COURSE DESCRIPTION CARD – SPECIMEN

Faculty of Electrical Engineering									
Field of study	**Automatics and Robotics**						**Degree level and programme type**	**Bachelor's degree**	
Specialization/ diploma path							**Study profile**		
Course name	**Programmable Logic Controllers**						**Course code**	**IS-FEE-10072S**	
							Course type	**elective**	

Forms and number of hours of tuition	**L**	**C**	**LC**	**P**	**SW**	**FW**	**S**	**Semester**	**summer**
	30			**45**				**No. of ECTS credits**	**6**

Entry requirements	**Computer Programming or equivalent**
Course objectives	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 (ST, IL), LAD and FBD. 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.
Course content	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 (ST, IL), FBD and LAD. 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.
Teaching methods	Power Point presentations, PLC programming software, PLC simulators, text books and other technical data
Assessment method	lecture – written exam, project – project completion, presentation and discussion, performance of the project, defence of project

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
LO1	basic knowledge of PLC logic operations with STL (ST, IL), LAD and FBD languages	
LO2	knowledge of defining of the PLC functions and logic operations	
LO3	knowledge of PLC hardware with modules, PLC cycle operation and PLC work principle	
LO4	practical skills to programming of PLC logic operations with embedded functions, and PID and PIDD digital PLC-oriented	

	control algorithms	
LO5	ability and skills to set-up run-on and testing PLC control binary algorithms	
LO6	workgroup and cooperation skills, team work and project management, and demand for permanent education	
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.	**22**
	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:	**155**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	**80**	**3**
Student workload – practical activities	**120**	**4**
Basic references	1. Bryan L.A., Bryan E.A., Programmable controllers, Theory and implementation, An Industrial Text Company Publication, Second Edition, Atlanta Georgia USA, 1997. 2. Kwasniewski J., Programmable Logic Controllers, Roma-Pol, Krakow, 2002. 3. Hugh J., Automating Manufacturing Systems with PLCs, E-book, Ver. 5.0, 2007. 4. IEC 61131 (Part 1, 2 and 3), IEC standard for Programmable Controllers.	
Supplementary references	1. Bolton W., Programmable Logic Controllers, 5th Edition, Elsevier, ISBN-10: 1856177513, 2009. 2. Keith C.J., The PLC Workbook: Programmable Logic Controllers made easy, 1996. 3. R.W. Lewis, Programming industrial control systems using IEC 1131-3.	
Organisational unit conducting the course	**Department of Automatic Control and Electronics**	**Date of issuing the programme**
Author of the programme	**Assoc Prof. Arkadiusz Mystkowski, PhD, DSc, Eng**	**22.01.2020**

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

S – seminar