



Subject card

Subject name and code	Hybrid and additive manufacturing processes, PG_00057409						
Field of study	Mechanical Engineering						
Date of commencement of studies	February 2023		Academic year of realisation of subject		2023/2024		
Education level	second-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	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Zakład Technologii Maszyn i Automatyzacji Produkcji -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Mariusz Deja				
	Teachers		Angelos Markopoulos				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	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	30		4.0		16.0	50
Subject objectives	Unconventional and aggregate methods of machine parts manufacturing including incremental methods and reverse engineering.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U06] when solving engineering problems on design, technology and operation of machines is able to assess and classify typical methods and tools, define systemic and ex-technical aspects using modern calculating methods and design tools or modifying the current ones		The student applies modern calculation and design methods when solving engineering tasks. The student selects a processing method for unconventional materials and specific features of the designed part.		[SU1] Assessment of task fulfilment		
	[K7_W06] possesses organized, profound knowledge necessary for designing and optimization of complex technological processes, modelling and calculations using numerical methods, knows modern manufacturing methods and tools for designing manufacturing processes of machines, devices, their elements and components		The student has a thorough knowledge of unconventional processing methods, in particular special materials. The student has knowledge necessary to design unconventional manufacturing processes as well as parameters used in them.		[SW1] Assessment of factual knowledge		
	[K7_U07] is able to perform a preliminary economic analysis of the undertaken engineering actions within the range of design, production and operation of machines and technical devices		The student is aware of the costs of unconventional processes and their cost-effectiveness in relation to the obtained results.		[SU2] Assessment of ability to analyse information		

Subject contents	Lecture Introduction, systematics of modern manufacturing technologies. Incremental technologies, HSC/ HSM machining. Characteristics of HSC/HSM, dry machining. Precision and ultra-precision machining. Machining centres, structure, principles of creation, equipment, changeable machining canters. Chemical machining, milling, etching. Electrochemical machining, electrochemical grinding, electro-discharge machining, wire electro-discharge machining. Laser and electron beam machining, surface treatment. Water jet machining, water jet and abrasive machining, abrasive blasting. Micromachining. Laboratory Exercises Incremental technologies, general knowledge, programming of devices on the example of Stereolithography principles of designing supporting elements, postprocessing data format and model resolution, reverse engineering and object analysis, parameterization of typical structural elements.		
Prerequisites and co-requisites	Taking a course in Basic Manufacturing Techniques and Metrology.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Project	60.0%	50.0%
	Test	60.0%	50.0%
Recommended reading	Basic literature	1. Katapian S. Manufacturing Engineering and Technology Pearson Education Inc. Upper Saddle River, New Jersey 2006. 2. Oczko k. E.: Kształtowanie materiałów skoncentrowanymi strumieniami energii. Wyd. Pol. Rzeszowskiej, Rzeszów 1988. 3. Schmid D.: Mechatronika. Rea, Warszawa 2002.	
	Supplementary literature	1. Zaborski St.: Obróbka elektrochemiczno-ścierna podstawy i zastosowania, Politechnika Wrocławska 2007, 2. Beer P. Niekonwencjonalne narzędzia do obróbki drewna, nóż ultradźwiękowy, promień świetlny, struga wody, Wydawnictwo Akademii Rolniczej, Poznań 2007, 3. Artykuły naukowe w czasopismach technicznych.	
	eResources addresses	Adresy na platformie eNauczanie: Hybrid and additive manufacturing processes (PG_00057409), 2023/2024 Winter semester - Moodle ID: 34910 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34910	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		