GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced engineering materials, PG_00064726						
Field of study	Management and Production Engineering						
Date of commencement of studies	February 2025		Academic year of realisation of subject	2025/2026			
Education level	second-cycle studies		Subject group	Specialty 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			
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	dr inż. Michał Landowski					
	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	Acquirement of the essential knowledge in modern structural materials and maintain their at industrial work environment.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K01] is aware of the importance and understanding of non-technical aspects and effects of engineering/production activities, including its impact on the environment and the related responsibility for decisions made, demonstrating knowledge of actions aimed at reducing risk and anticipating the social and environmental effects of engineering/production activities	The student is aware of the impact of engineering activities on the environment and knows methods to limit adverse impacts on the environment.	[SK5] Assessment of ability to solve problems that arise in practice
[K7_U13] evaluates the feasibility and potential for utilizing new technical and technological achievements in accomplishing tasks characteristic for the field of study	The student is able to assess the possibility of using modern technologies for manufacturing materials.	[SU3] Assessment of ability to use knowledge gained from the subject
[K7_W04] demonstrates knowledge covering selected issues in the field of advanced detailed knowledge, in particular in the field of methods, techniques, tools and algorithms used in production management and control processes as well as in the design of technological processes	The student has knowledge of advanced engineering materials and the limitations of their application.	[SW1] Assessment of factual knowledge
[K7_U01] uses known analytical, simulation and experimental methods as well as mathematical models to analyze and evaluate stationary and non-stationary technological and production systems/processes with continuous and discrete operation	The student learns methods of analyzing the impact of manufacturing processes on the properties of materials.	[SU2] Assessment of ability to analyse information

Subject contents

LECTURE:

Weldable structural steels AHSS (Advanced High Strength Steels). Modern steel grades for automotive industry. Corrosion-resistant steels: ferritic, austenitic, duplex, and precipitation hardening steels. Surface treatments of the stainless steels needed to prevent corrosion. The causes of corrosion damages of austenitic stainless steel in industrial systems. Low alloy steels operating at elevated temperature. Creep; influence of temperature, time and stresses to mechanical properties of metals. Creep-resisting steels and super alloys on the base of iron, nickel, and cobalt used in power industry, petrochemical or chemical systems. Heat-resisting steels; chemical composition, operating temperature. Refractory metals; Mo, Nb, W, Zr, Hf and their alloys. Materials on the intermetallic phase matrix.
Creep-resisting light metal alloys. Wear resistant materials.

LABORATORY:

1. Weldable structural steels AHSS (Advanced High Strength Steels). Vickers hardness of welded joints.
2. Corrosion-resistant austenitic steels and duplex steels. Case study of austenitic steel damages.
3. Low alloy Cr-Mo steel operating at elevated temperature; evaluation of the steel degradation process after long term operating in creep conditions.
4. Heat-resisting steels (ferritic and austenitic) and creep-resisting alloys;(austenitic and martensitic), evaluation of the degradation processes after long term operating in industrial systems.
5. Wear-resistant materials.

Prerequisites and co-requisites

Completed courses: Material Science I and Material Science II

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
	100.0%	30.0%
	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	Weldability of steel, equivalent CEV. Application of the welded carbon steels Strengthening mechanisms of steel. Bainitic steels, alloying elements, TTT diagram, application. Corrosion-resistant austenitic steel, the role of chromium and nickel, essential heat treatment. Examples of modern steel grades for automotive industry.	
Work placement	Not applicable	

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