboratory. The teachers determine the form of verification of that. 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
Kolokwium	50.0%	25.0%
Test wstępny + Praca na zajęciach + Sprawozdanie	50.0%	25.0%
Kolokwium/Prace domowe w formie grywalizacji	50.0%	25.0%
Sprawozdanie	50.0%	25.0%

Recommended reading

Basic literature

1. Taylor J. R., Wstep do analizy błędu pomiarowego, PWN,
2. Tumański S., Technika pomiarowa, WNT,
3. Chwaleba A., Poniński M., Siedlecki A., Metrologia elektryczna, WNT,
4. Stabrowski M., Cyfrowe przyrządy pomiarowe. PWN,
5. Nawrocki W., Komputerowe systemy pomiarowe, WKiŁ,
6. Dusza J. i inni, Podstawy miernictwa. Wyd. Politechniki Warszawskiej
7. Guide to the Expression of Uncertainty in Measurement. Wydanie polskie: Wyrażenie niepewnosci pomiaru,
8. Przewodnik, Główny Urząd Miar
9. Sedra A., Microelectronic circuits, HRW, New York,
10. Osiowski J., Szabatin J., Podstawy teorii obwodów, t.2, WNT,
11. Stabrowki M., Cyfrowe przyrządy pomiarowe, PWN,
12. Instrukcje i materialy pomocnicze do laboratorium

Supplementary literature

A. Filipkowski: Układy elektroniczne analogowe i cyfrowe, WNT

- Domańska A., Barzykowski J., Kujawińska M., *Współczesna metrologia wybrane zagadnienia*, WNT 2016
- Jakubiec W., Malinowski J., *Metrologia wielkości geometrycznych*, PWN 2018
- Bewoor A. K., Kulkarni V. A., *Metrology & Measurements*, Tata McGraw-Hill Education 2009 (dostępna częściowo w books.gogle)
- Banerjee G. K., *Electrical And Electronic Measurements*, PHI Learning Pvt. Ltd (dostępna częściowo w books.gogle)

eResources addresses

Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

Principle of operation of an integrating voltage to time converter.Use of an oscilloscope to observe and measure the parameters of analogue and digital signals.

Work placement

Not applicable

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