GDAŃSK UNIVERSITY OF TECHNOLOGY

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 2026	Academic year of realisation of subject	2026/2027
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 -> Wydziały Politechniki Gdańskiej		
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 inmanufacturing processes. Learn about the construction and application of various tool systems. Methodsand means of selection and analysis of the implementation of processes on machine tools.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[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.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K7_U12] dvelops 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.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information

<table>
<tr><td>Subject contents</td><td>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 cutting edge 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 cost analysis.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of machining processes.</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Lecture</td><td>56.0%</td><td>90.0%</td></tr>
<tr><td>Laboratory</td><td>100.0%</td><td>10.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Grzesik W.: Advanced machining processes of metallic materials. Theory, modelling and applications. Elsevier, 2017.</td></tr>
<tr><td>Supplementary literature</td><td>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</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>List and describe measures of tool cutting edge wear according to PN-ISO standard.The effect of cutting parameters on cutting edge life.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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