GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Programmable Controllers (WEiA), PG_00042092
Field of study	Power Engineering, Power Engineering, Power Engineering, Power Engineering, Power Engineering

Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
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	English
Semester of study	6	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment

Conducting unit	Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering

Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Ireneusz Mosoń
	Teachers	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	15.0	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	5.0	65.0	100

Subject objectives	Acquisition by students basic knowledge about programmable controllers - their structure, principle of operation, implementation in control systems - and the skil of programming programmable controllers.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_U05	Student describes the role and functions that programmable controllers perform in automatic control systems, in particular in power engineering.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
	K6_U01	Student analyses requirements of control tasks and creates control algorithms. Writes, debugs and tests programs of low and medium complexity for control of different control objects, in particular in power engineering. Creates user functions and function blocks. Creates simple visualisation applications.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	K6_W05	Student describes types and structures of programmable controllers. Explains principle of programmable controller operation and principle of execution of the user program. Student selects programmable controllers for specific applications and knows how to design simple control systems with programmable controllers.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

Subject contents	LECTURE Programmable controllers in control systems. Types, structure and principle of operation. Execution of the user program. Process image memory. Hardware characteristics. Fundamentals of programming. International standard IEC 61131-3. Programming model. Programming languages. Data types and declaration of variables. Program organisation units: programs, functions and function blocks. Fundamentals of programming. Creation of user functions and function blocks. Structuring of user programs. Networking programmable controllers (network structures, communication interfaces and transmission media, methods of media access control). Communication protocols in fieldbuses. Industrial Ethernet; protocols in industrial Ethernet. Design of programmable controllers based control systems. Selection of a programmable controller depending on an application. Realization of human - machine interface (HMI). SEMINAR Basics of writting and debugging control programs with the use of program simulator (virtual controller) and creation of visualisation applications. Description of a control object (preference: from power engineering). Creation of the algorithm and control program with visualisation for the chosen object. Preparation of presentation of the completed task and/or current trends in industry automation.
Prerequisites and co-requisites	Basic knowledge on electronics and digital technique.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Presentation	80.0%	50.0%
	Test	50.0%	50.0%

Recommended reading	Basic literature	Kacprzak S.: Programowanie sterowników PLC zgodnie z normą IEC 61131-3 w praktyce. Wydawnictwo BTC, Legionowo, 2011.
		Kasprzyk J.: Programowanie sterowników przemysłowych. WNT, Warszawa, 2006.
		Mosoń I.: Programmable controllers - Part 1. Politechnika Gdańska, Gdańsk, 2010.
		Mosoń I.: Sterowniki programowalne - Część 2. Politechnika Gdańska, Gdańsk, 2010.
		IEC 61131-1: Programmable Controllers - Part 1: General information.
		IEC 61131-3: Programmable Controllers - Part 3: Programming languages.
	Supplementary literature	Gilewski T.: Szkoła programisty PLC. Sterowniki przemysłowe. Wydawnictwo Helion, Gliwice, 2017.
		Broel-Plater B.: Układy wykorzystujące sterowniki PLC. Projektowanie algorytmów sterowania. Wydawnictwo Naukowe PWN, Warszawa, 2009.
		Kwaśniewski J.: Sterowniki PLC w praktyce inżynierskiej. Wydawnictwo BTC, Legionowo, 2008.
	eResources addresses	Adresy na platformie eNauczanie:

| Example issues/ example questions/ tasks being completed | Principle of operation of a programmable controller. What is the proces image memory and what are the advantages and disadvantages of its usage?

Programming languages of programmable controllers. What are the differences betwen functions and function blocks?

Network operation of programmable controllers; media access control methods.

Writing, debugging and testing control programs of specified control objects with simple visualisations. |
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| Work placement | Not applicable |