GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced engineering materials, PG_00059499						
Field of study	Management and Production Engineering						
Date of commencement of studies	February 2024		Academic year of realisation of subject		2024/2025		
Education level	second-cycle studies		Subject group		Optional subject group 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 Polish		
Semester of study	2		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Zakład Technologii Materiałów Konstrukcyjnych i Spajania -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Krzysztof Krzysztofowicz				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30		10.0		35.0	75
Subject objectives	Obtaining basic knowledge of modern construction materials and their behavior in working environment in industry.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_K04] is aware of the social role of the university graduate, and especially understands the need to formulate and communicate to society - incl. through the mass media - information and opinions on technological achievements and other aspects of an engineer's activity; makes efforts to provide such information and opinions in a generally comprehensible manner, justifying different points of view	The student is aware of the need to disseminate knowledge	[SK4] Assessment of communication skills, including language correctness
	[K7_U04] is able to plan and carry out experiments, including measurements and computer simulations, interpret the obtained results and extract conclusions; can use analytical, simulation and experimental methods to formulate and solve engineering tasks	The student is able to plan an experiment, analyze the obtained results and draw conclusions	[SU4] Assessment of ability to use methods and tools
	[K7_U01] can obtain information from literature, databases and others sources, also in English or another foreign language recognized as the language of international communication in a given engineering discipline; is able to integrate the obtained information, interpret it, as well as draw conclusions and formulate and justify opinions.	The student is able to obtain and use engineering information and formulate appropriate conclusions based on it	[SU2] Assessment of ability to analyse information
	[K7_U07] is able to communicate fluently using various techniques in professional environment and in other environments, also in English or another foreign language recognized as the language of international communication in a given engineering discipline	The student has communication skills using various techniques	[SU3] Assessment of ability to use knowledge gained from the subject
	[K7_W01] knows and understands to a greater extent selected issues in the field of management and quality sciences and mechanical engineering, their location in the field of social sciences and engineering and technical sciences, as well as relationships with related disciplines, and sees the possibility of applying the knowledge in practice	The student understands issues in the field of mechanical engineering in the field of modern materials and sees the possibilities of their application	[SW1] Assessment of factual knowledge

Subject contents	LECTURE:Weldable structural steels with increased and high strength.Steel for industry automotive.Stainless steels: ferritic, austenitic, duplex ferritic-austenitic and hardened secretory.Passivation treatment of stainless steel to protect against corrosion.Reasons corrosion damage to austenitic steels in industrial installations.Low-alloy steels for operation at elevated temperatures.Creep; influence of temperature, time and stresses on the mechanical properties of alloys.Heat-resistant steels and superalloys based on iron, nickel and cobalt, used in the energy industry and in petrochemical and chemical industry equipment.Heat-resistant alloys; chemical composition, operating temperatures.High-melting metals; molybdenum, niobium, tungsten, zirconium, hafnium and their alloys.Materials with an intermetallic phase structure. Heat-resistant light metal alloys. Materials resistant to abrasive wear. LABORATORY: 1. Weldable structural steels with increased and high strength. Vickers hardness distribution in welded joints. 2. Austenitic and duplex stainless steels. Analysis of operational damage cases. 3. Low-alloy Cr-Mo steels for operation at elevated temperatures; assessment of the degree of degradation after long-term operation in creep conditions. 4. Heat-resistant alloys (ferritic and austenitic) and heat-resistant alloys (austenitic and martensitic), assessment of the degree of degradation after long-term use. 5. Materials resistant to abrasive wear.
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory	100.0%	30.0%
Lecture	60.0%	70.0%

Recommended reading

Basic literature	1. Adamczyk J.: Inżynieria materiałów metalowych. Monografia. Cz. 1 i Cz. 2. Wyd. Politechniki Śląskiej. Gliwice 2004. 2. Ashby M.F., Jones D.R.H.: Materiały inżynierskie. Tom 1. Właściwości i zastosowanie. WNT, W-wa 1995. Tom 2. Kształtowanie struktury i właściwości, dobór materiałów. WNT. Warszawa 1996. 3.Blicharski M.: Inżynieria materiałowa. Stal. WNT W-wa 2004. 4. Bala H.: Korozja materiałów Teoria i praktyka. Wyd. WIPMiFS. Częstochowa 2002. 5. Baszkiewicz J., Kamiński M.: Korozja materiałów. Wyd. Polit. Warsz. Warszawa 2006. 6. Boczkowska A., Krzesiński G.: Kompozyty i techniki ich wytwarzania, Oficyna Wyd. PW, Warszawa 2016 7. Dobrzański J.: Materiałoznawcza interpretacja trwałości stali dla energetyki. Open Access Library vol. 3, 2011. 8. Dobrzański L.A.: Podstawy nauki o materiałach i metaloznawstwo. PWN 2004. 9. Hernas A.: Żarowytrzymałość stali i stopów. Wyd. Polit. Śląskiej. Gliwice 2000. 10. Łabanowski J.: Stale odporne na korozję i ich spawalność. Wyd. Politechniki Gdańskiej. Gdańsk 2018. 11. Oczoś K.E., Kawalec A.: Kształtowanie metali lekkich. PWN. Warszawa 2012. 12. Tasak E., Ziewiec A.: Spawalność materiałów konstrukcyjnych. T1. Spawalność stali. Wyd. Fotobit. Kraków 2008 13. Skrzypek S., Przybyłowicz K. (red): Inżynieria metali i ich stopów. Wyd. AGH Kraków 2012. 14. Głowacka M., Zieliński A. (red.): Podstawy materiałoznawstwa Wyd. Polit. Gdańskiej. Gdańsk 2014.
Supplementary literature	1. Chodorowski J., Ciszewski A., Radomski T.: Materiałoznawstwo lotnicze. Oficyna Wyd. Politechniki Warszawskiej. Warszawa 1996 2. Głowacka M., Łabanowski J.: Inżynieria powierzchni. Wybrane zagadnienia. PWSZ w Elblągu. Elbląg 2015.
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	Metallurgical weldability of steel, carbon equivalent. The use of weldable non-alloy steels. Steel strengthening mechanisms. Bainitic steels, alloy additions, CTP chart, applications. Austenitic stainless steels, the role of chromium and nickel, basic heat treatment. Examples of modern steel grades for the automotive industry.
Work placement	Not applicable