GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mechatronic design of technological equiopement systems, PG_00064801		
Field of study	Mechatronics		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
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	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Manufacturing and Production Engineering -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mateusz Wrzochal	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

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	30	4.0	16.0	50

Subject objectives

To acquaint students with modern solutions and design issues in the field of control and drives of automatedtechnological machines.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W04] demonstrates knowledge encompassing selected issues in the field of detailed knowledge, particularly in the scope of methods, techniques, tools, and algorithms specific to Mechatronics	The student has knowledge of the design issues of mechatronic systems related to the control technique and drives of cutting machine tools and other technological machines	[SW1] Assessment of factual knowledge
[K7_W03] demonstrates structured and theory supported knowledge encompassing key issues in the field of Mechatronics, enabling developement and synthesis of stationary and non-stationary mechatronic systems, devices, and processes with continuous and discrete operation	The student has knowledge of mechatronic systems containing programmable systems and signal processing algorithms that are used in control systems and drives of technological machines.	[SW1] Assessment of factual knowledge
[K7_U14] integrates information obtained from literature and other properly selected sources, including those in a foreign language, creatively interpreting and critically evaluating them, and drawing conclusions	The student knows the most important achievements in the field of automatic control systems and techniques of electromechanical and direct servo drives, which are used in modern technological machines.	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
[K7_U04] creatively designs or modifies, either entirely or at least in part, a mechatronic system or process according to a given specification, considering both technical and non-technical aspects, estimating costs and utilizing design techniques appropriate for tasks within the scope of mechatronics	The student has knowledge of computer aids used for calculations and selection of drive components, for tuning programmable drive parameters and for testing the motional accuracy of CNC machines.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information

Subject contents

Course content – lecture

LECTURE: Spatial-motion structures and kinematic systems of selected technological machines. Control and automation of technological machines. Review and examples of solutions of conventional control systems. Control systems using modern microprocessor controllers. Sensors and measuring transducers in control systems of technological machines. Drive systems of modern technological machines. Comparison of operating characteristics and range of applications of electric, hydraulic and pneumatic drives. Classification, construction and range of applications of electric motors for machine tool drives. Principles of determining load conditions and control requirements for the selection of drive motors. Transducers and sensors for drive control, servo feedback, measuring devices. Gear components and other mechanical components in electromechanical drives for rotary and linear motion. Methods of assessing the running accuracy of CNC and similar machines, measuring equipment and test software.LABORATORY: Drive and control components of modern technological machines. Structural structure and operation of CNC machine tools. Principles of selection and performance characteristics of sensors and measuring devices for drive automation. Adjustable AC drives. Positioning drive with stepper motor CNC control. Determination of critical speeds in the spindle-to-tool system. Construction and control of CNC machine tools. Principles of selection, parameterisation and operation of inverter in a drive with asynchronous squirrel-cage motor. Principles of selection, parameterisation and operation of a servo drive with an AC brushless motor.

Prerequisites and co-requisites

Subjects related to Computer-Aided Manufacturing, Computer-Aided Design, modelling of mechatronic systems, mechatronic design, construction and operation of mechatronic systems.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture	56.0%	70.0%
Laboratory	100.0%	30.0%

Recommended reading	Basic literature	Skoczyński W: Sensory w obrabiarkach CNC. Wydawnictwo Naukowe PWN S.A. 2018 Uhla T.: Projektowanie mechatroniczne zagadnienia wybrane. Wydawnictwo Instytutu Technologii Eksploatacji - Państwowy Instytut Badawczy 2011 Schmid D. (Red.): Mechatronika. Wydawnictwo REA 2002 Wrotny L.T: Podstawy konstrukcji obrabiarek i inne książki Honczarenko J.: Roboty przemysłowe, budowa i zastosowanie. WNT. 2010.Honczarenko J.: Obrabiarki sterowane numerycznie. WNT. 2009.Kosmol J.:Serwomechanizmy obrabiarek sterowanych numerycznie. WNT. Warszawa, 1998.
	Supplementary literature	Habrat W.: Obsługa i programowanie obrabiarek CNC. Podręcznik operatora. Wydawnictwo KaBe 2007 Szelerski M. W.:Praktyczne podstawy mechatroniki. Wydawnictwo Kabe 2022 Kluszczyński K. (Red.): Mechatronika. Analiza, projektowanie i badania wybranych elementów i systemów. Wydawnictwo PAK 2013. Grzesik W., Ruszaj A.: Hybrydowe metody obróbki materiałów konstrukcyjnych. Wydawnictwo Naukowe PWN SA 2021 Pritschow G.: Technika sterowania obrabiarkami. Ofic. Wyd. Pol. Wrocławskiej. Wrocław 1995.
	eResources addresses	
Example issues/ example questions/ tasks being completed	The final test contains a lot of detailed questions on the subject.	
Practical activites within the subject	Not applicable	

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