



Subject card

Subject name and code	Introduction to material technologies, PG_00062717						
Field of study	Technologies for Industry 5.0						
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	1	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Maria Gazda				
	Teachers		prof. dr hab. inż. Maria Gazda				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	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		2.0		18.0	50
Subject objectives	The aim of the course is to learn the basics of modern materials science, in particular aimed at achieving the first two (out of three) goals of industry 5.0, i.e. industry oriented towards improving a sustainable, and humancentric European industry . An important goal of the course is to provide an initial understanding of where the properties of materials come from and how they can be modified appropriately for various applications.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W03] demonstrates knowledge on materials used in industrial technologies, their structure and fabrication, knows the principles of conducting research, analyzing it and creating technical documentation		has basic knowledge of the structure, production and properties of materials, especially those used for sustainable development and improving the human condition. Knows the principles of conducting material tests and interpreting the results as well as creating technical documentation.		[SW1] Assessment of factual knowledge		
	[K6_U03] has the ability to plan, prepare and carry out engineering activities using practical knowledge and understanding of the specificity of materials, devices and tools, processes and technologies, and prepare a substantive report		is able to develop and carry out activities related to the use of selected materials, using basic knowledge of materials and their testing. Is able to prepare a substantive report		[SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	<p>Introduction: history of materials science; division of materials into groups according to various criteria; interdependencies between composition, structure, microstructure, technology used, properties and applications. 1 hour</p> <p>Basic knowledge of materials technologies: elements of thermodynamics, Gibbs phase rule, phase equilibrium systems; a brief description of selected methods of producing materials. 4 hours</p> <p>Basic knowledge of materials: chemical bonds, structure (crystalline, amorphous, partially crystalline), structural defects and microstructure; mechanical properties of materials; thermal properties; electrical, magnetic and optical properties; Selected methods for testing properties. 10 hours</p> <p>Groups of materials particularly important for Industry 5.0: electronic and electrotechnical materials (metals, semiconductors, dielectrics); materials that change electrical properties when exposed to light, the surrounding atmosphere and other environmental factors; materials and structures with special optical properties (photosensitive, electro-, chemo-, etc. - luminescent materials, photonic crystals); ferroelectric and piezoelectric materials; ferromagnetic and magnetostrictive materials; shape memory materials; other new multifunctional materials. 13 hours.</p> <p>Summary: the importance of materials, their impact on humans and the environment, creating devices composed of many materials, reusing and recycling materials. During the lecture, students will receive a homework assignment consisting in analyzing one specific material in terms of the issues discussed in class.</p>											
Prerequisites and co-requisites	None											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 994 794 1025">Subject passing criteria</th> <th data-bbox="799 994 1137 1025">Passing threshold</th> <th data-bbox="1142 994 1481 1025">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1028 794 1059">Homework</td> <td data-bbox="799 1028 1137 1059">55.0%</td> <td data-bbox="1142 1028 1481 1059">10.0%</td> </tr> <tr> <td data-bbox="456 1061 794 1093">Written test</td> <td data-bbox="799 1061 1137 1093">55.0%</td> <td data-bbox="1142 1061 1481 1093">90.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Homework	55.0%	10.0%	Written test	55.0%	90.0%
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Homework	55.0%	10.0%										
Written test	55.0%	90.0%										
Recommended reading	Basic literature	Marek Blicharski, Wstęp do inżynierii materiałowej										
	Supplementary literature	Krzysztof Kurzydłowski, Małgorzata Lewandowska, Nanomateriały inżynierskie										
	eResources addresses	Adresy na platformie eNauczanie: Wstęp do materiałoznawstwa - Moodle ID: 337 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=337										
Example issues/ example questions/ tasks being completed	1. Explain why a material with a strong bond has a high melting point, a large Young's modulus and low thermal expansion, 2. Similarities and differences between the structure of SiO ₂ : monocrystalline, polycrystalline and amorphous. 3. Suggest materials that need to be used to make a resistor/UV filter/oxygen sensor/... 4. What factors determine the optical properties of dielectric materials? 5. What materials and phenomena can be used to convert electrical energy into mechanical energy (and vice versa)?											
Work placement	Not applicable											

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