GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Programmable Controllers (WEiA), PG_00042092		
Field of study	Power Engineering, Power Engineering		
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	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	dr inż. Ireneusz Mosoń	

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_W03] knows the basics of automation and automatic regulation, knows the principles of the selection of electrical devices, drive systems and their control	Student describes the role and functions that programmable controllers perform in automatic control systems, in particular in power engineering. Student selects programmable controllers for specific applications and knows how to design simple control systems with programmable controllers.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_U01] can obtain information from literature and other sources, organize, interpret it and draw and formulate conclusions; has the ability to self-educate, interprets the results of completed engineering tasks, is able to design simple energy systems and their systems	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.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K6_W05] has structured knowledge in the field of electrical engineering and electronics, necessary to understand the basics of operation and selection of electrical machines, electricity transmission systems and power electronic devices	Student describes types and structures of programmable controllers. Explains principle of programmable controller operation and principle of execution of the user program.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_U12] can correctly choose tools (analytical or numerical) to solve engineering problems filtration processes, and data analysis; is able to use photogrammetric and remote sensing tools in engineering tasks in the field of geodetic techniques and metrology	Student chooses programming packages for programming and simulation of programmable controllers operation.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject

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: Programmable Controllers [EE][I][2023/24] - Moodle ID: 36978 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36978

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