



## Subject card

Subject name and code	Construction materials, PG_00055365						
Field of study	Mechatronics						
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	1	ECTS credits			6.0		
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	dr hab. Agata Lisińska-Czekaj					
	Teachers	dr inż. Gabriel Strugała dr inż. Magda Rościszewska dr hab. inż. Agnieszka Ossowska dr inż. Artur Sitko dr hab. Agata Lisińska-Czekaj dr inż. Beata Majkowska-Marzec dr inż. Grzegorz Gajowiec					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	0.0	30.0	0.0	0.0	75
	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	75	4.0		71.0	150	
Subject objectives	The aim of the course is to familiarize students with the basic properties of metal materials, alloys, ceramic, polymer and composite materials with special electrical, mechanical and optical properties, especially for the construction of mechatronic systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W05] has knowledge in the field of electrical engineering, electronics and construction materials applied in mechatronics				[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K6_U01] is able to acquire information from literature, databases and other, properly chosen sources, integrate these information, interpret them, draw conclusions and formulate opinions				[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	[K6_U03] has self-learning skills				[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		

Subject contents	<p>Materials and their importance in technology. Structure of matter. Characteristics of the main groups of materials. General principles of selection of engineering materials in mechanical engineering. Crystalline structure of materials. Defects in crystal structure. Influence of structure defects on mechanical properties of materials. Polymorphism. Crystallization of metals and alloys.</p> <p>Mechanical properties of materials. Methods of testing materials. Anisotropy of properties. Degradation of materials. Brittle fracture. Fatigue of materials. High temperature degradation. Chemical, electrochemical and biological corrosion. Forms of corrosion: general, local, galvanic, selective, intercrystalline, gas, stress, fatigue, hydrogen, impact attack, cavitation erosion.</p> <p>Metal alloys. Mechanisms of strengthening of metals and alloys, phase transformations. Phase equilibrium systems. Classification of phase transformations. Transformations in the solid state. Phase equilibrium system iron-carbon. Phase and structural components of the system.</p> <p>Manufacture of iron and its alloys. Metallurgy of pig iron. Metallurgy of steel. Steelmaking processes. Metallurgy of cast iron. Methods of manufacturing semi-finished products and products.</p> <p>Division and classification of steels. Alloyed and non-alloyed steels. Structural steels. Tool steels. Steels with special properties corrosion resistant steels, heat resistant and heat resistant steels.</p> <p>Cast iron alloys. Steel and cast iron.</p> <p>Standardization and classification and designation systems for steels and cast irons.</p> <p>Formation of structure and properties of engineering materials by technological methods. Crushing and recrystallization. Heat and thermo-chemical treatment. Transformations during heating and cooling of ferrous alloys. CTP diagrams. Hardenability of steel. Annealing of steel, volumetric and surface hardening, carburizing, nitriding.</p> <p>Technical non-ferrous metal alloys. Copper and its alloys. Light metals and their alloys. Zinc and its alloys. Bearing alloys. Nickel, titanium and cobalt alloys. Low melting alloys.</p> <p>Ceramic materials division, properties, manufacturing. Polymeric materials division, properties, manufacturing. Structural composite materials division, properties, manufacturing. Biomimetics. Trends in materials development</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 775 794 801">Subject passing criteria</th> <th data-bbox="801 775 1139 801">Passing threshold</th> <th data-bbox="1145 775 1482 801">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 810 794 837"></td> <td data-bbox="801 810 1139 837">50.0%</td> <td data-bbox="1145 810 1482 837">50.0%</td> </tr> <tr> <td data-bbox="456 846 794 873"></td> <td data-bbox="801 846 1139 873">50.0%</td> <td data-bbox="1145 846 1482 873">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade		50.0%	50.0%		50.0%	50.0%
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Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Ashby M., Jones D., Materiały inżynierskie. Tom I Właściwości i zastosowanie. WNT, Warszawa 1995</li> <li>2. Ashby M., Jones D., Materiały inżynierskie. Tom IIKształowanie struktury i właściwości, dobór materiałów. WNT, Warszawa 1996</li> <li>3. Blicharski M., Wstęp do inżynierii materiałowej. WNT, Warszawa 2004</li> <li>4. Blicharski M., Inżynieria materiałowa. Stal. WNT, W-wa 2004.</li> <li>5. Dobrzański L.A., Podstawy nauki o materiałach i metaloznawstwo. WNT, Gliwice-Warszawa 2002</li> <li>6. Dobrzański L.A., Metaloznawstwo z podstawami nauki o materiałach. WNT Warszawa 1996.</li> <li>7. Głowacka M., Zieliński A. (Red). Podstawy metaloznawstwa, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2014</li> </ol>										
	Supplementary literature	<ol style="list-style-type: none"> <li>1. A.Lisińska-Czekaj, Wielofunkcyjne materiały ceramiczne na osnowie tytanianu bizmutu, Wydawnictwo Gnome, Uniwersytet Śląski, Katowice 2012</li> <li>2. D. Czekaj, Fabrication and study of BST based functional materials, University of Silesia, Gnome Publishing House, Katowice 2010,</li> <li>3. Dobrzański L.A., Metalowe materiały inżynierskie. WNT Warszawa 2004.</li> <li>4. Grabski W., Kozubowski J., Istota inżynierii materiałowej geneza, istota, perspektywy. Oficyna Wyd. Politechniki Warszawskiej, Warszawa 2003.</li> <li>5. Pampuch R., Współczesne materiały ceramiczne, Wydawnictwo AGH, Kraków 2005</li> <li>6. Prowans S., Metaloznawstwo. PWN, W-wa 1988.</li> <li>7. Przybyłowicz K., Metaloznawstwo. WNT, Warszawa 2003.</li> <li>8. Boczkowska A., Krzesiński G., Kompozyty i techniki ich wytwarzania, Oficyna Wydawnicza Politechniki Warszawskiej, 2016</li> <li>9. Królikowski W., Polimerowe kompozyty konstrukcyjne, PWN, Warszawa, 2012</li> </ol>										
	eResources addresses	<p>Adresy na platformie eNauczanie:</p> <p>Materiały konstrukcyjne, W, Mech, sem.1, zimowy 2023/24 - Moodle ID: 33558  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33558">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33558</a></p> <p>Materiały konstrukcyjne, W, Mech, sem.1, zimowy 2023/24 - Moodle ID: 33558  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33558">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33558</a></p>										
Example issues/ example questions/ tasks being completed												
Work placement	Not applicable											