



## Subject card

Subject name and code	Modeling and analysis of cutting tool systems, PG_00057384						
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		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	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		6.0		24.0	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_W11] possesses organized knowledge useful in understanding ex-technical conditioning connected with performing the profession of an engineer and taking it into consideration in engineering practice; possesses well-established knowledge within the range of intellectual property, management and organization of manufacturing processes, including the management and life-cycle of a product	The student knows criteria and algorithms for optimizing the selection of cutting conditions. He/she can create an economic model and a performance model.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
	[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	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.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
	[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	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
Subject contents	<p>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.</p> <p>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.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory exercises	100.0%	10.0%
	Control tests	56.0%	90.0%
Recommended reading	Basic literature	<p>1. Grzesik W.: Advanced machining processes of metallic materials. Theory, modelling and applications. Elsevier, 2017.</p>	

	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	