



Subject card

Subject name and code	Machine tools and tools, PG_00055240						
Field of study	Management and Production Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-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	3	Language of instruction			Polish Not applicable		
Semester of study	5	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	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 Chuchała					
	Teachers	prof. dr hab. inż. Kazimierz Orłowski dr hab. inż. Daniel Chuchała dr inż. Aleksandra Suchta					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60		4.0		61.0	125
Subject objectives	Presentation of the most commonly used varieties of drives of modern numerically controlled machines. Understand the most common types of drives of modern numerically controlled machines and their basic components. Extend knowledge of machine tool kinematics using the example of machine tools for gearing of cylindrical wheels. Familiarize with the basic phenomena in machining processes. Familiarize with basic phenomena in machining processes, construction and principles of selection of modern cutting tools.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U11] is able to identify and formulate simple engineering tasks related to the diagnostics of the technical condition of machines and devices using appropriate methods, techniques and tools	The student knows and is able to use the appropriate nomenclature that allows to describe the technical condition of machine tools and their components as well as the cutting tools and universal equipment used in manufacturing processes.	[SU3] Assessment of ability to use knowledge gained from the subject
	[K6_W06] has knowledge of the life cycle of products and mechanical devices and systems, in the field of machine parts manufacturing techniques, as well as the possibilities and trends in the development of machines and production devices and process control	The student explains the processes occurring in machining machining. The student distinguishes and describes basic machining methods: hobbing and shaping of gears. Identifies basic tools and machine tools.	[SW1] Assessment of factual knowledge
	[K6_K01] feels the need for self-realization by learning throughout life, is looking for modern and innovative solutions in their actions, is able to think creatively and act in an entrepreneurial way	Students will recognize the most common varieties of drives used of contemporary machines numerically controlled machines and their subassemblies. Explains the principle of operation the principle of operation of individual varieties of drives and determines the scope of their applications	[SK3] Assessment of ability to organize work
	[K6_W13] has detailed knowledge of the production and operation of machines and devices, diagnosing their technical conditions and selection of regeneration techniques	The student is able to choose the correct machining process, machine tool and the type of cutting tools for a given type of the manufactured element.	[SW1] Assessment of factual knowledge
	[K6_U09] can use analytical techniques as well as computer simulation and numerical analysis methods in solving specific problems in the field of production engineering, is able to carry out simple engineering tasks related to the production of typical machine parts using widely understood techniques and computer tools, is able to select and apply appropriate methods of project planning and control courses with the use of computer aided means	Examines the influence of basic parameters of the cutting process on machining effects and selects basic tools. Select basic cutting tools and indexable cutting inserts; and is able to select elements of the drive	[SU4] Assessment of ability to use methods and tools
	[K6_W08] has basic management knowledge, including process and product quality management, and detailed knowledge of integrated and standardized quality, environmental, health and safety management systems	The student understands the effect of the condition of cutting tools and machine tools on the quality results of machining processes	[SW1] Assessment of factual knowledge

Subject contents	<p>LECTURE: Motor control, motion control and process control in modern machine tools. Structures of automated drives and servo drives. Overview, principles of operation and control and application areas of the most important varieties of modern drives with AC, DC and stepper motors and servo motors. Examples of individual varieties of motors and power electronic units. Drives "intelligent" drives. Motors for direct drives. Feedback devices and other sensors used in drives. Structure, operating principle, ways of programming and examples of microprocessor controllers Structure, operation principle, programming methods and examples of microprocessor controllers cooperating with drives. Typical mechanical components of modern drives. Modular Drive units. Computer aided selection and operation of drives. Machine tool control: NC, adaptive. Cutting edge materials. General characteristics and classification of cutting edge materials. General characteristics and classification of cutting edge materials. Causes of wear, geometric indicators of wear, Physical and technological indicators of blade bluntness. Wear in time (service life, wear of cutting tool blades. Tool wear in interrupted machining conditions). Principles of blade material selection. Loads of tools - energy properties of machining process. Energy properties of machining process. Cutting forces, methods of their determination. Tool systems (ISO, HSK, CAPTO, etc.). Rules of selection of typical tools and cutting inserts. Kinematics of machine tools. Kinematics of gear hobbing machines.</p> <p>LABORATORY: Modular technology machines. Automatic linear unit with stepper motor and CNC control. Control and drive elements of technological machines. Kinematic accuracy of hobbing milling machine for gears of cylindrical wheels (Pfauder milling machine). Effect of using Wiper geometry on surface roughness. Computer-aided selection of turning, milling and threading tools. Prediction of surface roughness of milling head operations. Switching positioning drive with PLC control. Selection of belt transmissions for machine tool drives. Selection and use of grinding tools. Selection of tools and machining parameters for hull drilling machine. Modular technology machines. Automatic linear unit with stepper motor and CNC control. Control and drive elements of technological machines. Kinematic accuracy of hobbing milling machine for gears of cylindrical wheels (Pfauder milling machine). Effect of using Wiper geometry on surface roughness. Computer-aided selection of turning, milling and threading tools. Prediction of surface roughness of milling head operations. Switching positioning drive with PLC control. Selection of belt transmissions for machine tool drives. Selection and use of grinding tools. Selection of tools and machining parameters for drilling of holes on the boring machine</p>											
Prerequisites and co-requisites	Basic knowledge of machining processes											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 1187 794 1216">Subject passing criteria</th> <th data-bbox="799 1187 1141 1216">Passing threshold</th> <th data-bbox="1145 1187 1485 1216">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 1223 794 1252">Laboratory</td> <td data-bbox="799 1223 1141 1252">100.0%</td> <td data-bbox="1145 1223 1485 1252">30.0%</td> </tr> <tr> <td data-bbox="453 1258 794 1288">Lecture</td> <td data-bbox="799 1258 1141 1288">56.0%</td> <td data-bbox="1145 1258 1485 1288">70.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratory	100.0%	30.0%	Lecture	56.0%	70.0%
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Laboratory	100.0%	30.0%										
Lecture	56.0%	70.0%										
Recommended reading	Basic literature	<ol style="list-style-type: none"> Honczarenko J.: Obrabiarki sterowane numerycznie, WNT. 2009. Olszak W.: Obróbka skrawaniem. WNT, 2008. Grzesik W.: Podstawy skrawania materiałów metalowych. WNT. 1998. Jemielniak K.: Obróbka skrawaniem. Oficyna Wyd. Polit. Warsz. Warszawa 1998. Cichosz P.: Narzędzia skrawające. WNT, 2006 										
	Supplementary literature	<ol style="list-style-type: none"> Podręcznik szkoleniowy - obróbka metali skrawaniem. C-2920:40 pl-PL © AB Sandvik Coromant 2017.11 										
	eResources addresses											

Example issues/ example questions/ tasks being completed	Analysis of the kinematic scheme of a selected hobbing machine tool. Selection of tools using computer programs.
Work placement	Not applicable