



## 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 2021	Academic year of realisation of subject			2022/2023		
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. Michał Landowski					
	Teachers	dr inż. Michał Landowski dr inż. Aleksandra Świerczyńska 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_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		
	[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_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.			[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		

Subject contents	<p>LECTURE:</p> <p>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.</p> <p>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.</p> <p>LABORATORY:</p> <p>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.</p> <p>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.</p>											
Prerequisites and co-requisites	Basic knowledge of physics, chemistry, materials science, electrical engineering and mechanics.											
Assessment methods and criteria	<table border="1" data-bbox="448 1043 1489 1151"> <thead> <tr> <th data-bbox="448 1043 796 1084">Subject passing criteria</th> <th data-bbox="796 1043 1144 1084">Passing threshold</th> <th data-bbox="1144 1043 1489 1084">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 1084 796 1115">Short tests at laboratories</td> <td data-bbox="796 1084 1144 1115">56.0%</td> <td data-bbox="1144 1084 1489 1115">20.0%</td> </tr> <tr> <td data-bbox="448 1115 796 1151">Final test</td> <td data-bbox="796 1115 1144 1151">56.0%</td> <td data-bbox="1144 1115 1489 1151">80.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Short tests at laboratories	56.0%	20.0%	Final test	56.0%	80.0%
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Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<p>1. Klimpel A.: Technologia spawania i cięcia metali. WNT. Warszawa 1999.</p> <p>2. Walczak W. (red.): Spawalnictwo. Ćwiczenia laboratoryjne. Wydawnictwo Politechniki Gdańskiej. Gdańsk, 2000.</p> <p>3. Butnicki S.: Spawalność i kruchość stali. Wydawnictwo WNT. Warszawa 1991.</p> <p>4. Pilarczyk J., Pilarczyk J.: Spawanie i napawanie elektryczne metali. Wydawnictwo Śląsk, Katowice 1996.</p> <p>5. Skoblik R., Wilczewski L.: Technologia metali. Laboratorium. 2006. <a href="http://www.wbss.pg.gda.pl">www.wbss.pg.gda.pl</a></p> <p>6. Murza-Mucha. K.: Techniki wytwarzania. Odlewnictwo. PWN. Warszawa 1978.</p> <p>1. Poradnik inżyniera - Spawalnictwo. WNT Warszawa 2003.</p> <p>2. Dobrucki W.: Zarys obróbki plastycznej metali. Wyd. Śląsk 1992.</p> <p>Adresy na platformie eNauczenie: Techniki wytwarzania materiałów, W/L, IMM, sem 3, zima 22/23 (PG_00055749) - Moodle ID: 27334 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=27334">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=27334</a></p>										
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											