



## Subject card

Subject name and code	Fundamentals of electronic, PG_00058341						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2023/2024		
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 inż. Krzysztof Iwan  dr hab. inż. Marek Turzyński  dr inż. Piotr Kołodziejek				
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	Knowledge and analysis of fundamental electronic components and applications.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[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		Student is able to explain and knows physical mechanisms of phenomena occurring in semiconductor materials Student knows operation principles of elements and elementary electronic circuits. Student is able to perform tasks and laboratory measurements. Student is able to define functions of electronic system and can design a simple electronic circuit.		[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
	[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		Student knows safety rules of using electronic equipment.		[SK1] Assessment of group work skills [SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice		

Subject contents	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. A/C and D/C converters.		
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, BibliotekaCyfrowa PG, 2008. Opolski A. (red.): Elektronika dla elektryków - Laboratorium. Wydawnictwo PG. Gdańsk 2000.	
	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.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Field-effect transistors: structure, classification, graphic symbols and current-voltage output characteristics		
Work placement	Not applicable		