GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Construction materials, PG_00055365		
Field of study	Mechatronics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
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 -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Agata Lisińska-Czekaj	
	Teachers		

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	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. 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. 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. 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. 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. Cast iron alloys. Steel and cast iron. Standardization and classification and designation systems for steels and cast irons. Formation of structure and properties of engineering materials by technological methods. Crushing 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. 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. Ceramic materials division, properties, manufacturing. Polymeric materials division, properties, manufacturing. Structural composite materials division, properties, manufacturing. Biomimetics. Trends in materials development
Prerequisites and co-requisites	

Assessment methods and criteria

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

Recommended reading

Basic literature	1. Ashby M., Jones D., Materiały inżynierskie. Tom I Właściwości i zastosowanie. WNT, Warszawa 1995 2. Ashby M., Jones D., Materiały inżynierskie. Tom IIKształtowanie struktury i właściwości, dobór materiałów. WNT, Warszawa 1996 3. Blicharski M., Wstęp do inżynierii materiałowej. WNT, Warszawa 2004 4. Blicharski M., Inżynieria materiałowa. Stal. WNT, W-wa 2004. 5. Dobrzański L.A., Podstawy nauki o materiałach i metaloznawstwo. WNT, Gliwice-Warszawa 2002 6. Dobrzański L.A., Metaloznawstwo z podstawami nauki o materiałach. WNT Warszawa 1996. 7. Głowacka M., Zieliński A. (Red). Podstawy materiałoznawstwa, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2014
Supplementary literature	1. A.Lisińska-Czekaj, Wielofunkcyjne materiały ceramiczne na osnowie tytanianu bizmutu, Wydawnictwo Gnome, Uniwersytet Śląski, Katowice 2012 2. D. Czekaj, Fabrication and study of BST based functional materials, University of Silesia, Gnome Publishing House, Katowice 2010, 3. Dobrzański L.A., Metalowe materiały inżynierskie. WNT Warszawa 2004. 4. Grabski W., Kozubowski J., Istota inżynierii materiałowej geneza, istota, perspektywy. Oficyna Wyd. Politechniki Warszawskiej, Warszawa 2003. 5. Pampuch R., Współczesne materiały ceramiczne, Wydawnictwo AGH, Kraków 2005 6. Prowans S., Metaloznawstwo. PWN, W-wa 1988. 7. Przybyłowicz K., Metaloznawstwo. WNT, Warszawa 2003. 8. Boczkowska A., Krzesiński G., Kompozyty i techniki ich wytwarzania, Oficyna Wydawnicza Politechniki Warszawskiej, 2016 9. Królikowski W., Polimerowe kompozyty konstrukcyjne, PWN, Warszawa, 2012
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	
Work placement	Not applicable

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