

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: **ELR052174**  
 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):	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. 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:		<b>11</b>

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:		<b>11</b>

## 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) 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:

- [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\*

\*literature available from teacher or Siemens WWW

### SECONDARY LITERATURE:

- [1] Kwaśniewski J., "Sterowniki SIMATIC S7-1200 w praktyce inżynierskiej", BTC, Legionowo 2013  
 [2] Kwaśniewski J., "Język tekstu strukturalnego w sterownikach S7-1200 i S7-1500", BTC, Legionowo 2014  
 [3] SIMATIC S7-1200 Micro Controller for Totally Integrated Automation, Siemens\*  
 [4] SIMATIC HMI WinCC flexible - User manual, Siemens\*

\*literature available from teacher or Siemens WWW

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