



Subject card

Subject name and code	Electronic circuits, PG_00064046						
Field of study	Technical Physics						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2028/2029	
Education level	first-cycle studies	Subject group				Optional subject group 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	5	ECTS credits				4.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Division of Electrochemistry and Surface Physical Chemistry -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Ryszard Barczyński					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	15.0	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 aim of this course is to familiarize students with basic electronic circuits implemented using operational amplifiers. Particular attention is paid to circuits found in measurement systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W04] has advanced knowledge of the principles of experimental design, experimental methods, measurement techniques and scientific equipment used in physics and related sciences, including their life cycle.	The student designs an experiment: selects a method, determines the procedure and selects appropriate equipment.			[SW3] Assessment of knowledge contained in written work and projects		
	[K6_U04] is able, individually or in a team, to plan and conduct experiments in physics and related fields, including applied computer science or energy engineering, and to analyse and interpret results and formulate conclusions.	The student designs and builds an electronic system used in measurement technology, tests and analyzes its parameters and characteristics.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task		
	[K6_U05] is able, individually or in a team, to design and construct simple devices, measuring instruments or technical systems using appropriately selected methods, techniques, tools and materials.	The student independently builds a circuit used in measurement technology using an operational amplifier.			[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
	[K6_W06] has knowledge of technical sciences related to physics, including electronics or energy engineering, and understands their application in the design and implementation of technological processes.	The student knows the principles of operation and properties of basic electronic components and systems.			[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects		

Subject contents	Course content – lecture * Amplifier as a quad, feedback, amplifier stability. * Fulfillment of degrees amplifiers on an operational amplifier, sum amplifier, integrator, derivative circuit, current-voltage converter. * Selective amplifiers, active RC filters. * Non-linear analog blocks functional. * Broadband and power amplifiers. * RC, LC and quartz generators. * Layouts impulse, flip-flop. * Power supply systems, linear and impulse voltage stabilizers * Digital blocks functional, synthesis of combinational and sequential logic circuits.		
	Course content – laboratory Construction of basic electronic circuits using operational amplifiers.		
	Course content – project Designing a system (e.g. an anti-aliasing filter) based on assumed parameters, Construction and testing of a prototype.		
Prerequisites and co-requisites	None.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lectures	51.0%	25.0%
	Tutorial	51.0%	25.0%
	Laboratory	51.0%	25.0%
	Project	51.0%	25.0%
Recommended reading	Basic literature	* WWW site * Michał Polowczyk, Elektronika dla fizyków, PWN Warszawa * P. Horowitz, W. Hill, Sztuka elektroniki, WKŁ 2003 * U. Tietze, Ch. Schenk, Układy półprzewodnikowe	
	Supplementary literature	* Ben G. Streetman, Przyrządy półprzewodnikowe * Ch.L. Alley, K.W. Atwood, Elementy i układy półprzewodnikowe * Behzad Razavi, Fundamentals of microelectronics, Wiley 2008. * Mirosław Rusek, Jerzy Pasierbiński, Elementy i układy elektroniczne w pytaniach i odpowiedziach, NT Warszawa 2006.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Which goal cannot be achieved by using negative feedback in an amplifier circuit? A) Reducing the sensitivity of the amplifier to the spread of element parameters. B) Reduction non-linear distortions. C) Increase the gain. D) Widening the bandwidth amplifier. To obtain a 1V signal at the output of a certain differential amplifier, you can apply it between... its inputs have a 1mV signal. When we change the supply voltage by 1V, the output voltage will change by 10mV. The amplification factor of this amplifier is therefore... A) 120dB. B) 40dB. C) 60dB. D) 90dB.		
Practical activities within the subject	Not applicable		

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