



## Subject card

Subject name and code	Materials Science II, PG_00039868						
Field of study	Mechanical Engineering, Mechanical Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2020/2021		
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			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Materials Engineering and Bonding -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Dionizy Czekaj					
	Teachers	prof. dr hab. inż. Dionizy Czekaj dr inż. Magda Rościszewska Dorota Rogala-Wielgus mgr inż. Ewa Kozłowska dr inż. Łukasz Pawłowski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
	Address on the e-learning platform: <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=12405">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=12405</a> Adresy na platformie eNauczanie: Materiałoznawstwo II (M:31531W1) - Moodle ID: 12405 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=12405">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=12405</a>						
	Additional information: Laboratory classes:  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=12406">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=12406</a>						
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	5.0	15.0	50		
Subject objectives	The aim of the lecture is to introduce the students with selected issues of modern materials engineering						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W08] possesses basic knowledge including the methodology of designing machine parts, mechanical devices, selection of construction materials, manufacturing and operation, with the lifetime cycle	The student can indicate the essential properties of metals, ceramics, polymers and composite structural materials influencing the properties of a device	[SW1] Assessment of factual knowledge
	[K6_U10] is able to formulate the principles of selecting a material for a construction, ensuring the correct operation of a device	The student can compare the basic properties of materials in terms of their suitability for a specific application.	[SU2] Assessment of ability to analyse information
	[K6_W03] possesses and is able to practically apply the knowledge on the construction, properties and testing methods of construction materials	The student knows the structure, basic properties and methods of characterization of structural materials.	[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 close-packing). 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
	Laboratory classes	100.0%	50.0%
	Colloquium from the lecture	51.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Michael Ashby, Hugh Shercliff and David Cebon, <i>Materials Engineering, Science, Processing and Design</i>, Elsevier Ltd, 2007</li> <li>2. Michael Ashby, David Jones, <i>Engineering Materials 1, An Introduction to Properties, Applications, and Design</i>, Elsevier Ltd, 2012</li> <li>3. Michael Ashby, David Jones, <i>Engineering Materials 2, An Introduction to Microstructures and Processing</i>, Elsevier Ltd, 2013</li> <li>4. W. D. Callister, Jr., <i>Materials science and engineering, an introduction</i>, 7th ed., Wiley, 2007, ISBN 0-471-73696-1.</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>1. A.J. Moulson, , J.M. Herbert, <i>Electroceramics, Materials Properties and Applications</i>, Chapman and Hall, 1990</li> <li>2. R. Pampuch, <i>An Introduction to Ceramics</i>, Springer International Publishing Switzerland, 2014</li> </ol>	
	eResources addresses	Materiałoznawstwo II (M:31531W1) - Moodle ID: 12405 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=12405">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=12405</a>	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Periodic table of elements, law of periodicity</li> <li>2. Binding of atoms in a crystal - the essence, classification and characterization of atomic bonds</li> <li>3. Elements of the crystal lattice</li> <li>4. Basic properties of metal, ceramic, polymer and composite materials</li> <li>5. Semiconductors</li> </ol>		
Work placement	Not applicable		