GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modelling of heat and plastic treatment processes of materials, PG_00064853		
Field of study	Mechanical Engineering		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
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	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Division of Materials Science and Technology -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Michał Landowski	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	15.0	15.0	0.0	60

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	60	4.0	36.0	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_U04] creatively designs or modifies devices, processes or systems specific to Mechanics and Mechanical Engineering, using computer-aided design systems in the form of technical documentation, taking into account aspects of economic analysis, using appropriate tools and techniques	The student designs tool elements for forming processes.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
[K7_W04] demonstrates knowledge covering selected topics of advanced specific knowledge, in particular methods, techniques, tools specific to Mechanics and Mechanical Engineering processes, systems and equipment	The student demonstrates knowledge about issues of heat treatment and forming.	[SW1] Assessment of factual knowledge
[K7_W01] explains and describes, on the basis of general knowledge of the scientific disciplines forming the theoretical basis of Mechanics and Mechanical Engineering, the structure and principles of operation of mechanical systems and processes	The student is able to describe the operation of processing equipment.	[SW3] Assessment of knowledge contained in written work and projects
[K7_W13] explains the main principles of individual and teamwork organization, including various forms of entrepreneurship utilizing knowledge from the field of engineering and technical sciences and disciplines relevant to the course of study	As part of the project, the student works in a team to solve a technical problem.	[SW3] Assessment of knowledge contained in written work and projects

<table>
<tr><td>Subject contents</td><td>Course content – lecture

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

Project: Design of the OC process, Design of the plastic forming process

Laboratory: Hardening, tempering, thermo-chemical treatment, plastic forming processes</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Laboratory</td><td>50.0%</td><td>30.0%</td></tr>
<tr><td>Project</td><td>50.0%</td><td>40.0%</td></tr>
<tr><td>Exam</td><td>50.0%</td><td>30.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Burakowski T., Roliński E., Wierzchoń T.: Inżynieria powierzchni metali. WPW, Warszawa 1992.
2. Jarzębski M.Z.: Dyfuzja w metalach. Śląsk. Katowice 1976.
3. Praca zbiorowa.: Metaloznawstwo. Skrypt Politechniki Gdańskiej, Gdańsk 1991.
4. Poradnik inżyniera. Obróbka cieplna stopów żelaza. WNT, Warszawa 1977.</td></tr>
<tr><td>Supplementary literature</td><td>1. Askeland. D, Phules P.: The science and engineering of materials. Thomson 2008</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table>
</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Quenching and tempering process

2. Annealing

3. Design of the heat treatment process 4. Design of the plastic forming process</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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