



Subject card

Subject name and code	Modelling of heat and plastic treatment processes of materials, PG_00059373						
Field of study	Mechanical 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	Part-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Zakład Materiałoznawstwa I Technologii Materiałowych -> 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	18.0	0.0	9.0	9.0	0.0	36
	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	36		11.0		53.0	100
Subject objectives	The aim of the course is to familiarize students with the basic issues related to heat treatment and plastic working of construction materials.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W10] possesses knowledge on the methods of technical and economic analysis of industrial systems and optimization of manufacturing systems; is familiar with the general principles of initiating and developing forms of individual entrepreneurship, particularly for innovative projects using the knowledge		has knoweldge and knows rules		[SW3] Assessment of knowledge contained in written work and projects		
	[K7_U07] is able to perform a preliminary economic analysis of the undertaken engineering actions within the range of design, production and operation of machines and technical devices		is able to make a preliminary analysis		[SU5] Assessment of ability to present the results of task		
	[K7_W04] possesses specialized knowledge on design, construction, properties and testing methods of construction materials		hes specialist knowledge		[SW3] Assessment of knowledge contained in written work and projects		

Subject contents	<p>Lecture: Design and modeling of thermo-chemical treatment processes in relation to plastics iron-based metal. Diffusion saturation with non-metallic elements. Nitriding conventional and ionic, selective nitriding. Conventional carburizing, high temperature and ionic. Diffusion saturation with metallic elements. Machining defects thermochemical. Basics of plastic working. Plastic deformation of metals. The influence of plastic deformation on the properties of metals. Classification of plastic working processes. Rolling of metals. Rolling of sections. Rolling of pipes. Forging and ironing. Forging and pressing machines. Open-die forging. Die forging. Classification of forgings. Drawing and extrusion. Characteristics of drawing and extrusion processes. Drawing machines. Extrusion presses. Technology for drawing bars, wires and pipes. Technology of extrusion processes. Classification of pressing processes. Metal cutting. Metal bending. Multiple and simultaneous pressing</p> <p>Project: Design of the OC process, Design of the plastic forming process</p> <p>Laboratory: Hardening, tempering, thermo-chemical treatment, plastic forming processes</p>														
Prerequisites and co-requisites															
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 598 794 629">Subject passing criteria</th> <th data-bbox="799 598 1141 629">Passing threshold</th> <th data-bbox="1145 598 1492 629">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 636 794 667">Exam</td> <td data-bbox="799 636 1141 667">50.0%</td> <td data-bbox="1145 636 1492 667">30.0%</td> </tr> <tr> <td data-bbox="453 674 794 705">Laboratory - activity</td> <td data-bbox="799 674 1141 705">50.0%</td> <td data-bbox="1145 674 1492 705">30.0%</td> </tr> <tr> <td data-bbox="453 712 794 734">Project</td> <td data-bbox="799 712 1141 734">50.0%</td> <td data-bbox="1145 712 1492 734">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Exam	50.0%	30.0%	Laboratory - activity	50.0%	30.0%	Project	50.0%	40.0%
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Project	50.0%	40.0%													
Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<p>1. Burakowski T., Roliński E., Wierzchoń T.: Inżynieria powierzchni metali. WPW, Warszawa 1992.</p> <p>2. Jarzębski M.Z.: Dyfuzja w metalach. Śląsk. Katowice 1976.</p> <p>3. Praca zbiorowa.: Metaloznawstwo. Skrypt Politechniki Gdańskiej, Gdańsk 1991.</p> <p>4. Poradnik inżyniera. Obróbka cieplna stopów żelaza. WNT, Warszawa 1977.</p> <p>1. Askeland. D, Phules P.: The science and engineering of materials. Thomson 2008</p> <p>Adresy na platformie eNauczanie:</p>													
Example issues/ example questions/ tasks being completed	<p>1. Quenching and tempering process</p> <p>2. Annealing</p> <p>3. Design of the heat treatment process 4. Design of the plastic forming process</p>														
Work placement	Not applicable														