



## Subject card

Subject name and code	, PG_00052087						
Field of study	Nanotechnology						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2022/2023		
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			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Ryszard Barczyński					
	Teachers	dr hab. inż. Ryszard Barczyński dr inż. Bartosz Trawiński					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30	3.0		17.0		50
Subject objectives	The aim of the course is to familiarize students with the basic electronic systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_U05	The student designs, builds, and runs a simple electronic device.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	K6_U04	The student effectively uses the basic instruments and laboratory equipment.			[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 [SU5] Assessment of ability to present the results of task		
	K6_W09	The student builds basic laboratory systems and analyzes their operation.			[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects		
	K6_W08	The student analyzes and designs basic electronic circuits.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
Subject contents	* Amplifier as a quad, feedback, amplifier stability. * Realization of amplification stages on an operational amplifier, sum amplifier, integrator, differentiator, current-voltage converter. * Selective amplifiers, active RC filters. * Nonlinear analog functional blocks. * Broadband and power amplifiers. * RC, LC and quartz generators. * Pulse and trigger systems. * Power systems, linear and pulse voltage stabilizers * Digital functional blocks, synthesis of combinational and sequential logic circuits.						
Prerequisites and co-requisites	None.						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Labs	51.0%	50.0%
	Final test	51.0%	50.0%
Recommended reading	Basic literature	* Materials from lectures available on the website * Michał Polowczyk, Electronics for physicists, PWN Warsaw * P. Horowitz, W. Hill, The art of electronics, WKŁ 2003 * U. Tietze, Ch. Schenk, Semiconductor systems	
	Supplementary literature	* Ben G. Streetman, Semiconductor Devices * Ch.L. Alley, K.W. Atwood, Semiconductor Elements and Circuits * Behzad Razavi, Fundamentals of microelectronics, Wiley 2008.	
	eResources addresses	Adresy na platformie eNauczenie: Układy Elektroniczne 2022/2023 - Moodle ID: 25894 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=25894">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=25894</a>	
Example issues/ example questions/ tasks being completed	<p>Which goal cannot be achieved by using negative feedback in an amplifier circuit?</p> <p>A) Reducing the sensitivity of the amplifier to the dispersion of component parameters. B) Reduction of nonlinear distortions. C) Increase the gain. D) Broadening the frequency response of the amplifier.</p> <p>To obtain a 1V signal at the output of a certain differential amplifier, a 1mV signal can be applied between its inputs. When we change the supply voltage by 1V, the output voltage will change by 10mV. So the amplification factor of this amplifier is ...</p> <p>A) 120dB. B) 40dB. C) 60dB. D) 90dB.</p>		
Work placement	Not applicable		