COURSE DESCRIPTION CARD – SPECIMEN

<table>
<tr><td colspan="10">Faculty of Electrical Engineering</td></tr>
<tr><td>Field of study</td><td colspan="6">Automatic Control and Robotics</td><td>Degree level and programme type</td><td>Bachelor's degree</td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6">general</td><td>Study profile</td><td></td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Programmable Logic Controllers</td><td>Course code</td><td>IS-FEE-10072S</td></tr>
<tr><td>Course type</td><td>elective</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>summer</td></tr>
<tr><td>30</td><td></td><td></td><td>45</td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>6</td></tr>
<tr><td>Entry requirements</td><td colspan="9">-</td></tr>
<tr><td>Course objectives</td><td colspan="9">This course deals with the study of engineering principles and methodologies used to design, configure and programming of PLC controllers. Emphasis is placed on hardware configuration and software engineering. Principle of PLC operation. PLC of various manufactures. Programming languages: STL, LAD and SCL. A structured approach to combination and sequential control design. Programming of binary and analog control systems. Before attendance of this course, students should have basic knowledge of computer programming.</td></tr>
<tr><td>Course content</td><td colspan="9">Principle of PLC operation, definitions and terms. PLC cycle of operation. Knowledge of PLC modules. A/D and D/A PLC converters. Programming and logical structure of PLC. PLC data addressing, data types and memory management. Programming languages STL, LAD and SCL. Programming elements. Logic gates. Binary codes. Logic control instructions, data block instructions, counter instructions, timer instructions, math instructions, load and transfer (move) instructions, program control commands and comparison instructions. Digital control algorithms PID and PIDD. Principle of distributed control systems.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">power-point presentations, PLC programming software, PLC simulators, text books and other technical data</td></tr>
<tr><td>Assessment method</td><td colspan="9">lecture – written exam, project – project completion, presentation and discussion, performance of the project, defence of project</td></tr>
<tr><td>Symbol of learning outcome</td><td colspan="7">Learning outcomes</td><td colspan="2">Reference to the learning outcomes for the field of study</td></tr>
<tr><td>LO1</td><td colspan="7">basic knowledge of PLC logic operations with STL (ST, IL), LAD and FBD languages</td><td colspan="2">K_W05</td></tr>
<tr><td>LO2</td><td colspan="7">knowledge of defining of the PLC functions and logic operations</td><td colspan="2">K_W14</td></tr>
<tr><td>LO3</td><td colspan="7">knowledge of PLC hardware with modules, PLC cycle operation and PLC work principle</td><td colspan="2">K_W16</td></tr>
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LO4	practical skills to programming of PLC logic operations with embedded functions, and PID and PIDD digital PLC-oriented control algorithms	K_U17
LO5	ability and skills to set-up run-on and testing PLC control binary algorithms	K_U20
LO6	workgroup and cooperation skills, team work and project management, and demand for permanent education	K_U02
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	written exam, project evaluation, activity on project classes	L, P
LO2	written exam, project evaluation, activity on project classes	L, P
LO3	written exam, project evaluation, activity on project classes	L, P
LO4	written exam, project evaluation, activity on project classes	L, P
LO5	written exam, project evaluation, activity on project classes	L, P
LO6	student activity on project classes	P
Student workload (in hours)		No. of hours
Calculation	lecture attendance	30
	participation in classes, laboratory classes, etc.	45
	preparation for classes, laboratory classes, projects, seminars, etc.	32
	working on projects, reports, etc.	18
	participation in student-teacher sessions related to the classes/seminar/project	5
	implementation of project tasks and preparation for and participation in exams/tests	35
	TOTAL:	165

Quantitative indicators	HOURS	No. of ECTS credits
Student workload – activities that require direct teacher participation	80	3
Student workload – practical activities	85	3

Basic references	1. Jay Hooper, Introduction to PLCs 2nd Edition, Carolina Academic Press, 2006. 2. The TIA Portal Tutorial Center. 3. Siemens Automation Cooperates with Education (SCE)	
Supplementary references	1. Teacher's materials, projects and instructions. 2. Libraries in the TIA Portal	
Organisational unit conducting the course	Department of Automatic Control and Robotics	Date of issuing the programme
Author of the programme	Assoc Prof. Arkadiusz Mystkowski, PhD, DSc, Eng	27.01.2023

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S – seminar