FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Automatyzacja procesów przemysłowych**
Name in English:	**Automation of industrial processes**
Main field of study (if applicable):	**Industrial Control Engineering**
Specialization (if applicable):	
Level and form of studies:	**1st level, full-time**
Kind of subject:	**optional**
Subject code:	**APR013211**
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):	30		60		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	1		2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:	0.70		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.

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 LEARNING OUTCOMES

relating to knowledge:

PEU_W01 It has knowledge of the structure of the industrial control systems.
PEU_W02 Knows the structure and principles of configuration and programming of the popular PLCs.
PEU_W03 Knows the connection topologies and understands the principles of operation of the popular industrial communication networks.

relating to skills:

PEU_U01 It can connect various industrial automation devices using standard communication networks.
PEU_U02 Is able to develop algorithms and write programs for PLCs, used for industrial process control.

relating to social competences:

PEU_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.	1
Lec 2	Construction, hardware configuration and programming of CJ1M Omron PLC. The CX-One software suite.	2
Lec 3	Timers, counters and comparators - practical examples. Data operations in the CJ1M controller.	2
Lec 4	User program structuring. Programming of function blocks.	2
Lec 5	Analog and digital telemetry systems. Communication standards in industrial networks.	2
Lec 6	Monitoring and visualization systems for industrial processes. Programming of HMI terminals.	2
Lec 7	Selected communication standards used in OMRON controllers.	2
Lec 8	Final test.	2
	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	Introduction to the CX-One software. Configuration and programming OMRON CJ1M controller.	2
Lab 3	Programming of basic logic structures using ladder diagram. Timers, counters and comparators.	2
Lab 4	Programming of the building lighting model.	2
Lab 5	Programming models of electric drives in various operating states.	4
Lab 6	Programming selected models of machines and devices.	4
Lab 7	Configuration and programming of analog input-outputs.	2
Lab 8	Application of PRM21 and DRM21 modules for distributed communication in PROFIBUS and DeviceNet networks.	2
Lab 9	Programming of HMI terminals.	2
Lab 10	Design of a control and visualization system for a selected industrial process in a distributed system.	6
Lab 11	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 LEARNING OUTCOMES ACHIEVEMENT		
Evaluation *F – forming (during semester)* *P – concluding (at semester end)*	**Educational effect number**	**Way of evaluating educational effect achievement**
F1(W)	PEU_W01 PEU_W02 PEU_W03	Final test.
P(W)	P = F1	
F1(L)	PEU_U01 PEU_U02 PEU_K01	Assessment of prepare for laboratory exercises.
F2(L)	PEU_U01 PEU_U02 PEU_K01	Activity in laboratory classes.
F3(L)	PEU_U01 PEU_U02 PEU_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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