



Subject card

Subject name and code	Structural Materials, PG_00042004						
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			Polish		
Semester of study	2	ECTS credits			3.0		
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. Jerzy Łabanowski					
	Teachers	dr hab. inż. Jacek Tomków mgr inż. Adrian Wolski dr inż. Jacek Haras mgr inż. Anna Janeczek prof. dr hab. inż. Jerzy Łabanowski					
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:						
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		25.0		75
Subject objectives	The aim of this course is to provide students with the knowledge in the field of materials science and materials technologies necessary for an engineer with a specialization in Power Engineering						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_U02	Student selects the appropriate construction materials for a particular purpose. The student knows the method of forming the mechanical properties of metallic materials.			[SU4] Assessment of ability to use methods and tools		
	K6_W04	Student defines the basic groups of materials. Student explains the differences in physical and mechanical properties of structural materials depending upon the chemical composition and structure.			[SW1] Assessment of factual knowledge		

Subject contents	<p>COURSE CONTENT The structure of materials. Characteristics of the major groups of materials. Metals. Ceramic materials. Polymers. Composite materials. Rules for the selection of engineering materials. Crystalline structure of materials. Defects in the crystal structure. Polymorphism. Crystallization of metals and alloys. Mechanical properties of materials. Methods of testing materials. Working conditions and wear mechanisms of engineering materials. Alloys. Strengthening of metals and alloys, phase transformations. Phase equilibrium systems. Transformations in the solid state. System phase equilibrium iron-carbon. The division and classification of steel. Structural steels. Steels with special properties - corrosion resistant, heat resistant and creep resistant. Casting alloys. Cast steel and cast iron. Technological methods for structure and mechanical properties modeling. Plastic processing, thermal and thermo-chemical treatment. Annealing, hardening, carburizing, nitriding. Technical non-ferrous alloys. Copper and its alloys. Light metals and their alloys. Metallic materials for power plant industry. Ceramics and glass. Properties of ceramic materials. Methods of manufacture and shaping of ceramic materials. Polymeric materials. Structure of polymers. Thermoplastic polymers. Thermosetting polymers. Elastomers. Processing of polymers. Properties of polymers. Composite materials.</p> <p>LABORATORY PRACTICAL TRAINING Practical metallography. Cold plastic processing and recrystallization of metals. Phases and structural components of alloys of iron - coal system. Iron foundry alloys. Alloy and non-alloyed steels. Hardening and tempering heat treatment.</p>														
Prerequisites and co-requisites	Not required														
Assessment methods and criteria	<table border="1" data-bbox="451 651 1487 790"> <thead> <tr> <th data-bbox="451 651 798 689">Subject passing criteria</th> <th data-bbox="798 651 1141 689">Passing threshold</th> <th data-bbox="1141 651 1487 689">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 689 798 723">laboratory reports</td> <td data-bbox="798 689 1141 723">100.0%</td> <td data-bbox="1141 689 1487 723">20.0%</td> </tr> <tr> <td data-bbox="451 723 798 757">pass tests in the laboratory</td> <td data-bbox="798 723 1141 757">100.0%</td> <td data-bbox="1141 723 1487 757">20.0%</td> </tr> <tr> <td data-bbox="451 757 798 790">written exam</td> <td data-bbox="798 757 1141 790">50.0%</td> <td data-bbox="1141 757 1487 790">60.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	laboratory reports	100.0%	20.0%	pass tests in the laboratory	100.0%	20.0%	written exam	50.0%	60.0%
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<p>Example issues/ example questions/ tasks being completed</p>	<p>Provide the characteristics of metals and metal alloys. Enter the characteristics of the polymers. What are composites? Explain the phenomenon of polymorphism. What allotropic varieties does iron have? What defects in the crystal structure do you know? The principle of measuring hardness of the method: a - Vickers, b - Rockwell, c - Brinell Observation of digested and non-digested deaths. Explain the Charpy impact test. Draw and describe a low carbon steel tensile graph. What is hot metal forming? Draw the Fe - Fe₃C system with the description Give a definition of cast iron and divide cast iron. What are the advantages and disadvantages of gray iron? Give a definition of steel and cast steel and divide steel. How does carbon affect the mechanical properties of steel? What determines the corrosion resistance of steel? What is heat resistance and heat resistance of steel? Structural alloys for work at elevated temperatures - Structural Q-T alloyed steels Characteristic of stainless and Normalizing annealing. What is steel hardening? Present the basic mechanical and physical properties of copper Give definitions of basic copper alloys. Present the characteristics of aluminum alloys for plastic working. Present the characteristics of aluminum casting alloys. What are bearing alloys, provide requirements and examples of such alloys List the most important features of polymers What are elastomers. What are plastomers. Specify the properties and methods of processing thermoplastics.</p>
<p>Work placement</p>	<p>Not applicable</p>