GDAŃSK UNIVERSITY OF TECHNOLOGY

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 2024	Academic year of realisation of subject	2024/2025
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_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.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[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.	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
[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.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents

LECTURE:General characteristics and classification of materials for cutting edges of tools withdefinedcutting edge. Causes of wear, geometrical factors of wear, physical and technological bluntnessfactors of ablade. Wear in time (tool life, wear of cutting tool blades in interrupted machining). Principles ofblademateriał selection. Tool loading - energy properties of machining process. Cutting forces - methods offorceestimation based on model taking into account specific cutting resistance and elements of modernfracturemechanics (Atkins's model). Models for determining shear angle in cutting zone. Tooling systemoverview(ISO, HSK, CAPTO, etc.). Principles of tool and insert selection. Methods of measuring cuttingedge wear.Vibrations in cutting process. Dynamic stiffness of tools with low inherent stiffness. Economicefficiency andoptimization of machining process.

LABORATORY: Geometry of cutting edge. Construction ofmodern cutting tools. Study of influence of cuttingedge geometry on surface roughness in turning. Wear andtear of cutting edges. Computer aided selectionof cutting tools. Static stiffness. Determination of criticalspeeds of tools with low inherent stiffness. Tool costanalysis.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Control tests	56.0%	90.0%
Laboratory exercises	100.0%	10.0%

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 ofcutting parameters on cutting edge life.	
Work placement	Not applicable	