



Subject card

Subject name and code	Fundamentals of materials engineering , PG_00058990						
Field of study	Materials Engineering, Materials Engineering, Materials Engineering						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2022/2023		
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		5.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Dionizy Czekaj				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	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		75.0	125
Subject objectives	The aim of the lecture is to introduce the students with selected issues of modern materials science and engineering.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_K01		The student understands the need to improve professional competence.		[SK2] Assessment of progress of work		
	K6_W06		Student knows the basic research methods and technological processes used in materials engineering.		[SW1] Assessment of factual knowledge		
	K6_W03		Student has basic knowledge in the field of materials science and engineering.		[SW1] Assessment of factual knowledge		
Subject contents	Engineering materials. Properties of engineering materials: economic, mechanical, non-mechanical volume properties, surface properties, production and aesthetics properties; Prices and availability of materials. Periodic table of elements, structure of the PTE, law of periodicity. Electron configurations of elements, sizes of atoms and ions; ionization potentials; electron affinity; electronegative and electropositive elements; Binding of atoms in a crystal, Classification and characterization of bonds; Comparative characteristics of bonds; Basics of crystallography; Elements of the crystal lattice; Elementary cell; Crystallographic systems, Types of crystal lattices; Density of crystal lattice filling; Atomic structure dense arrangement of atoms; Sequence of ABC.ABC ... layers and atomic structure - CCP (cubic close-packed); Sequence of layers AB.AB ... or AC.AC ... - the densest hexagonal structure HCP (hexagonal closepacking). Material characteristics of construction materials; Definitions of stress, strain and modulus of elasticity; Hooke's law; Static tensile test; Elastic properties of the system of two atoms; Perfect durability; Crystal imperfections - defects in metals and ceramics; Principles of measuring the hardness of metals by Brinell, Vickers and Rockwell methods. Dynamic hardness measurements, Hardness and yield strength. Phase equilibrium systems. Phase balance diagram of the "Fe-C" system. Metals and their alloys. Cast iron. Non-ferrous alloys. Ceramics and glasses. Advanced ceramics. Polymers and composites. Technology processes; Manufacture of metal products, ceramics, glasses, polymers and composites. Electrical properties of materials. Electrical conductivity, semiconductors. Magnetic, optical and thermal properties of materials.						
Prerequisites and co-requisites							

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	51.0%	80.0%
	Tutorial	100.0%	20.0%
Recommended reading	Basic literature	1. Michael Ashby, Hugh Shercliff and David Cebon, <i>Materials Engineering, Science, Processing and Design</i> , Elsevier Ltd, 2007 2. Michael Ashby, David Jones, <i>Engineering Materials 1, An Introduction to Properties, Applications, and Design</i> , Elsevier Ltd, 2012 3. Michael Ashby, David Jones, <i>Engineering Materials 2, An Introduction to Microstructures and Processing</i> , Elsevier Ltd, 2013 4. W. D. Callister, Jr., <i>Materials science and engineering, an introduction</i> , 7th ed., Wiley, 2007, ISBN 0-471-73696-1.	
	Supplementary literature	1. 1. A.J. Moulson, , J.M. Herbert, <i>Electroceramics, Materials Properties and Applications</i> , Chapman and Hall, 1990 2. 2. R. Pampuch, <i>An Introduction to Ceramics</i> , Springer International Publishing Switzerland, 2014	
	eResources addresses	Adresy na platformie eNauczanie: Materials Science I, W, DaPE, sem.01, zimowy 22/23 - Moodle ID: 23829 https://enauczenie.pg.edu.pl/moodle/course/view.php?id=23829	
Example issues/ example questions/ tasks being completed	1. Periodic table of elements, law of periodicity 2. Binding of atoms in a crystal - the essence, classification and characterization of atomic bonds 3. Definitions of stress, strain and modulus of elasticity 4. Basic properties of metal, ceramic, polymer and composite materials 5. Semiconductors		
Work placement	Not applicable		

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