



Subject card

Subject name and code	Advanced welding processes, PG_00064855						
Field of study	Mechanical Engineering						
Date of commencement of studies	February 2026		Academic year of realisation of subject		2026/2027		
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		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Division of Structural Materials Technology and Welding -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology -> Wydział Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Grzegorz Rogalski				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	15.0	0.0	45
	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	45		5.0		25.0	75
Subject objectives	The aim of the course is to familiarize students with advanced bonding processes. The topics covered include the physical foundations of the processes discussed, the relationships between the basic variables and their influence on the obtained properties of bonded joints, technological guidelines and areas of their implementation						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[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 explain and describe advanced joining technologies taking into account information that forms the theoretical foundations of Mechanics and Machine Design, e.g. issues related to the modification of technological and mechanical processes, etc.		[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation		
	[K7_U13] evaluates the feasibility and potential for utilizing new technical and technological achievements in accomplishing tasks characteristic for the field of study		The student has structured technical knowledge in the field of advanced joining processes. He is able to take into account aspects related to the theoretical foundations of Mechanics and Machine Design (production, modeling of continuous and discrete technological processes) when selecting a process		[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		
	[K7_W11] interprets social, economic, legal (including industrial and intellectual property laws), and other non-technical aspects of engineering activities, and includes them into engineering practice		The student is aware of the impact of non-technical aspects of advanced bonding processes on the surrounding environment and knows the risks of their implementation		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
Subject contents	Basic concepts and definitions. Classification of welding processes. Laser welding. Plasma welding. Electron beam welding. Hybrid welding. Solid state bonding. Vacuum brazing. Developments of standard welding processes that allow for increased efficiency and quality of the joints made, e.g. orbital welding, deep penetration welding, tandem welding and others.						

Prerequisites and co-requisites	Basic knowledge of welding processes		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		60.0%	50.0%
		60.0%	25.0%
		60.0%	25.0%
Recommended reading	Basic literature	Pilarczyk J. (red.): Poradnik inżyniera. Spawalnictwo. tom I. Wydawnictwo Naukowe PWN, Warszawa. Pilarczyk J. (red.): Poradnik inżyniera. Spawalnictwo. tom II Wydawnictwo Naukowe PWN, Warszawa. Chmielewski T., Zembaty Z.: Projektowanie procesów technologicznych. Spawalnictwo.. Oficyna Wydawnicza Politechniki9 Warszawskiej 2013 Nowacki J.: Lutowanie w budowie maszyn. wydawnictwo WNT. 2017	
	Supplementary literature	Klimpel A.: Technologie laserowe. Spawanie, napawanie, stopowanie, obróbka cieplna i cięcie. Wydawnictwo Politechniki Śląskiej, Gliwice Klimpel A.: Nowoczesne lasery i technologie laserowe w inżynierii spawalnictwa. Wydawnictwo Politechniki Śląskiej, Gliwice 2023	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Explain the differences between the joining processes, i.e. welding, brazing, soldering, gluing 2. Characterize the vacuum brazing process, provide its stages and description 3. Describe the physical phenomena characteristic of the plasma welding process 4. Explain the influence of the fundamental variables of the laser welding process on the geometry of the weld 5. Describe and explain the principle of operation of the TIG welding process with deep penetration 6. Provide the differences between the MIG/MAG and FCAW welding processes, specify the method of droplet transfer to the liquid metal pool for each method. 7. Provide the parameters of stir welding (FSW) and their influence on the construction of the joint		
Work placement	Not applicable		

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