



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 skill 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 writing 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		<p>Kacprzak S.: Programowanie sterowników PLC zgodnie z normą IEC 61131-3 w praktyce. Wydawnictwo BTC, Legionowo, 2011.</p> <p>Kasprzyk J.: Programowanie sterowników przemysłowych. WNT, Warszawa, 2006.</p> <p>Mosoń I.: Programmable controllers - Part 1. Politechnika Gdańska, Gdańsk, 2010.</p> <p>Mosoń I.: Sterowniki programowalne - Część 2. Politechnika Gdańska, Gdańsk, 2010.</p> <p>IEC 61131-1: Programmable Controllers - Part 1: General information.</p> <p>IEC 61131-3: Programmable Controllers - Part 3: Programming languages.</p>	
	Supplementary literature		<p>Gilewski T.: Szkoła programisty PLC. Sterowniki przemysłowe. Wydawnictwo Helion, Gliwice, 2017.</p> <p>Broel-Plater B.: Układy wykorzystujące sterowniki PLC. Projektowanie algorytmów sterowania. Wydawnictwo Naukowe PWN, Warszawa, 2009.</p> <p>Kwaśniewski J.: Sterowniki PLC w praktyce inżynierskiej. Wydawnictwo BTC, Legionowo, 2008.</p>	
	eResources addresses		Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<p>Principle of operation of a programmable controller. What is the proces image memory and what are the advantages and disadvantages of its usage?</p> <p>Programming languages of programmable controllers. What are the differences betwen functions and function blocks?</p> <p>Network operation of programmable controllers; media access control methods.</p> <p>Writing, debugging and testing control programs of specified control objects with simple visualisations.</p>			
Work placement	Not applicable			