

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Sterowniki programowalne w automatyce**
 Name in English: **Programmable controllers in automation**
 Main field of study (if applicable): **Industrial Control Engineering**
 Specialization (if applicable): **Automation and Control in Electrical Power Systems**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **optional**
 Subject code: **APR012119**
 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. Relating to knowledge: Basic knowledge of digital circuits and A/D and D/A conversion. Relating to skills: Basic ability of high level languages programming. Relating to social competencies: Ability of creative thinking and working. Ability of team working.

SUBJECT OBJECTIVES

- C1. Knowledge of structure, operation and programming rules Programmable Logic Controllers.
 C2. Knowledge of PLC peripheral circuits.
 C3. Practical ability of PLC programming (high level languages FBD or LADDER), especially practical implementation in automation systems.
 C4. 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) and their peripheral circuits.
 PEU_W02 Student has knowledge of algorithms development and programming (high level languages FBD or LADDER), especially for automation systems.

relating to skills:

- PEU_U01 Student has the ability to use and programming (in LADDER or FBD language) PLC peripheral circuits.
 PEU_U02 Student can independently, based on an existing PLC, execute a simple task, or part of a complex task from automation systems.

relating to social competences:

- PEU_K01 Student can competently cooperate in the group that develops a complex project using PLC.

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). Arithmetic operations	2
Lec 2	Timers and counters. Real-time clock	2
Lec 3	Interrupts: types, definitions, priorities.	2
Lec 4	Analogue inputs and outputs. A/D and D/A converters.	2
Lec 5	High speed outputs: PTO and PWM. PID controllers.	2
Lec 6	Practical advice on the application of PLC in automation systems for selected examples: - sorting system, - stepper motor control, - closed-loop control using a PID controller.	2
Lec 7	Practical advice on the application of PLC in automation systems for selected examples: - sorting system, - stepper motor control, - closed-loop control using a PID controller. (continued)	2
Lec 8	Practical advice on the application of PLC in automation systems for selected examples: - sorting system, - stepper motor control, - closed-loop control using a PID controller. (continued)	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 software environment. The rules for creating new projects. Documentation own programs. Hardware structure creating. Discussion of the structure of programme and memory. Simple programme creating . Compilation of the programme. Loading a programme into the PLC. Running the programme. Preview the variables, symbolic addressing.	2
Lab 2	Digital inputs and outputs handling. Boolean and arithmetic operations.	2
Lab 3	Counting circuits: event counters, timers, real-time clock RTC.	2
Lab 4	Emergency and accidental event handling: interrupts. Forming the digital output signal: PTO and PWM.	2
Lab 5	Management of analogue signals: A/D and D/A converters. Graphical touch screen handling.	2
Lab 6	The implementation of the passing project.	2
Lab 7	The implementation of the passing project. (continued)	2
Lab 8	The implementation of the passing project. (continued)	1
Total hours:		15

TEACHING TOOLS USED

- N1. Informative lecture.
 N2. PLC controllers 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 PEU_K01	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] 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*</p> |
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<p>*literature available from teacher or Siemens WWW</p>
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SUBJECT SUPERVISOR

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