GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Metal technology and bonding, PG_00055057		
Field of study	Management and Production 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	7.0
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	mgr inż. Adrian Wolski dr inż. Aleksandra Świerczyńska dr inż. Jacek Haras mgr inż. Anna Janeczek Dominika Kwidzińska dr inż. Grzegorz Gajowiec dr inż. Michał Landowski 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	30.0	15.0	0.0	75
	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	75	13.0	87.0	175

Subject objectives	The aim of the course is to obtain basic knowledge of welding and metal processing technology by students

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W13] has detailed knowledge of the production and operation of machines and devices, diagnosing their technical conditions and selection of regeneration techniques	Student classifies and recognizes plastic forming processes. Student defines the processes of joining metals. Student splits welded joints and welds. Student distinguishes between methods of welding and cutting metals.	[SW1] Assessment of factual knowledge
	[K6_U09] can use analytical techniques as well as computer simulation and numerical analysis methods in solving specific problems in the field of production engineering, is able to carry out simple engineering tasks related to the production of typical machine parts using widely understood techniques and computer tools, is able to select and apply appropriate methods of project planning and control courses with the use of computer aided means	Solves simple engineering tasks.	[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 [SU1] Assessment of task fulfilment
	[K6_K01] feels the need for self-realization by learning throughout life, is looking for modern and innovative solutions in their actions, is able to think creatively and act in an entrepreneurial way	Student understands the challenges related to the development of modern metalworking techniques and is able to independently search for solutions to technological problems.	[SK5] Assessment of ability to solve problems that arise in practice
	[K6_W06] has knowledge of the life cycle of products and mechanical devices and systems, in the field of machine parts manufacturing techniques, as well as the possibilities and trends in the development of machines and production devices and process control	Distinguishes between methods of welding and cutting metals as well as technologies of manufacturing and plastic processing of metals.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
	[K6_U02] has the ability of self-learning and expanding knowledge in a specialized field of engineering production	Distinguishes between learning methods.	[SU1] Assessment of task fulfilment

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%	70.0%
Short tests at laboratories	56.0%	20.0%
Preparing the project	56.0%	10.0%

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: Technologia i Spajanie Metali, W, L, P, ZiIP, sem. 03, zimowy 23/24 - Moodle ID: 32692 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32692
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 / forming / casting.	
Work placement	Not applicable	

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