GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Structural Materials, PG_00042019		
Field of study	Power Engineering, Power Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
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	prof. dr hab. inż. Dionizy Czekaj dr inż. Krzysztof Krzysztofowicz dr inż. Gabriel Strugała	

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						

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] has structured knowledge of mechanics, including the issues of material strength and general principles of shaping structures, necessary to conduct basic strength analyzes and design simple mechanical or construction systems for power industry or environmental engineering; knows the basics of machine construction and the most commonly used construction and operating materials	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_U01] can obtain information from literature and other sources, organize, interpret it and draw and formulate conclusions; has the ability to self-educate, interprets the results of completed engineering tasks, is able to design simple energy systems and their systems		

Subject contents	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. 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.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory - passing	50.0%	50.0%
Colloqium	50.0%	50.0%

Recommended reading	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	Adresy na platformie eNauczanie: Structural Materials, W, ET, sem.02, letni 22/23 (PG_00042019) - Moodle ID: 29670 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29670 Structural Materials, W, ET, sem.02, letni 22/23 (PG_00042019) - Moodle ID: 29670 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29670
Example issues/ example questions/ tasks being completed	Material groups Crystal networks The influence of carbon content on the mechanical properties of steel	
Work placement	Not applicable	