



Subject card

Subject name and code	Behaviour of Materials During Welding and Operation, PG_00055500						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			Optional 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	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Dariusz Fydrych					
	Teachers	dr hab. inż. Dariusz Fydrych mgr inż. Adrian Wolski mgr inż. Anna Janeczka					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	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	3.0		27.0	75	
Subject objectives	The aim of the course is to provide the students with knowledge of weldability of materials						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W03] possesses and is able to practically apply the knowledge on the construction, properties and testing methods of construction materials	Student can choose the method of joining (welding, resistance welding, soldering, brazing) for a group of materials, properties of estimate and develop the technical specifications			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K6_U10] is able to formulate the principles of selecting a material for a construction, ensuring the correct operation of a device	Student recognizes the construction materials and their operating properties			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		
Subject contents	LECTURE						
	Weldability. The phenomena of cracking during the welding process. Hot, cold, lamellar and reheat cracks. Weldability of alloy steels. Characteristics of consumables. Thermal field, thermal cycle. Crystallization of the weld metal. Metallurgical reactions and slag properties. Design of the weld metal. Heat affected zone. CTP and CTPcs charts. The concept of $t_8/5$. Weldability of ferrous and nonferrous alloys.						
	LABORATORY						
Determination of susceptibility of steel to hot and cold cracking. Evaluation of weldability of mild and high alloyed steels. Determination of diffusible hydrogen content in deposited metal.							
Prerequisites and co-requisites	Metallography Mathematics Chemistry Physics Joining processes						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	test	60.0%	60.0%
	laboratory test	60.0%	40.0%
Recommended reading	Basic literature	<p>Butnicki S.: Spawalność i kruchość stali. WNT Warszawa 1975.</p> <p>Tasak E.: Spawalność stali. Fotobit Kraków 2002.</p> <p>Węgrzyn J.: Fizyka i metalurgia Spawania. Politechnika Śląska 1990.</p>	
	Supplementary literature	<p>Praca zbiorowa. Poradnik inżyniera. Spawalnictwo. Tom 1. WNT Warszawa 2003.</p> <p>Jakubiec M., Lesiński K., Czajkowski H.: Technologia konstrukcji spawanych. WNT Warszawa 1987.</p> <p>Pilarczyk J., Pilarczyk J.: Spawanie i napawanie elektryczne metali. Wydawnictwo Śląsk Katowice 1996.</p>	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>Describe weldability of heat resistant steel.</p> <p>Describe weldability of stainless steel.</p> <p>Describe weldability of aluminium alloys</p>		
Work placement	Not applicable		