

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: **ELR042105**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):			15		
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 EDUCATIONAL EFFECTS***relating to knowledge:**relating to skills:*

- PEK\_U01 Student has the ability to use and programming PLC and their peripheral circuits.  
 PEK\_U02 Student can independently, based on an existing PLC, execute a simple task, from automation systems.

*relating to social competences:*

- PEK\_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, logic and arithmetic operations.		2
Lab 3	PLC's counting circuits: event counters, timers, real-time clock RTC.		2
Lab 4	PLC's emergency and accidental event handling: interrupts. Forming the digital output signal: PTO and PWM.		2
Lab 5	Management of analogue signals in PLC: A/D and D/A converters. Graphical touch screen handling.		2
Lab 6	The implementation of the project using selected PLC's circuits.		2
Lab 7	The implementation of the project using selected PLC's circuits. (continued)		2
Lab 8	The implementation of the project using selected PLC's circuits. (continued)		1
Total hours:			<b>15</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 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(L)	PEK_U01 PEK_U02	activity
F2(L)	PEK_U01 PEK_U02 PEK_K01	preparation of the final project with documentation
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

Janusz Staszewski, janusz.staszewski@pwr.edu.pl

### MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT **ELR042105 - Programmable Logic Controllers** AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical 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_U01	K1ETK_U23 K1ETK_EEN_U06	C.1 C.2	Lab1 Lab2 Lab3 Lab4 Lab5	N.1 N.2 N.3
PEK_U02	K1ETK_U23 K1ETK_EEN_U06	C.1 C.2	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8	N.1 N.2 N.3
PEK_K01	K1ETK_K05	C.3	Lab6 Lab7 Lab8	N.4