



## Subject card

Subject name and code	Metals and Alloys, PG_00039807						
Field of study	Materials Engineering, Materials Engineering, Materials Engineering						
Date of commencement of studies	October 2021		Academic year of realisation of subject			2023/2024	
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	3		Language of instruction			Polish	
Semester of study	5		ECTS credits			4.0	
Learning profile	general academic profile		Assessment form			exam	
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 inż. Artur Sitko  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						
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		50.0	100
Subject objectives	Delivery of basic knowledge in the field of materials science of non-ferrous alloys, and technology of surface layers and protective coatings.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_W03		The student recognizes technical non-ferrous metal alloys, chemical composition, mechanical and physical properties and application		[SW1] Assessment of factual knowledge		
	K6_K01		Student is able to connect the acquired knowledge in the field of materials science with other fields of engineering knowledge		[SK5] Assessment of ability to solve problems that arise in practice		
	K6_U06		Student defines non-ferrous alloys, bearing alloys, low-melting alloys and precious metals. Classifies types of wear of metallic alloys. Presents the techniques of obtaining surface layers and presents chemical, electrolytic, immersion and welding methods for producing metal coatings.		[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		

Subject contents	<p>LECTURE Classification and properties of non-ferrous metals. Technical non-ferrous metal alloys, chemical composition, mechanical and physical properties, application, marking. Copper and copper alloys. Light metals and their alloys (aluminum, magnesium, titanium). Nickel and its alloys. Cobalt alloys. Zinc and its alloys. Tin, lead and their alloys. Bearing alloys. Low-melting alloys. Precious metal alloys. Solid surface. The concept of coatings and surface layers. Electrochemical and chemical corrosion. Friction wear. Division of methods and techniques for the production of surface layers. Chemical and electrolytic methods of producing metal coatings. Coatings produced by immersion method and clad coatings. Welding and detonation techniques.</p> <p>LABORATORY Copper alloys. Aluminum alloys. Bearing alloys. Electrolytic and immersion coatings. Coatings applied by welding techniques and plated.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Egzamin	50.0%	60.0%
	zaliczenie ćwiczeń	100.0%	40.0%
Recommended reading	<p>Basic literature</p> <p>1. Podstawy materiałoznawstwa. Praca zbiorowa pod red. Marii Głowackiej. Skrypt PG, Gdańsk 2014</p> <p>2. Burakowski T., Wierzchoń T.: Inżynieria powierzchni metali. WNT Warszawa 1995.</p> <p>3. Głowacka M., Łabanowski J. Inżynieria powierzchni. Wybrane zagadnienia. Wyd. PWSZ w Elblągu, Elbląg 2014</p> <p>4. Dobrzański L.A.: Metalowe materiały inżynierskie. WNT, Warszawa, 2004.</p> <p>5. Kula P.: Inżynieria warstwy wierzchniej. Wyd. Politechniki Łódzkiej, Łódź 2000.</p>		
	Supplementary literature	Praca zbiorowa pod redakcją Stanisława Tkaczyka.: Powłoki ochronne. Gliwice 1994.	
	eResources addresses	Adresy na platformie eNauczanie:	

<p>Example issues/ example questions/ tasks being completed</p>	<ol style="list-style-type: none"> <li>1. Give the definitions of the basic copper alloys</li> <li>2. Brass: division, rules of marking, heat treatment.</li> <li>3. Bronzes: classification, rules of marking, heat treatment.</li> <li>4. What are the properties and application of aluminum.</li> <li>5. What are the difficulties when welding aluminum and aluminum alloys?</li> <li>6. List the most important nickel alloys, describe their properties and applications.</li> <li>7. List the most important titanium alloys, describe their properties and applications.</li> <li>8. List the most important magnesium alloys, describe their properties and applications.</li> <li>9. What are bearing alloys?</li> <li>10. What are the methods for creating metal protective coatings?</li> <li>11. Describe the technology of electroplated metal coatings.</li> <li>12. Describe the technology of metal immersion coatings.</li> <li>13. Describe the technology of metal spray coatings.</li> <li>14. List the technologies of obtaining welded surface layers</li> </ol>
<p>Work placement</p>	<p>Not applicable</p>