



## Subject card

Subject name and code	Materials Engineering, PG_00038433						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2023		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	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Mechatronics and High Voltage Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Arkadiusz Żak				
	Teachers		dr hab. inż. Arkadiusz Żak				
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		3.0		27.0	75
Subject objectives	The aim of the course is to gain knowledge about present issues of material sciences with a special attention paid on materials used in electrical engineering as well as on novel intelligent materials.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_W04		- can evaluate selected aspects of the selection of electro-technical materials - can present arguments in favour of sustainable development in the field of material science		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation		
	K6_U01		- can characterise the properties of electro-technical materials - can measure selected properties of electro-technical materials		[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information		

Subject contents	<p>Lecture: Material engineering and material science. Physical basics of electrical conductivity. Copper and aluminium - comparison of properties. Contacts. Metallic and non-metallic resistive materials, criteria of selection. High temperature superconductors. Semiconductors in power electronics. Electronic materials. Magnetic materials: anisotropic, isotropic, amorphous, nanocrystalline magnetic materials. Hard magnetic materials. Mechanisms of conductivity and polarisation of dielectrics. Organic and non-organic solids. Synthetic solids - physical and chemical basics. Thermoplastics, thermosets and elastomers. Liquid and gas insulating materials. Selection of electrical materials - computer techniques of selection.</p> <p>Laboratory exercises.</p> <p>1. Application of the optical microscope in the examination of technical objects 2. Analysis of the dielectric materials using the TSD method 3. Analysis of the electrical resistivity of insulation materials 4. Measurements of dielectric constant of the transformer oil 5. Investigation of the physical parameters of the metal oxide surge arresters 6. Investigation of the semiconductor materials</p>		
Prerequisites and co-requisites	Background in basic physics and electrical engineering.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Colloquia during the semester	55.0%	50.0%
	Laboratory exercises	55.0%	50.0%
Recommended reading	Basic literature	<p>1. Celiński Z.: Materiałoznawstwo elektrotechniczne. Warszawa: Oficyna Wyd. PW 2005. 2. Kolbiński K., Słowikowski J.: Materiałoznawstwo elektrotechniczne. Warszawa: WNT 1978. 3. Woynarowski Z., Sulikowski J., Augustyniak W.: Badanie materiałów elektrotechnicznych. Gdańsk, Wyd. PG, 1990.</p>	
	Supplementary literature	Based on information available on the Internet	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Application of modern intelligent materials in electrical engineering.		
Work placement	Not applicable		