



Subject card

Subject name and code	Advanced bonding processes, PG_00064715						
Field of study	Management and Production Engineering						
Date of commencement of studies	February 2026		Academic year of realisation of subject		2025/2026		
Education level	second-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	1		Language of instruction		Polish		
Semester of study	1		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	30.0	0.0	0.0	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		7.0		23.0	75
Subject objectives	The aim of the course is to familiarize students with advanced joining 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_K01] is aware of the importance and understanding of non-technical aspects and effects of engineering/production activities, including its impact on the environment and the related responsibility for decisions made, demonstrating knowledge of actions aimed at reducing risk and anticipating the social and environmental effects of engineering/production activities	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	[SK1] Assessment of group work skills [SK4] Assessment of communication skills, including language correctness
	[K7_W02] demonstrates structured and theoretically based knowledge covering key issues in the field of Management and Production Engineering allowing for modeling and analysis of stationary and non-stationary production processes and systems, devices and technological processes with continuous and discrete operation	The student has structured technical knowledge in the field of advanced bonding processes. When selecting a process, he or she is able to take into account aspects related to production management, modeling of the technological process of continuous and discrete operation.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
	[K7_K13] is ready for responsible performance of professional roles, considering ever-changing need of the society, including self development and supporting and fulfilling work ethics	The student is prepared to develop his/her creative potential within the framework of advanced joining technologies and factors related to them.	[SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice
	[K7_U04] creatively designs or modifies, in whole or at least in part, production and technological systems and processes, in accordance with the given specifications, taking into account technical and non-technical aspects, estimating costs and using known design techniques appropriate for tasks in the field of Management and Production Engineering	The student is able to design and modify elements of technological processes taking into account economic aspects and the requirements of production management systems.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
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 in the field of Joining processes		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Project	60.0%	40.0%
	Exam / credit	60.0%	60.0%
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.	
	Supplementary literature	Klimpel A.: Technologie laserowe. Spawanie, napawanie, stopowanie, obróbka cieplna i cięcie. Wydawnictwo Politechniki Śląskiej, Gliwice	
	eResources addresses		

Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Explain the differences between the joining processes, i.e. welding, resistance 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 essential 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 friction stir welding (FSW) and their influence on the construction of the joint
Work placement	Not applicable

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