

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Automatyzacja procesów produkcyjnych - zagadnienia wybrane**
 Name in English: **Automation of production processes - selected issues**
 Main field of study (if applicable): **Electrical Engineering**
 Specialization (if applicable): **Industrial Electrical Engineering**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ELR043210**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	15		30		
Number of hours of total student workload (CNPS):	60		60		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	2		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		1.40		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. He has knowledge of the theory of logic circuits.
2. It has knowledge of the structure of programmable controllers and understands their principles of operation.
3. It can connect the PLC to the control system.
4. He can develop a control algorithm of the selected industrial process.
5. Understands the need and knows the possibilities of the continuous training, improving the professional, personal and social competencies.

SUBJECT OBJECTIVES

- C1. Familiarize students with the structure of typical control systems in the industry.
 C2. The acquisition of basic knowledge of popular communication networks used in industrial automation.
 C3. Acquire the skills configure and programming of the selected PLC in distributed control systems.
 C4. Acquiring skills: connection, configuration, programming and commissioning of advanced control system, which consists of several PLC connected via industrial communication networks.

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 It has knowledge of the structure of the industrial control systems.
 PEK_W02 Knows the structure and principles of configuration and programming of the popular PLCs.
 PEK_W03 Knows the connection topologies and understands the principles of operation of the popular industrial communication networks.

relating to skills:

- PEK_U01 It can connect various industrial automation devices using standard communication networks.
 PEK_U02 Is able to develop algorithms and write programs for PLCs, used for industrial process control.

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 - lecture		Number of hours:
Lec 1	Introduction. Automation in the modern manufacturing plant. Structures of the industrial control systems.	2
Lec 2	PLC programming languages. Programming with SFC.	2
Lec 3	Construction, hardware configuration and programming of selected programmable logic controllers - Part 1.	2
Lec 4	Construction, hardware configuration and programming of selected programmable logic controllers - Part 2.	2
Lec 5	Communication networks in industrial automation. Features of the PROFIBUS network.	2
Lec 6	Communication networks - continued. Data exchange in popular industrial networks.	2
Lec 7	Final test.	2
Lec 8	Selected automation components used in integrated control systems.	1
Total hours:		15

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	Hardware configuration and programming of the selected PLCs from SIMATIC Siemens family.	2
Lab 3	Programming of basic logic structures. Timers and counters.	2
Lab 4	Programming of control systems of selected models of devices and industrial processes - Part 1.	2
Lab 5	Programming of control systems of selected models of devices and industrial processes - Part 2.	2
Lab 6	Programming of control systems of selected models of devices and industrial processes - Part 3.	2
Lab 7	Programming of control systems of selected models of devices and industrial processes - Part 4.	2
Lab 8	Programming of analog input-outputs of selected PLCs.	2
Lab 9	Application of selected communication networks (PROFIBUS, AS-i, Ethernet) to exchange data between PLCs - Part 1.	2
Lab 10	Application of selected communication networks (PROFIBUS, AS-i, Ethernet) to exchange data between PLCs - Part 2.	2
Lab 11	Programming of distributed control systems - implementation of selected projects - Part 1.	2
Lab 12	Programming of distributed control systems - implementation of selected projects - Part 2.	2
Lab 13	Programming of distributed control systems - implementation of selected projects - Part 3.	2
Lab 14	Programming of distributed control systems - implementation of selected projects - Part 4.	2
Lab 15	Giving reports, summary and pass the lab.	2
Total hours:		30

TEACHING TOOLS USED

- N1. Lecture using audiovisual techniques, multimedia presentations.
- N2. The laboratory is carried out in the traditional manner in student groups. Laboratory is equipped with: PCs, PLCs and the models of machinery, equipment and industrial processes.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation <i>F - forming (during semester) P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(W)	PEK_W01 PEK_W02 PEK_W03	Final test.
P(W)	P = F1	
F1(L)	PEK_U01 PEK_U02	Assessment of prepare for laboratory exercises.
F2(L)	PEK_U01 PEK_U02 PEK_K01	Activity in laboratory classes.
F3(L)	PEK_U01 PEK_U02 PEK_K01	Rating of reports of completed projects.
P(L)	P = 0,2*F1+0,5*F2+0,3*F3	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Kasprzyk J., Programowanie sterowników przemysłowych, WNT
- [2] Legierski T., Wyrwał J., Programowanie sterowników PLC, Wyd. Pracowni Komputerowej J. Skalmierskiego, Gliwice 1998
- [3] Pawlak M., Sterowniki Programowalne, e-skrypt, Wyd. Politechnika Wrocławska, Wrocław 2010, dostępny w Dolnośląskiej Bibliotece Cyfrowej

SECONDARY LITERATURE:

- [1] Janusz Kwaśniewski, Sterowniki PLC w praktyce inżynierskiej, BTC
- [2] Laboratory instruction set, auxiliary materials for lectures and technical documentation of PLCs.
- [3] Weigmann J., Kilian G., Decentralization with PROFIBUS-DP, Publicis MCD Verlag, Erlangen 2000
- [4] Solnik W., Zajda Z., Komputerowe sieci przemysłowe Profibus DP i MPI, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2004.
- [5] Mikulczyński T., Automatyzacja procesów produkcyjnych, WNT, 2009

SUBJECT SUPERVISOR

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT ELR043210 - Automation of production processes - selected issues AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical Engineering** AND SPECIALIZATION **Industrial Electrical Engineering**

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_W01	S2ETP_W01	C.1	Lec1 Lec3 Lec4 Lec8	N.1
PEK_W02	S2ETP_W01	C.1	Lec2 Lec3 Lec4 Lec8	N.1
PEK_W03	S2ETP_W01	C.1 C.2	Lec1 Lec5 Lec6 Lec8	N.1
PEK_U01	S2ETP_U01	C.3 C.4	Lab2 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14	N.2
PEK_U02	S2ETP_U01	C.3 C.4	Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14	N.2
PEK_K01	K2ETK_K07	C.3 C.4	Lec7 Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.1 N.2