



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 Janeczka				
		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	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%
Recommended reading	Basic literature	<p>1. Podstawy Metaloznawstwa. Praca zbiorowa pod red M.Głowackiej. Politechnika Gdańska 2014.</p> <p>2. Metaloznawstwo. Praca zbiorowa pod red. M. Głowackiej. Skrypt Politechniki Gdańskiej. Wyd.3. Gdańsk 1996.</p> <p>3. Blicharski M. Wstęp do inżynierii materiałowej. Wyd. AGH, Kraków 2003.</p> <p>4. Materiały do ćwiczeń laboratoryjnych z metaloznawstwa. Skrypt Politechniki Gdańskiej Wyd.2. Gdańsk 1995.</p>	
	Supplementary literature	<p>1. Dobrzański L.: Podstawy nauki o materiałach i metaloznawstwo. WNT Warszawa 2002. 2. Przybyłowicz K.: Metaloznawstwo. WNT, Warszawa, 1992. 3. Dobrzański L.A.: Materiały inżynierskie i projektowanie materiałowe. WNT, Warszawa, 2005.</p>	
	eResources addresses		

Example issues/ example questions/ tasks being completed	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 - Fe ₃ C 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.
Work placement	Not applicable