

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Sterowniki PLC**  
 Name in English: **Programmable Logic Controllers**  
 Main field of study (if applicable): **Electrical Engineering**  
 Specialization (if applicable):  
 Level and form of studies: **1st level, full-time**  
 Kind of subject: **optional**  
 Subject code: **ELR052105**  
 Group of courses: **NO**

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

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Basic knowledge of digital circuits.
2. Basic ability of high level languages programming.

**SUBJECT OBJECTIVES**

- C1. Knowledge of structure, operation and programming rules Programmable Logic Controllers (PLC) and their peripheral circuits.  
 C2. Practical ability of PLC programming (high level languages).  
 C3. Ability of practical team working: algorithms creation and programming.

**SUBJECT LEARNING OUTCOMES***relating to knowledge:**relating to skills:*

PEU\_U01 Student has the ability to use and programming PLC and their peripheral circuits.

PEU\_U02 Student can independently, based on an existing PLC, execute a simple task, from automation systems.

*relating to social competences:*

PEU\_K01 Student can competently cooperate in the group that develops a project using PLC.

PROGRAMME CONTENT		
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 software environment. The rules for creating new projects. Documentation own programs. Hardware structure creating. Discussion of the structure of programme and memory. Creating first simple programme. Compilation of the programme. Loading a programme into the PLC. Running the programme. Preview the variables, symbolic addressing.	2
Lab 2	PLC's digital inputs and outputs handling. Boolean operations.	2
Lab 3	Logic and arithmetic operations. Introducing initial conditions.	2
Lab 4	PLC's counting circuits: event counters, timers.	2
Lab 5	High speed digital inputs and outputs. High Speed Counters (HSC), Pulse Width Modulation (PWM)	2
Lab 6	PLC's emergency and accidental event handling. Internal and external interrupts.	2
Lab 7	Management of analogue signals in PLC: A/D and D/A converters.	2
Lab 8	Data block management. Creating variables also tables. The use of function and function block.	2
Lab 9	Basics of programming in SCL language.	2
Lab 10	User interface. Graphical touch screen handling.	2
Lab 11	Real-Time Clock (RTC).	2
Lab 12	Data transfer between controllers using Ethernet.	2
Lab 13	The implementation of the project using selected PLC's circuits.	2
Lab 14	The implementation of the project using selected PLC's circuits. (continued)	2
Lab 15	The implementation of the project using selected PLC's circuits. (continued)	2
Total hours:		<b>30</b>

TEACHING TOOLS USED
N1. Introductory, short informative lecture preceding each laboratory.
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(L)	PEU_U01 PEU_U02	activity
F2(L)	PEU_U01 PEU_U02 PEU_K01	preparation of the final project with documentation
P(L)	$P = 0,3F1 + 0,7F2$	

PRIMARY AND SECONDARY LITERATURE
<b>PRIMARY LITERATURE:</b> [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  <b>SECONDARY LITERATURE:</b> [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

SUBJECT SUPERVISOR
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