



Subject card

Subject name and code	Materials science in welding, PG_00055248						
Field of study	Management and Production 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			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 hab. inż. Dariusz Fydrych				
	Teachers		mgr inż. Adrian Wolski mgr inż. Anna Janeczek dr hab. inż. Dariusz Fydrych				
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	4.0		26.0	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_U02] has the ability of self-learning and expanding knowledge in a specialized field of engineering production		The student has knowledge of the directions of development of machine construction		[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
	[K6_W02] has knowledge of materials, their properties and research methods, including construction materials used in the machinery industry, has ordered, theoretically founded knowledge of mechanics including modeling of mechanical systems in the field of statics, kinematics and dynamics, and has an ordered, theoretically founded knowledge in the field of strength analysis materials and products		Student recognizes structural materials and their operating properties		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[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 can choose the method of joining (welding, resistance welding, soldering, brazing) for a group of materials, properties of estimate and develop the technical specifications		[SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice [SK1] Assessment of group work skills		

Subject contents	<p>LECTURE</p> <p>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 $t/5$. Weldability of ferrous and nonferrous alloys.</p> <p>LABORATORY</p> <p>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.</p>											
Prerequisites and co-requisites	MetallographyMathematicsChemistryPhysicsWelding and joining processes											
Assessment methods and criteria	<table border="1" data-bbox="450 577 1489 680"> <thead> <tr> <th data-bbox="450 577 794 613">Subject passing criteria</th> <th data-bbox="794 577 1139 613">Passing threshold</th> <th data-bbox="1139 577 1489 613">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="450 613 794 645">test</td> <td data-bbox="794 613 1139 645">60.0%</td> <td data-bbox="1139 613 1489 645">60.0%</td> </tr> <tr> <td data-bbox="450 645 794 680">laboratory test</td> <td data-bbox="794 645 1139 680">60.0%</td> <td data-bbox="1139 645 1489 680">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	test	60.0%	60.0%	laboratory test	60.0%	40.0%
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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											