GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00056121		
Field of study	Mechatronics		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish Polish
Semester of study	6	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Zakład Technologii Maszyn i Automatyzacji Produkcji -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mieczysław Siemiątkowski	
	Teachers	dr inż. Mieczysław Siemiątkowski	

Lesson types and methods of instruction							
	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	0.0	0.0	30

Subject objectives	Providing basic knowledge concerning the formation and operation of flexible automated production systems, along with related methods and means of production realisation.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U05] is able to use properly choosen tools to compare design solutions of elements and mechatronics systems according to given application and economic crtierions (e.g. power demand, speed, costs)	Are able to compare design solutions of mechatronic elements and systems suitable for use in flexible manufacturing automation systems, considering standard efficiency, quality and economic criteria, through selecting appropriate engineering methods, techniques and means of industrial automation and computerassistance.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
	[K6_U06] is able to identify and formulate specification of simple, practical engineering tasks, distinctive for mechatronics	Are capable of identifying and specifying a set of engineering tasks concerning the possibility for selection and effective use of practically known devices and design solutions of mechatronic systems in the operation of production segments of assorted production.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
	[K6_W10] has a basic knowledge about development trends in terms of engineering and technical sciences and scientific disciplines: Mechanical Engineering, Automation, Electronics and Electrical Engineering, adequate for Mechatronics curse	Have a structured and theoretically based knowledge of the current status and the latest development trends in the manufacturing of technologically advanced products, automation and electronics means in relation to engineering tasks concerning buiiding the structure and functioning the flexibly automated manufacturing systems.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
	[K6_W08] knows and understands design and production processes of elements and simple mechatronic devices	Have basic knowledge in the area of: flexibly automated manufacturing of advanced products using machine resources and related drives and simple measuring systems equipped with mechatronics means as well as computer tools for the design and operational simulation.	[SW1] Assessment of factual knowledge

Subject contents

LECTURE: The essence, significance and development directions of flexible manufacturing automation. Functional structure of flexible manufacturing systems (FMSs). Forms of organisation and FMS layouts. Technical means FMSs. CNC control of machine tools and automatic control. Technical possibilities of modern automation systems. Organisational structure and functions of flexibly automated manufacturing systems. Manufacturing control system architectures and data transmission techniques. Manufacturing information acquisition systems. Characteristics of material flow subsystems. Transport and storage in FMSs. Sub-systems for supplying and manipulating workpieces and tools. Supervision and diagnostics of FMS system components. Production process realisation and control based on MES standards. Methodology of planning and efficiency analysis of ESP applications. Modelling techniques in ESP design and control tasks.

LABORATORY: Automation of CNC machining operations, incl. measurement of tool settings; determining the position of the working system; contact probe measurements. Planning activity cycles of a robot with the material handling operation in a flexible production cell; recognition of manipulation objects and evaluation of its handling capabilities. Modelling and analysis of manufacturing processes using graph modelling, and event networks. Planning organisational structure of a cellular flexible system for manufacturing mechatronic components and simulation-based quantitative analysis of the process flow of a specific product-mix in the FlexSim® system environment.

Prerequisites and co-requisites

Knowledge of basic issues within the range of manufacturing technologies and production organisation.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Reports	56.0%	50.0%
Final written colloquium	56.0%	50.0%

Recommended reading

Basic literature

1. Charczenko A., Świć A., Taranenko W.: Obrabiarki i urządzenia technologiczne w produkcji elastycznej, Politechnika Lubelska, Lublin 2011.
2. Grzesik W., Niesłony P., Kiszka P., Programowanie Obrabiarek CNC. Wydawnictwo Naukowe PWN, Warszawa 2020.
3. Honczarenko J.: Obrabiarki sterowane numerycznie, WNT, Warszawa 2008.
4. Kost G., Łebkowski P., Węsierski Ł. N.: Automatyzacja i robotyzacja procesów produkcyjnych. Seria: Zarządzanie i Inżynieria Produkcji, PWE, Warszawa 2013.

	Supplementary literature	1. Honczarenko J.: Elastyczna automatyzacja wytwarzania. Obrabiarki i systemy obróbkowe, WNT, Warszawa 2000. 2. Mechatronika. Praca zbiorowa pod kier. D. Schmida (oprac polskie M. Olszewski i inni), Verlag Europa-Lehrmittel Rea, Warszawa 2002. 3. FlexSim. 3D Simulation software, User manual, FlexSim software Products Inc., USA, 2017. 4. Heindenhain, TNC Guide (webside) http://content.heidenhain.de/doku/tnc_guide/html/en/index/1242135142456/1242135142489/1242135142489.html.
	eResources addresses	Adresy na platformie eNauczanie: Elastyczne Systemy Produkcyjne, w/l; Mechatronika, 1.st., SC, sem. 06, letni 2023/2024, (PG_00056121) - Moodle ID: 37016 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37016
Example issues/ example questions/ tasks being completed	1. Directions in the development of modern processing machines under the conditions of flexibly automated production 2. The application of stand-alone and multi-machine layouts in flexible manufacturing systems (FMS). 3. Loading and unloading techniques for working centres operation of in FMS automation. 4. Typical applications of industrial robots in handling tasks for selected machine tools. 5. Basic problems of the circulation of tools and fixtures in ESP systems. 6. The range of applications of machining centers (MC) and stand-alone machining stations. 7. Basic solutions of part handling devices in flexible manufacture. 8. Methods and means for the part smeasurement and process control in FMS. 9. Techniques and the measures used in the tools and related equipment storage under the conditions of flexibly automated manufacture. 10. Technical means applied to data logging and related process control in FMS.	
Work placement	Not applicable	