GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Technics of material manufacturing, PG_00055749		
Field of study	Mechanical and Medical Engineering		
Date of commencement of studies	October 2022	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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
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. Aleksandra Świerczyńska	
	Teachers	dr inż. Aleksandra Świerczyńska dr inż. Michał Landowski dr hab. inż. Dariusz Fydrych mgr inż. Adrian Wolski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	30.0	0.0	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	61.0	125

Subject objectives

The aim of the course is to obtain basic knowledge of metal welding, casting and metal forming.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U04] he/she is able to use basic medical apparatus and methods to assess measurement errors	Can assess the correctness of conducted measurements and their usefulness.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
[K6_W10] he/she has knowledge in the field of machine part manufacturing and metrology	Describes the metallurgical processes of ferrous and non-ferrous alloys. Presents the casting process. Classifies and recognizes plastic forming processes. Defines the processes of joining metals. Distinguishes between methods of welding and cutting metals.	[SW1] Assessment of factual knowledge
[K6_W06] he/she has basic knowledge in the fields of automatics and mechanical system robotics or electrical engineering and electronics	Student knows automatic and robotic welding and forming processes. Recognizes their advantages and areas of application.	[SW1] Assessment of factual knowledge

Subject contents	LECTURE: Metallurgy of metals and their alloys. Pig iron metallurgy. Steel metallurgy. Casting manufacturing methods. Manufacturing of sand castings by hand and machine. Molding sands. Automation and mechanization of forming and producing cores. Special methods of making molds and cores. Special casting methods. Basics of plastic working. Plastic deformation of metals. The influence of plastic deformation on the properties of metals. Classification of plastic working processes. Metal rolling. Rolling of billets and slabs. Rolling of sections. Rolling of pipes. Forging and ironing. Forging and pressing machines. Open-die forging. Die forging. Classification of forgings. Characteristics of drawing and extrusion processes. Pressing of non-unfolding coatings. Classification of pressing processes. Metal cutting. Metal bending. Multiple and simultaneous pressing. Construction of a typical die. Classification of welding processes. Outline of welding thermal processes, welding thermal cycle. Phase transformations in the weld and in the heat affected zone. Definition of weldability. Basic materials and consumables for welding. Basics of the development of welding technology. Gas welding. MMA welding. Submerged arc welding. TIG welding. Shielding gases. Gas-shielded welding with the MIG/MAG method. Welding with flux cored wires. Pulsed arc welding. Laser, plasma and electron welding. Electric resistance welding. Basic process parameters. Other welding methods. Thermal cutting methods: oxygen cutting, plasma cutting. Laser beam cutting. Welding deformations and stresses and methods of their reduction. Control of welded joints, definitions of welding imperfections and methods of their detection. LABORATORY: Preparation of the production of castings. Making forms using the split and non-split model. Plastic working machines. Influence of crushing on the mechanical properties of metals. Rolling. Plastic bending of profiles and pipes. Pressing of non-unfolding coatings. Manual welding with covered electrodes, automatic submerged arc welding. GMAW and GTAW welding. Resistance welding. Gas welding and cutting. Construction of a welded joint. Imperfections of welded joints.
Prerequisites and co-requisites	Basic knowledge of physics, chemistry, materials science, electrical engineering and mechanics.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Final test	56.0%	80.0%
Short tests at laboratories	56.0%	20.0%

Recommended reading

Basic literature	1. Klimpel A.: Technologia spawania i cięcia metali. WNT. Warszawa 1999. 2. Walczak W. (red.): Spawalnictwo. Ćwiczenia laboratoryjne. Wydawnictwo Politechniki Gdańskiej. Gdańsk, 2000. 3. Butnicki S.: Spawalnośc i kruchość stali. Wydawnictwo WNT. Warszawa 1991. 4. Pilarczyk J., Pilarczyk J.: Spawanie i napawanie elektryczne metali. Wydawnictwo Śląsk, Katowice 1996. 5. Skoblik R., Wilczewski L.: Technologia metali. Laboratorium. 2006. www.wbss.pg.gda.pl 6. Murza-Mucha. K.: Techniki wytwarzania. Odlewnictwo. PWN. Warszawa 1978.
Supplementary literature	1. Poradnik inżyniera - Spawalnictwo. WNT Warszawa 2003. 2. Dobrucki W.: Zarys obróbki plastycznej metali. Wyd. Śląsk 1992.
eResources addresses	Adresy na platformie eNauczanie: Techniki wytwarzania materiałów, W, L, IMM, sem. 03, zimowy 23/24 - Moodle ID: 32687 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32687

Example issues/ example questions/ tasks being completed	Describe the welding method. Describe the casting method. Describe the method of plastic working. Compare the two methods of welding/casting/forming.
Work placement	Not applicable

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