



Subject card

Subject name and code	Efficiency and quality of machining processes, PG_00064727						
Field of study	Management and Production 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	Full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Zakład Technologii Maszyn i Automatykacji 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. Daniel Chuchala				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	15.0	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		14.0		41.0	100
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 and their influence on the quality and efficiency of processes. 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_U04] creatively designs or modifies, in whole or at least in part, production and technological systems and processes, in accordance with the given specifications, taking into account technical and non-technical aspects, estimating costs and using known design techniques appropriate for tasks in the field of Management and Production Engineering	Students will be able to design a manufacturing process based on the energy requirements of the manufacturing process.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
	[K7_K12] is ready for fulfilling social commitment and initiation of actions for public interest including entrepreneurial thinking and acting	The student is able to identify environmental risks and select appropriate process conditions to reduce them.	[SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work
	[K7_W04] demonstrates knowledge covering selected issues in the field of advanced detailed knowledge, in particular in the field of methods, techniques, tools and algorithms used in production management and control processes as well as in the design of technological processes	The student is able to use mathematical models to determine the energy properties of the cutting process and the parameters of the chip formation process in the cutting process.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
Subject contents	[K7_W12] identifies and interprets the main developmental trends and significant new achievements in the field of engineering and technical sciences and disciplines relevant to the course of study	The student is able to obtain information on the cutting tools, cutting parameters of machining processes using web and mobile tools.	[SW1] Assessment of factual knowledge
	<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 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. PROJECT: Prediction of energy conditions for a selected machining process</p>		
	Basic knowledge of machining, machine tools and cutting tools and manufacturing techniques		
Prerequisites and co-requisites	Basic knowledge of machining, machine tools and cutting tools and manufacturing techniques		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory exercises	100.0%	10.0%
	Final exam	56.0%	80.0%
	Project exercises	100.0%	10.0%
Recommended reading	Basic literature		
	<p>1. Grzesik W.: Advanced machining processes of metallic materials. Theory, modelling and applications. Elsevier, 2017.</p> <p>2. Cichosz P.: Narzędzia skrawające. WNT, 2006.</p>		

	Supplementary literature	<p>1. Markopoulos A.P.: Finite element method in machining processes. Springer, London, 2013.</p> <p>2. Training handbook. Metal cutting technology. C-2920:40 en-GB © AB Sandvik Coromant 2017.11</p>
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	<p>List and describe measures of tool cutting edge wear according to PN-ISO standard. The effect of cutting parameters on cutting edge life.</p>	
Work placement	Not applicable	

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