

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Układy peryferyjne programowalnych sterowników logicznych PLC**
 Name in English: **Peripheral devices of Programmable Logic Controllers**
 Main field of study (if applicable): **Electrical Engineering**
 Specialization (if applicable): **Electrical Power Engineering**
 Level and form of studies: **2nd level, part-time**
 Kind of subject: **optional**
 Subject code: **ELR042174**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	11		11		
Number of hours of total student workload (CNPS):	27		27		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	1		1		
including number of ECTS points for practical (P) classes :			1		
including number of ECTS points for direct teacher-student contact (BK) classes:	0.70		0.70		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of PLC and A/D and D/A conversion.
2. Basic ability of PLC high level languages programming.
3. Ability of creative thinking and working. Ability of team working.

SUBJECT OBJECTIVES

- C1. Knowledge of structure, operation and programming rules Siemens S7-1200 PLCs family especially their peripheral circuits: input/output ports, keyboard, graphic touchscreen, timers/counters, A/D and D/A converters, Real Time Clock (RTC), Pulse Width Modulation (PWM), Pulse Train Outputs (PTO).
- C2. Ability of Siemens S7-1200 PLCs family peripheral circuits programming (high level languages), especially for practical implementation.
- C3. Ability of practical team working: algorithms creation and programming.

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

PEK_W01 Student has knowledge of architecture, working and peripheral circuits of Programmable Logic Controllers (PLC).

PEK_W02 Student has knowledge of algorithms development, PLC and their peripheral circuits programming (high level languages), especially for practical implementation.

relating to skills:

PEK_U01 Student has the ability to use and programming (in high level languages) PLC and their peripheral circuits.

PEK_U02 Student can independently, based on an existing PLC and their peripheral circuits, execute a simple task, or part of a complex task from control systems.

relating to social competences:

PEK_K01 Student can competently cooperate in the group that develops a complex project.

PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Introduction. Establishing rules for credit. Description SIEMENS PLC family The construction of S7-1200 controller. Data types, memory structure, addressing modes, programming languages. Boolean operations (digital inputs/outputs) in Siemens S7-1200 PLCs family. Logic operations. Arithmetic operations.	2
Lec 2	Timers, counters and high speed counters (HSC) in Siemens S7-1200 PLCs family.	2
Lec 3	Interrupts handling in Siemens S7-1200 PLCs family.	2
Lec 4	Analogue inputs and outputs in Siemens S7-1200 PLCs family.	2
Lec 5	High speed outputs: PTO and PWM in Siemens S7-1200 PLCs family.	2
Lec 6	Real-Time Clock (RTC) in Siemens S7-1200 PLCs family.	1
Total hours:		11

Form of classes - laboratory		Number of hours:
Lab 1	Presentation of the Rules of Procedure Health and Safety Laboratory. Establish rules for passing. General knowledge of the laboratory stand. Discussion of the Siemens family PLCs software environment. Siemens S7-1200 PLCs hardware structure creating. Discussion of the structure of programme and memory in Siemens S7-1200 PLCs family. Digital inputs and outputs handling in Siemens S7-1200 PLCs family.	2
Lab 2	Counting circuits in Siemens S7-1200 PLCs family: event counters, timers, real-time clock RTC.	2
Lab 3	Interrupts handling in Siemens S7-1200 PLCs family. Forming the digital output signal: PTO and PWM.	2
Lab 4	Management of analogue signals in Siemens S7-1200 PLCs family. Graphical touch screen handling.	2
Lab 5	The implementation of the passing project with use of selected peripheral circuits.	2
Lab 6	The implementation of the passing project with use of selected peripheral circuits. (continued)	1
Total hours:		11

TEACHING TOOLS USED

- N1. Informative lecture.
 N2. PLC with graphical touch screen.
 N3. Programming environment for editing, compiling and running programs for PLC.
 N4. The presentation of the passing project.

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	attendance on classes
F2(W)	PEK_W01 PEK_W02	assessment of the correctness of the algorithms used in the implementation of the final project
P(W)	$P = 0,1F1 + 0,9F2$	
F1(L)	PEK_U01 PEK_U02	activity
F2(L)	PEK_U01 PEK_U02 PEK_K01	check the quality of the final task
P(L)	$P = 0,3F1 + 0,7F2$	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Flaga S., „Programowanie sterowników PLC w języku drabinkowym”, BTC, Warszawa 2010
 [2] Legierski T., Kasprzyk J., Wyrwał J., Hajda J.: Programowanie Sterowników PLC, Wyd. Prac. Komp. J. Skalmierskiego, Gliwice 2008
 [3] Kwaśniewski J., Sterowniki PLC w praktyce inżynierskiej, BTC, Warszawa 2008
 [4] SIMATIC S7-1200 Programmable controller - User manual, Siemens 2009*
 [5] SIMATIC HMI WinCC flexible - User manual, Siemens 2007*

*literature available from teacher

SECONDARY LITERATURE:

- [1] Łukasik Z., Seta Z., Programowalne sterowniki PLC w systemach sterowania przemysłowego, Wydawnictwo Politechniki Radomskiej, Radom 2001
 [2] SIMATIC S7-1200 Micro Controller for Totally Integrated Automation, Siemens 2009*
 [3] SIMATIC S7-1200 Getting Started, Siemens 2009*

*literature available from teacher

SUBJECT SUPERVISOR

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**MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ELR042174 - Peripheral devices of Programmable Logic Controllers
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical Engineering**
AND SPECIALIZATION **Electrical Power 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	S2EEN_W12	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6	N.1
PEK_W02	S2EEN_W12	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6	N.1
PEK_U01	S2EEN_U13	C.1 C.2	Lab1 Lab2 Lab3 Lab4	N.2 N.3
PEK_U02	S2EEN_U13	C.1 C.2	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6	N.2 N.3 N.4
PEK_K01	K2ETK_K02 K2ETK_K07	C.3	Lab5 Lab6	N.4