GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modern, material-saving wood machining processes , PG_00058893						
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				
Mode of study	Full-time studies		Mode of delivery	at the university			
Year of study	2		Language of instruction	English			
Semester of study	3		ECTS credits	4.0			
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	0.0	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		0.0	0.0		45
Subject objectives	The aim of the course is to get acquainted with issues of material-saving processes of wood cutting, which isa natural, renewable material used by man in many economic and industrial branches. Introduction tomethods of wood cutting, construction of cutting tools and phenomena occurring during cutting processwhich significantly affect volume of material waste.						

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.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[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_U01] is able to acquire information from specialist literary sources and other sources regarding the construction and operation of machines and related disciplines in polish and in a foreign language, is able to conduct a self-learning process, is able to synthesize the information, form conclusions and justify opinions	The student is able to read and analyse technical documentation describing the manufactured item and documentation describing machine tools and cutting tools in order to design the manufacturing process.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information

Subject contents

LECTURE:Wood sawing methods used in the woodworking industry. Basic construction of saws and their use.Construction of cutting tools used in wood cutting processes. Geometry of cutting edges. Generalcharacteristics and classification of cutting edge materials for tools with defined cutting edge. Causes ofwear, geometrical indicators of wear, physical and technological indicators of blade bluntness. Cuttingforces, methods of force estimation based on model taking into account proper cutting resistance andelements of fracture mechanics (Atkins model). Models for determining the shear angle in the cutting zone.Methods of cutting edge wear measurement. Static stiffness od saw blade. Dynamic stiffness of tools withlow inherent stiffness.PROJECT:Cutting edge geometry. Construction of modern cutting tools. Wear of cutting edges. Determination of criticalspeeds of tools with low inherent rigidity. Effect of feed rate on dimensional accuracy of cutting process.Effect of feed rate on energy demand of cutting process. Forecasting of cutting power and cutting forces.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Final test	56.0%	90.0%
Project exercises	100.0%	10.0%

Recommended reading

Basic literature	1. Orłowski, K. (2010). The fundamentals of narrow-kerf sawing; the mechanics and quality of cutting. Technical University of Zvolen, 2010. p.123.2. Csanády E. and Magoss E. Mechanics of Wood Machining. Springer Cham, 2020, p. 320. https://doi.org/10.1007/978-3-030-51481-53. Orlowski, K., Sandak, J. & Tanaka, C. The critical rotational speed of circular saw: simple measurement method and its practical implementations. J Wood Sci 53, 388393 (2007). https://doi.org/10.1007
Supplementary literature	1. Orlowski, K., Chuchala, D., Szczepanski, M., Migda, W., Wojnicz, W., & Sandak, J. (2022). Lateral forces determine dimensional accuracy of the narrowkerf sawing of wood. Scientific Reports, 12. https://doi.org/10.1038/s41598-021-04129-32. Orłowski, K., Chuchała, D., Przybyliński, T., & Legutko, S. (2021). Recovering Evaluation of Narrow-Kerf Teeth of Mini Sash Gang Saws. Materials, 14, 7459. https://doi.org/10.3390/ma142374593.Orłowski, K., Sandak, J., & Chuchała, D. (2020). Thickness accuracy of sash gang sawing. BIORESOURCES, 15, 9362-9374. https://doi.org/10.15376/biores.15.4.9362-93744.4. Orłowski, K., Ochrymiuk, T., Hlaskova, L., Chuchała, D., & Kopecky, Z. (2020). Revisiting the estimation of cutting power with different energetic methods while sawing soft and hard woods on the circular sawing machine: a Central European case. WOOD SCIENCE AND TECHNOLOGY, 54, 457-477. https://doi.org/10.1007/s00226-020-01162-95. Sandak, J., & Orłowski, K. (2018). MACHINE VISION DETECTION OF THE CIRCULAR SAW VIBRATIONS. Journal of Machine Engineering, 18(3), 68-78. https://doi.org/10.5604/01.3001.0012.4617

	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Geometry of cutting tools.Kinematics of basic sawing processes.Methods of energy efects determination	
Work placement	Not applicable	