



## Subject card

Subject name and code	, PG_00052097						
Field of study	Nanotechnology						
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			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Manufacturing and Production Engineering -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Stefan Dzionk					
	Teachers	dr inż. Krzysztof Doerffer dr inż. Dominika Zakrzewska dr inż. Aleksandra Laska mgr inż. Karolina Chodnicka-Wszelak					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	15.0	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		50.0	100	
Subject objectives	To familiarize students with the advanced methods of manufacturing construction elements including in the area of micro and nano-techniques						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_U04	The student practically verifies the machining results using various techniques and parameters. The student is able to assess the quality of the surface using appropriate parameters.			[SU3] Assessment of ability to use knowledge gained from the subject		
	K6_K05	The student prepares studies on the selected machining method, presenting the relationships between the machining results and the parameters used.			[SK4] Assessment of communication skills, including language correctness		
	K6_W06	The student knows advanced manufacturing methods, including for elements in the micro and nano scale. Student defines the basic parameters of the geometrical structure of the surface.			[SW1] Assessment of factual knowledge		
	K6_U02	The student finds data in the literature on advanced machining methods, including micro and nano scales. The student presents the results of his work on technological processes in the nanoscale and explains the details of the issue during the group discussion.			[SU5] Assessment of ability to present the results of task		

Subject contents	<p>LECTURES: Geometric surface structure, aspects of accuracy in manufacturing, basic of advanced machining methods, basic of planning of technological process and computer aided manufacturing including reverse engineering, methods of processing polymer materials, including methods of producing micro-elements. The scope of micro and nano scale processing. tools and processes used in micro and nano-technologies. Additive manufacturing methods including micro and nano-aspect of process. Micro i nano-particles used in additive processing.</p> <p>LABORATORY: Basis of measurement with accuracy to micrometers, basic manufacturing systems, geometric structure of surface, its parameters and properties, planning of machining accuracy for processing systems, additive method of manufacturing, methods of precision erosion machining, reverse engineering, processing of polymer materials.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Raports	60.0%	30.0%
	Coloquium	60.0%	30.0%
	Presentation	60.0%	40.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Feld M.: <i>Podstawy projektowania procesów technologicznych typowych części maszyn</i>, WNT, Warszawa, 2000.</li> <li>2. M. P. Groover: <i>Fundamentals of modern Manufacturing</i>, JOHN WILEY&amp;SONS, INC.</li> <li>3. S. Kalpakjian, S. R. Schmid: <i>Manufacturing Engineering and Technology</i>, Pearson Prentice Hall.</li> <li>4. Y. Qin: <i>Micromanufacturing Engineering and Technology</i>,</li> <li>5. <i>Cutting Edge Nanotechnology</i>, Edited by Dragica Vasileska, ISBN 978-953-7619-93-0, 444 pages, Publisher: InTech,</li> <li>6. <i>Nanofabrication</i>, Edited by Yoshitake Masuda, ISBN 978-953-307-912-7, 364 pages, Publisher: InTech</li> <li>7. E. Oczoś, A. Kawalec: <i>Kształtowanie metali lekkich</i>, PWN 2012.</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Precision Engineering - Journal online</li> </ol>	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Parameters characterize the geometric structure of the surface,</li> <li>2. Measurement length and evaluation length,</li> <li>3. Characterize machining allowances,</li> <li>4. Bases in the manufacturing process,</li> <li>5. The relationship between class of the accuracy of the components and the structure of the surface</li> <li>6. Characterize the additive method of manufacturing,</li> <li>7. The method of manufacture of micro plastics components,</li> <li>8. Describe *.stl format and its applications,</li> <li>9. Characterize additive methods for manufacture micro and nano-elements.</li> </ol>		
Work placement	Not applicable		