



Subject card

Subject name and code	Fundamentals of electronic, PG_00058341						
Field of study	Hydrogen Technologies and Electromobility						
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 Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Marek Turzyński				
	Teachers		dr hab. inż. Marek Turzyński				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	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		25.0	75
Subject objectives	The aim of the course is to provide the student with knowledge of basic electronic components and systems used for hydrogen technology and electromobility. The student will learn the principles of operation of elementary semiconductor devices and the operational properties of basic electronic systems. In addition, the student will acquire the skills of independent analysis of simple electronic systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_K04] can react in abnormal and emergency situations, threats to health and life when using automation and robotics components and systems in hydrogen devices and installations	Performs measurements of electronic systems while maintaining the required safety principles.			[SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work [SK1] Assessment of group work skills		
	[K6_W03] knows the methods of analysis of DC and AC circuits, the laws of electrical engineering and the properties of elements of electrical circuits	Defines the mechanisms of physical phenomena occurring in semiconductor materials. Performs tasks and simple laboratory measurements. Identifies and determines the operating principles of basic electronic components and systems. Designs a simple electronic system.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
Subject contents	Lectures: Laboratory equipment: multimeters, oscilloscopes, measuring probes. Passive electronic components: resistors, capacitors, inductors. Semiconductors: conduction processes, doped semiconductors, pn junction, ms junction. Diodes: switching, rectifier, Schottky, Zener, photodiodes, light emitting diodes, solar panels. Transistors bipolar and unipolar: structure, operation principles, electrical data and characteristics. Optoelectronic components. Amplifiers: technical data, characteristics, influence of negative feedback. Differential and operational amplifiers. Filters. Power amplifiers. Generators. Power supply units. Phase lock loop. Digital circuit technologies. Laboratory: 1) Semiconductor diodes. 2) Unipolar transistor. 3) Photovoltaic cells. 4) Negative feedback amplifier and comparator, univibrator. 5) Voltage-tuned generator and phase-locked loop. 6) Active filters.						

Prerequisites and co-requisites	Fundamentals of physics. Basic circuit theory.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written test	50.0%	50.0%
	Practical exercises	50.0%	50.0%
Recommended reading	Basic literature	Opolski A.: Elektronika dla elektryków. Wydawnictwo PG, Pomorska Biblioteka Cyfrowa, 2008. Opolski A. (red.): Elektronika dla elektryków - Laboratorium. Wydawnictwo PG. Gdańsk 2000. Schubert T.F., Kim E.: Fundamentals of Electronics: Book 1 Electronic Devices and Circuit Applications, Springer 2015. Bartlett J.: Electronics for Beginners: A Practical Introduction to Schematics, Circuits, and Microcontrollers, Apress 2020.	
	Supplementary literature	Hennel J.: Podstawy elektroniki półprzewodnikowej. WNT Warszawa 2003. Boksa J.: Analogowe układy elektroniczne. Wydawnictwo BTC Warszawa 2007. Filipkowski A.: Układy elektroniczne analogowe i cyfrowe. WNT Warszawa 2006. Horowitz P, Hill W.: Sztuka elektroniki, Wydawnictwa Komunikacji i Łączności WKŁ, 2018.	
	eResources addresses	Uzupelniające Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Field-effect transistors: structure, classification, graphic symbols and current-voltage output characteristics Inverting amplifier: circuit, transfer characteristic, amplification factor.		
Work placement	Not applicable		

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