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 2026	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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Metrology and Electronic Systems Department -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Bartłomiej Dec	
	Teachers	dr inż. Bartłomiej Dec dr hab. inż. Wiesław Kordalski mgr inż. Patryk Sokołowski dr inż. Maciej Wróbel	

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	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_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	Course content – lecture Electronics: Lecture:Types of electronic signals; electromagnetic quasi-staticityPassive elements of electric circuits and their time-domain characteristicsKirchhoff's laws; voltage and current sources; Thevenin and Norton theoremsAnalysis of linear circuits with harmonic excitationsImpedance and admittance; resonant circuits; filtersPower in sinusoidally alternating current circuitsElectrons and holes in semiconductorsSemiconductor diodes and their applicationsField-effect transistorsBipolar transistorsStatic characteristics of transistors and their small-signal modelsSignal amplification; frequency characteristics of amplifiersOperational amplifiersBasic logical functors: Inverter, NAND, NOR.Laboratory:As part of the laboratory classes, the student should complete at least two of the following eight exercises: 1. Examination of the input stage of an operational amplifier. 2. Example applications of an operational amplifier. 3. Negative feedback. 4. Basic operating circuits of a bipolar transistor. 5. Basic operating circuits of a MOS transistor. 6. Two-stage amplifier. 7. Power amplifier. 8. Active filter (resonant amplifier). 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/Prace domowe w formie grywalizacji	0.0%	25.0%
Kolokwium	0.0%	25.0%
Test wstępny + Praca na zajęciach + Sprawozdanie	0.0%	25.0%
Sprawozdanie	0.0%	25.0%

<table>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>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</td></tr>
<tr><td>Supplementary literature</td><td>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)</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">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.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="2">Not applicable</td></tr>
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