GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Programmable Logic Controller, PG_00042161		
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	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
Semester of study	6	ECTS credits	2.0
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	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	3.0	17.0	50

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_U04	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, among others in renewable power engineering. Creates user functions and function blocks. Creates simple visualisation applications.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
K6_W03	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, among others control systems in renewable power engineering.	[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. PN-EN 61131-3 standard. Programming model. Programming languages. Data types and declaration of variables. Program organisation units: programs, functions and function blocks. Creation of user functions and function blocks. Structuring of user programs. Factors of program quality. 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). LABORATORY Program for a conveyor control (I and II). Counting events, arithmetic and comparison functions. Implementation of the timer with time holding input. Control program of three pumps. Counting impulses with signalisation of the limit excided. Creation of a user function block. Programmable controllers operation in the network (master - active slave). Creation of visualisation applications. Creation of control programs and their debugging with the use of program simulator (virtual controller).

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
	Laboratory	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. PN-EN 61131-1: 2004. Sterowniki programowalne - Część 1: Postanowienia ogólne. PN-EN 61131-3: 2004. Sterowniki programowalne - Część 3: Języki programowania.	
	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.		
Work placement	Not applicable		