



## Subject card

Subject name and code	Structural Materials, PG_00042019						
Field of study	Power Engineering, Power Engineering, Power Engineering, Power Engineering, Power 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			English		
Semester of study	2	ECTS credits			4.0		
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	dr inż. Krzysztof Krzysztofowicz					
	Teachers	dr hab. inż. Jacek Tomków dr inż. Krzysztof Krzysztofowicz					
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 Adresy na platformie eNauczanie: Structural Materials - Laboratory, Energetyka, Energy Technologies, Ist, sem 02 - Nowy - Moodle ID: 10477 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=10477">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=10477</a> Structural Materials - Laboratory, Energetyka, Energy Technologies, Ist, sem 02 - Nowy - Moodle ID: 10477 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=10477">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=10477</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	45	7.0	48.0	100		
Subject objectives	Providing students with a general knowledge of materials science and material technologies necessary for an engineer in the field of Power Engineering						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W04	The student defines the basic groups of construction materials. The student explains the differences in mechanical properties and physical materials construction depending on chemical composition and structure.			[SW1] Assessment of factual knowledge		
	K6_U02	The student selects the right ones construction materials for suitable applications. The student knows the methods of shaping mechanical properties metallic structural materials			[SU1] Assessment of task fulfilment		

Subject contents	<p>LECTURE Structure of materials. Characteristics of the main groups of materials. Metals. Ceramic materials. Polymers. Composite materials. Principles of selection of engineering materials in machine building. Crystalline structure of materials. Crystal structure defects. Polymorphism. Crystallization of metals and alloys. Properties mechanical materials. Materials testing methods. Working conditions and mechanisms of material consumption engineering. Metal alloys. Strengthening metals and alloys, phase transitions. Phase equilibrium systems. Solid state transformations. Iron-carbon phase equilibrium system. Division and classification of steel. Constant construction. Steels with special properties - corrosion-resistant steels, heat-resistant and heat-resistant steels. Foundry iron alloys. Cast steel and cast iron. Shaping the structure and properties of engineering materials technological methods. Plastic, thermal and thermo-chemical treatment. Annealing, hardening, carburizing, nitriding. Technical non-ferrous metal alloys. Copper and its alloys. Light metals and their alloys. Metal materials for energy. Ceramics and glass. Properties of ceramic materials. Methods of producing and shaping ceramic materials. Polymer materials. Structure of polymers. Thermoplastic polymers. Thermosetting polymers. Elastomers. Processing of polymers. Properties polymers. Composite materials.</p> <p>LABORATORY Metallographic tests. Crushing and recrystallization of metals. Phases and ingredients structural alloys of iron with carbon. Iron casting alloys. Alloy and unalloyed steels. Hardening and tempering of steel.</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="459 663 794 689">Subject passing criteria</th> <th data-bbox="802 663 1137 689">Passing threshold</th> <th data-bbox="1145 663 1481 689">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="459 696 794 723">Laboratory - passing</td> <td data-bbox="802 696 1137 723">50.0%</td> <td data-bbox="1145 696 1481 723">50.0%</td> </tr> <tr> <td data-bbox="459 730 794 757">Colloquium</td> <td data-bbox="802 730 1137 757">50.0%</td> <td data-bbox="1145 730 1481 757">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratory - passing	50.0%	50.0%	Colloquium	50.0%	50.0%
Subject passing criteria	Passing threshold	Percentage of the final grade										
Laboratory - passing	50.0%	50.0%										
Colloquium	50.0%	50.0%										
Recommended reading	<table border="1"> <tbody> <tr> <td data-bbox="459 775 794 824">Basic literature</td> <td colspan="2" data-bbox="802 775 1481 824">Askeland, D, Phules P.: The science and engineering of materials. Thomson 2008</td> </tr> <tr> <td data-bbox="459 831 794 880">Supplementary literature</td> <td colspan="2" data-bbox="802 831 1481 880">Srivastava C.M, Srinivasan C: Science of engineering materials. New Age Publishers 2005</td> </tr> <tr> <td data-bbox="459 887 794 1037">eResources addresses</td> <td colspan="2" data-bbox="802 887 1481 1037">           Structural Materials - Laboratory, Energetyka, Energy Technologies, Ist, sem 02 - Nowy - Moodle ID: 10477  <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477</a>            Structural Materials - Laboratory, Energetyka, Energy Technologies, Ist, sem 02 - Nowy - Moodle ID: 10477  <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477</a> </td> </tr> </tbody> </table>			Basic literature	Askeland, D, Phules P.: The science and engineering of materials. Thomson 2008		Supplementary literature	Srivastava C.M, Srinivasan C: Science of engineering materials. New Age Publishers 2005		eResources addresses	Structural Materials - Laboratory, Energetyka, Energy Technologies, Ist, sem 02 - Nowy - Moodle ID: 10477 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477</a> Structural Materials - Laboratory, Energetyka, Energy Technologies, Ist, sem 02 - Nowy - Moodle ID: 10477 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477</a>	
Basic literature	Askeland, D, Phules P.: The science and engineering of materials. Thomson 2008											
Supplementary literature	Srivastava C.M, Srinivasan C: Science of engineering materials. New Age Publishers 2005											
eResources addresses	Structural Materials - Laboratory, Energetyka, Energy Technologies, Ist, sem 02 - Nowy - Moodle ID: 10477 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477</a> Structural Materials - Laboratory, Energetyka, Energy Technologies, Ist, sem 02 - Nowy - Moodle ID: 10477 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=10477</a>											
Example issues/ example questions/ tasks being completed	<p>Material groups</p> <p>Crystal networks</p> <p>The influence of carbon content on the mechanical properties of steel</p>											
Work placement	Not applicable											