GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Programmable Controllers, PG_00038409		
Field of study	Electrical Engineering		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
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	20.0	0.0	10.0	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	7.0	63.0	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_U07	Student selects programmable controllers for specific applications and knows how to design simple control systems with programmable controllers. Student analyses requirements of control tasks and creates control algorithms. Writes, debugs and tests programs of low and middle complexity for control of different control objects. 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 [SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
K6_K01	Student understands how important is to widen permanently his knowledge and skills concerning programmable controllers and their applications. For this purpose he is able to use current technical documentations and publications.	[SK5] Assessment of ability to solve problems that arise in practice
K6_W08	Student describes types and structures of programmable controllers. Explains principle of programmable controller operation and principle of execution of the user program. Student describes the role and functions that programmable controllers perform in automatic control systems.	[SW1] Assessment of factual knowledge

Subject contents	**LECTURE** Programmable controllers in control systems. Types, structure and principle of operation. Execution of the user program. Process image memory. Hardware characteristics. Interaction with a controlled process. Digital, analog and special input/output circuits. Fundamentals of programming. PN-EN 61131-3 standard. Programming model. Programming languages. Data types and declaration o variables. Addressing. Program organization units - programs, functions and function blocks. Creation of user functions and fuction blocks. Structuring of user programs. Factors of a program quality. Networking programmable controllers. Network structures. Communication interfaces and transmission media. Methods of media access control. Communication protocols (Suconet K, Modbus RTU, Profibus DP, AS-i). Industrial Ethernet (protocols: Modbus TCP, Powerlink, Profinet). Design of programmable controllers based control systems. Selection of a programmable controller depending on an application. Realization of a human - machine interface (HMI). Programming software Easy soft CoDeSys. Creation of visualisation applications. SCADA programs. **LABORATORY** Programming software Sucosoft S40 (structure; konfiguring control systems; editting, debuging, testing and documenting programs). Program for a conveyor control - I and II. Conversion functions and arithmetic operators. Counting events and compiler options. Creation of the user function block. Modifying programs and changing variable values in On-line mode. Programming PS4-200 and PS4-150 series controllers in the network (master - active slave).
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%
Written exam	50.0%	50.0%

Recommended reading	Basic literature	1. Kasprzyk J.: Programowanie sterowników przemysłowych. WNT, Warszawa, 2006. 2. Kwaśniewski J.: Sterowniki PLC w praktyce inżynierskiej. Wyd. BTC, Legionowo, 2008. 3. Brok S., Muszyński R., Urbański K., Zawirski K.: Sterowniki programowalne. Wyd. Politechniki Poznańskiej, Poznań, 2000. 4. Mosoń I.: Sterowniki programowalne - Część 1 (ang.). Politechnika Gdańska, Gdańsk, 2010 (www.ely.pg.gda.pl/kelime/). 5. Mosoń I.: Sterowniki programowalne - Część 2. Politechnika Gdańska, Gdańsk, 2010 (www.ely.pg.gda.pl/kelime/).
	Supplementary literature	1. Legierski T., Kasprzyk J., Hajda J., Wyrwał J.: Programowanie sterowników PLC. Wyd. Pracowni Komputerowej Jacka Skalmierskiego, Gliwice, 1998. 2. Ruda A., Olesiński R.: Sterowniki programowalne PLC. Wyd. COSIW SEP, Warszawa, 2003. 3. Pietrusewicz K., Dworak P.: Programowalne sterowniki automatyki PAK. Wyd. Nakom, Poznań, 2007.
	eResources addresses	Adresy na platformie eNauczanie: STEROWNIKI PROGRAMOWALNE [Niestacjonarne][2023/24] - Moodle ID: 32240 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32240
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. Writing, debuging and testing simple control programs.	
Work placement	Not applicable	