



Subject card

Subject name and code	Modelling and analysis of cutting tool systems, PG_00064941						
Field of study	Mechanical Engineering						
Date of commencement of studies	February 2025		Academic year of realisation of subject		2025/2026		
Education level	second-cycle studies		Subject group		Specialty subject group Subject group related to scientific research in the field of study		
Mode of study	Part-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		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		prof. dr hab. inż. Kazimierz Orłowski				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	9.0	0.0	9.0	0.0	0.0	18
	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	18		10.0		47.0	75
Subject objectives	The aim of the course is to get acquainted with issues of process modeling and operation of cutting tools in manufacturing processes. Learn about the construction and application of various tool systems. Methods and means of selection and analysis of the implementation of processes on machine tools.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U12] develops her/his own potential and independently plans own, lifelong learning, while also being able to guide others in this regard		The student knows criteria and algorithms for optimizing the selection of cutting conditions. He/ she can create an economic model and a performance model.		[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	[K7_W02] demonstrates a structured and theoretically grounded knowledge of the key topics in Mechanical Engineering enabling the analysis and modelling of mechanical systems, processes and devices		Students is able to classify manufacturing methods and distinguish between different types of means, equipment and tools used in manufacturing.		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K7_W03] demonstrates a well-structured and theoretically grounded knowledge of the key issues in Mechanical Engineering to enable the design and diagnosis of mechanical systems, processes and devices		Students understand the phenomena occurring in the cutting zone, know the basic models of chip formation. He is able to evaluate energy effects of the machining process.		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		

Subject contents	LECTURE: General characteristics and classification of materials for cutting edges of tools with defined cutting edge. Causes of wear, geometrical factors of wear, physical and technological bluntness factors of a blade. Wear in time (tool life, wear of cutting tool blades in interrupted machining). Principles of blade material selection. Tool loading - energy properties of machining process. Cutting forces - methods of force estimation based on model taking into account specific cutting resistance and elements of modern fracture mechanics (Atkins's model). Models for determining shear angle in cutting zone. Tooling system overview (ISO, HSK, CAPTO, etc.). Principles of tool and insert selection. Methods of measuring cutting edge wear. Vibrations in cutting process. Dynamic stiffness of tools with low inherent stiffness. Economic efficiency and optimization of machining process. LABORATORY: Geometry of cutting edge. Construction of modern cutting tools. Study of influence of cutting edge geometry on surface roughness in turning. Wear and tear of cutting edges. Computer aided selection of cutting tools. Static stiffness. Determination of critical speeds of tools with low inherent stiffness. Tool cost analysis.		
Prerequisites and co-requisites	Basic knowledge of machining processes.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	100.0%	10.0%
	Lecture	56.0%	90.0%
Recommended reading	Basic literature	1. Grzesik W.: Advanced machining processes of metallic materials. Theory, modelling and applications. Elsevier, 2017.	
	Supplementary literature	1. Markopoulos A.P.: Finite element method in machining processes. Springer, London, 2013. 2. Training handbook. Metal cutting technology. C-2920:40 en-GB © AB Sandvik Coromant 2017. 11	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	List and describe measures of tool cutting edge wear according to PN-ISO standard. The effect of cutting parameters on cutting edge life.		
Work placement	Not applicable		

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