

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Sterowniki programowalne w automatyce przemysłowej**
 Name in English: **Programmable Logic Controllers In Industrial Automation**
 Main field of study (if applicable): **Control Engineering and Robotics**
 Specialization (if applicable): **Automation of Machines, Vehicles and Apparatus**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ARR043225**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):			30		
Number of hours of total student workload (CNPS):			60		
Form of crediting:			crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:			2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:			1.40		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. It has a basic knowledge of the construction and operation of PLCs.
2. He knows basic PLC programming languages.
3. It can connect the PLC to the control system.
4. He can develop a control algorithm of the selected industrial process.

SUBJECT OBJECTIVES

- C1. Acquire skills to configure and program a modern PLC.
 C2. Strengthening knowledge and skills in the field of programming, commissioning and testing of the control systems and industrial automation
 C3. Acquiring the ability to configure and program the industrial vision sensors.

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:**relating to skills:*

- PEK_U01 It can configure and run modern PLC.
 PEK_U02 He can develop a control algorithm and program PLCs, working in a distributed control system.
 PEK_U03 It can configure and program industrial vision sensors.

relating to social competences:

- PEK_K01 It has a sense of responsibility for their own work and a willingness to comply with the principles of teamwork.

PROGRAMME CONTENT		
Form of classes - laboratory		Number of hours:
Lab 1	Introduction to the Rules and Regulations of internal safety lab. Establish rules for passing. General familiarization with laboratory equipment. Discussion of the laboratory exercises.	2
Lab 2	Operation of the Sysmac Studio toolkit. Configuration and programming of OMRON NJ301 controller.	2
Lab 3	Getting to know the function libraries of the Sysmac Studio software. The timer and counter functions.	2
Lab 4	Communication with NX Series distributed I/O modules using EtherCAT network.	2
Lab 5	Configuration and programming of distributed analog input modules. The arithmetic and type-conversion functions.	2
Lab 6	Programming of control systems of selected models of machines and industrial processes - Part 1.	2
Lab 7	Programming of control systems of selected models of machines and industrial processes - Part 2.	2
Lab 8	Programming of control systems of selected models of machines and industrial processes - Part 3.	2
Lab 9	Programming of control systems of selected models of machines and industrial processes - Part 4.	2
Lab 10	Programming of control systems of selected models of machines and industrial processes - Part 5.	2
Lab 11	Configuration and programming of the OMRON FQ2 vision sensors - Part 1.	2
Lab 12	Configuration and programming of the OMRON FQ2 vision sensors - Part 2.	2
Lab 13	Configuration and programming of the OMRON FQ2 vision sensors - Part 3.	2
Lab 14	The data exchange between the NJ301 controller and the FQ2 vision sensor using EtherNet/IP network.	2
Lab 15	Giving reports, summary and pass the lab.	2
Total hours:		30

TEACHING TOOLS USED
N1. Multimedia presentations.
N2. The laboratory is carried out in the traditional manner in student groups. Laboratory is equipped with: PCs, PLCs, vision sensors and the models of machinery, equipment and industrial processes.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(L)	PEK_U01 PEK_U02 PEK_U03	Assessment of prepare for laboratory exercises.
F2(L)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Activity in laboratory classes.
F3(L)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Rating of reports of completed projects.
P(L)	$P = 0,2 \cdot F1 + 0,5 \cdot F2 + 0,3 \cdot F3$	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Kasprzyk J., Programowanie sterowników przemysłowych, WNT [2] Pawlak M., Sterowniki Programowalne, e-skrypt, Wyd. Politechnika Wrocławska, Wrocław 2010, dostępny w Dolnośląskiej Bibliotece Cyfrowej
SECONDARY LITERATURE: [1] Flaga S., Programowanie sterowników PLC w języku drabinkowym, BTC, Legionowo 2010 [2] Mikulczyński T., Automatyzacja procesów produkcyjnych, WNT, 2009 [3] Laboratory instruction set, auxiliary materials and technical documentation of PLC and vision sensors.

SUBJECT SUPERVISOR
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ARR043225 - Programmable Logic Controllers In Industrial Automation
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Control Engineering and Robotics**
AND SPECIALIZATION **Automation of Machines, Vehicles and Apparatus**

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U01	S2AMPU_U10	C.1	Lab2 Lab3 Lab4 Lab5	N.1 N.2
PEK_U02	S2AMPU_U10	C.1 C.2	Lab4 Lab6 Lab7 Lab8 Lab9 Lab10 Lab14	N.1 N.2
PEK_U03	S2AMPU_U10	C.3	Lab11 Lab12 Lab13 Lab14	N.1 N.2
PEK_K01	K2AiR_K07	C.1 C.2 C.3	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.1 N.2