

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, full-time**
 Kind of subject: **optional**
 Subject code: **ELR052116**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	15		15		
Number of hours of total student workload (CNPS):	30		30		
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 LEARNING OUTCOMES*relating to knowledge:*

PEU_W01 Student has knowledge of architecture, working and peripheral circuits of Programmable Logic Controllers (PLC).

PEU_W02 Student has knowledge of algorithms development, PLC and their peripheral circuits programming (high level languages), especially for practical implementation.

relating to skills:

PEU_U01 Student has the ability to use and programming (in high level languages) PLC and their peripheral circuits.

PEU_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:

PEU_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.	2
Lec 2	Boolean operations (digital inputs/outputs) in Siemens S7-1200 PLCs family. Logic operations. Arithmetic operations.	2
Lec 3	Timers and counters in Siemens S7-1200 PLCs family.	2
Lec 4	High speed counters (HSC) in Siemens S7-1200 PLCs family.	2
Lec 5	Interrupts handling in Siemens S7-1200 PLCs family.	2
Lec 6	Analogue inputs and outputs in Siemens S7-1200 PLCs family.	2
Lec 7	High speed outputs: PTO and PWM in Siemens S7-1200 PLCs family.	2
Lec 8	Real-Time Clock (RTC) in Siemens S7-1200 PLCs family.	1
Total hours:		15

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.	2
Lab 2	Digital inputs and outputs handling in Siemens S7-1200 PLCs family.	2
Lab 3	Counting circuits in Siemens S7-1200 PLCs family: event counters, timers, real-time clock RTC.	2
Lab 4	Interrupts handling in Siemens S7-1200 PLCs family. Forming the digital output signal: PTO and PWM.	2
Lab 5	Management of analogue signals in Siemens S7-1200 PLCs family. Graphical touch screen handling.	2
Lab 6	The implementation of the passing project with use of selected peripheral circuits.	2
Lab 7	The implementation of the passing project with use of selected peripheral circuits. (continued)	2
Lab 8	The implementation of the passing project with use of selected peripheral circuits. (continued)	1
Total hours:		15

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 LEARNING OUTCOMES 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(W)	PEU_W01 PEU_W02	attendance on classes
F2(W)	PEU_W01 PEU_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)	PEU_U01 PEU_U02	activity
F2(L)	PEU_U01 PEU_U02 PEU_K01	check the quality of the final task
P(L)	$P = 0,3F1 + 0,7F2$	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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| <p>[1] Gilewski T., „Podstawy programowania sterowników PLC SIMATIC S7-1200 w języku LAD”, BTC, Legionowo 2017
[2] Gilewski T., „Podstawy programowania sterowników PLC SIMATIC S7-1200 w języku SCL”, BTC, Legionowo 2015
[3] SIMATIC S7-1200 Programmable controller - User manual, Siemens*
[4] SIMATIC S7-1200 Getting Started”, Siemens*</p> |
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<p>*literature available from teacher or Siemens WWW</p>
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SECONDARY LITERATURE:

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| <p>[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*</p> |
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<p>*literature available from teacher or Siemens WWW</p>
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SUBJECT SUPERVISOR

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