GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00056104		
Field of study	Mechanical and Medical Engineering		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	6	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Magdalena Jażdżewska	
	Teachers	dr inż. Magdalena Jażdżewska dr inż. Beata Majkowska-Marzec dr inż. Łukasz Pawłowski dr inż. Magda Rościszewska	

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	0.0	0.0	30

Subject objectives	Getting to know the technologies of surface layers and coatings.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W07] he/she is able to design, manufacture and utilize machine parts and technical devices, he/she can prepare a technical documentation	The student has knowledge of the methods of obtaining coatings, types of coatings, properties and basic research methods.	[SW1] Assessment of factual knowledge
	[K6_W04] he/she has skills in the field mechanical testing of materials used in engineering and mechanical-medical area	The student has knowledge of the structure, properties and testing methods of coatings in the field of medical engineering	[SW1] Assessment of factual knowledge
	[K6_K01] he/she knows his/her proficiencies and his/her limitations in performing professional tasks, he/she is aware of needing to improve his/her skills through the whole life, he/she has entrepreneurship and innovation skills, he/she is aware of engineering skills from the society point of view	The student is aware of his competences and limitations in the performance of professional tasks.	[SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness
	[K6_U07] he/she is able to identify the problem and list simple engineering tasks to solve this problem in practice, he/she is able to critically analyze the proposed technical solutions and conclude whether these solutions can be implemented to solve problems related to design of mechanical devices and mechanical-medical devices	The student is able to assess the usefulness of the known methods for solving a simple engineering task.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
	[K6_W13] he/she has knowledge related to application of engineering approaches in medicine or application of medical devices and rehabilitation devices	The student has knowledge of selected issues related to the application of mechanical engineering in medicine	[SW1] Assessment of factual knowledge

Subject contents

LECTURE: Classification of methods and techniques for producing surface layers. Chemical and electrolytic methods of producing metal coatings. Selected technologies of steel impregnation with non-metals and metals. Gas, arc, plasma and detonation spraying. Fluorescent treatment techniques and their application. Fabrication of surface layers by laser processing, CVD, PVD and PLD. Test methods for surface layers.

LABORATORY: Production of coatings using the electrolytic method. Microscopic analysis of the obtained layers and coatings. Assessment of selected properties of the obtained layers and coatings.

Prerequisites and co-requisites

Basic knowledge of materials science.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Practical exercises	50.0%	40.0%
Test of the lecture	50.0%	60.0%

Recommended reading

Basic literature

1. Burakowski T., Wierzchoń T.: Inżynieria powierzchni metali. WNT Warszawa 1995.

2. Praca zbiorowa pod redakcją Stanisława Tkaczyka.: Powłoki ochronne. Gliwice 1994.

3. Kula P.: Inżynieria warstwy wierzchniej. Wyd. Politechniki Łódzkiej, Łódź 2000.

4. Kusiński J.: Lasery i ich zastosowanie w inżynierii materiałowej. Kraków, Wyd. Naukowe Akapit 2000.

5. Klimpel A.: Napawanie i natryskiwanie cieplne. Technologie. WNT Warszawa 2000

6. Głowacka M., Łabanowski J.: Inżynieria Powierzchni Wybrane Zagadnienia, WPWSZ Elbląg 2014

	Supplementary literature	1. Dobrzański L.A.: Podstawy nauki o materiałach i metaloznawstwo. Materiały inżynierskie i podstawy projektowania materiałowego. WNT. 2002.
	eResources addresses	Adresy na platformie eNauczanie: Techniki inżynierii powierzchni - wykład, IMM, I stopień, VI semestr - Moodle ID: 10337 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=10337 Techniki inżynierii powierzchni - laboratorium, IMM, I stopień, 6 semestr, - Moodle ID: 38253 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38253
Example issues/ example questions/ tasks being completed	1. Basic concepts of Surface Engineering: surface layer, top layer, protective coating 2. Classification of coatings and their requirements according to the type of material from which it is made according to the intended use according to the type of protection 3. Methods of producing surface layers: substrate preparation, mechanical, thermo-mechanical, thermal, thermo-chemical, electrochemical, chemical and physical methods. 4. Galvanic coatings: types of coatings and their requirements, factors affecting the structure of the coating, coating technology, advantages of the galvanic method, typical electrolytic coatings used in the technology (Zn, Cr, Ni, Fe, composite 5. Immersion coatings: characteristics, operations; tin coatings - properties, application; galvanizing - methods, properties, application; aluminizing - types, properties, application 6. Thermally sprayed coatings: description of the method, preparation of the substrate surface, stages of spray metallization, coating materials, properties and application of sprayed coatings, types of spraying - characteristics, important parameters 7. Methods of testing surface layers	
Work placement	Not applicable	

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