Zał. nr 5 do ZW 16/2020

FACULTY ELECTRONICS

SUBJECT CARD

Name of subject in Polish:	**Podstawy automatyki**
Name of subject in English:	**Introduction to Automatic**
Main field of study (if applicable):	**Electronic and Computer Engineering**
Specialization (if applicable):	**……..**
Profile:	**academic**
Level and form of studies:	**1 st level/ full-time**
Kind of subject:	**obligatory**
Subject code:	**ECEA00019**
Group of courses:	**YES**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	30		60		
Form of crediting	Crediting with grade		Crediting with grade		
For group of courses mark (X) final course	**X**				
Number of ECTS points	**3**				
including number of ECTS points for practical (P) classes			2		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1		1		

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

C1 Acquisition of knowledge of basic concepts of control theory and systems theory.
C2 Knowledge how to perform simple simulations in MATLAB/Simulink.
C3 Acquisition of knowledge of principles of operation and tuning controllers, sensors, actuators, and industrial controllers, computer networks and automatic signal standards.
C4 Acquisition of knowledge on identification, mathematical model, computer simulation, dynamics design of closed-loop system.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 knows definitions and basic properties of static and dynamic systems, linear and non-linear systems.

PEU_W02 knows a basic structure of control systems and linear regulators.

PEU_W03 has a basic knowledge of mathematical models of control engineering objects, methods for identifying and computer simulation

PEU_W04 has a basic knowledge of selection of controls and settings of regulators, sensors, industrial controllers, and actuators.

relating to skills:

PEU_U01 is able to plan and conduct an experiment to determine the dynamics of the controlled object.

PEU_U02 can run a simple simulation of linear dynamic systems in MATLAB / Simulink.

PEU_U03 can run a simple test for automatic control systems in MATLAB / Simulink.

relating to social competences:

PEU_K01 Students are aware of necessity to search and collect technical information permanently and to analyze the data critically.

PEU_K02 Students understand and can apply the principles of health and safety at work with devices of automation in the laboratory and beyond.

PROGRAMME CONTENT

	Lecture	**Number of hours**
Lec1	The basic structure of control systems and linear regulators, industrial controllers, sensors, actuators.	2
Lec2	Static and dynamic, linear and nonlinear, stationary and non-stationary systems. Impulse response and step response. Frequency domain characteristics	2
Lec3	Selected properties of systems, stability and instability of systems.	2
Lec4	Automatic regulation. Regulation systems in open and closed-loop. Some elementary properties of linear regulators. Tuning PID controllers	2
Lec5	Introduction and presentation of the overall structure of master SCADA system.	1
	Sensors and different methods of measuring basic physical phenomena	1
Lec6	Sensors and different methods of directly and indirectly measuring	1
	Standards and signals of measurement	1
Lec7	Measurement converters and other devices to convert signals of measurement	1
	Methods of power supply and protecting of measuring and executive devices, methods and symbols used in electric designs	1
Lec8	Actuators	2
Lec9	Norms and standards used on technological schema of industrial processes	1
	Devices used as central measurement stations. The function of PLC controller in a distributed control system.	1

Lec10	Construction and configuration of PLC controller. Methods of programming PLC controllers	2
Lec11	A basic structure and rules of ladder language. The memory structure and types of values in PLC controllers	2
Lec12	Microprocessor PID controllers: - structures of hardware, discrete equation of regulator, multi-function and modular controllers	1
	Controllers tuning in control systems.	1
Lec13	Two- and three-state controllers. Fuzzy controllers.	2
Lec14	Serial communication standards used in systems of acquisition of measuring data	2
Lec15	SCADA systems and operator panels in distributed control systems.	2
	Total hours	30

Laboratory		**Number of hours**
Lab 1	Training of health and safety-at-work legislation. Organizational details. Basics of Matlab/Simulink.	3
Lab 2	Simulation of linear and nonlinear objects	3
Lab 3	Impulse response and step response. Frequency domain characteristics	3
Lab 4	PID regulator with different linear objects. Tuning PID controllers	3
Lab 5	Linear controller with nonlinear object	3
	Total hours	15

TEACHING TOOLS USED
N1. Traditional lecture using video projector N2. Laboratory classes N3. Consultations. N4. Independent work – preparation for laboratory classes. N5. Independent work – self study.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01 - PEU_W04	written test
F2	PEU_U01 - PEU_U03 PEU_K01 – PEU_K02	evaluation of laboratory reports
P = 0,5*F1 + 0,5*F2 (in order to pass the course, both F1 and F2 must be positive)		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Bolton W.: *Programmable Logic Controllers*, Elsevier 2003

[2] Fraden J.: *Handbook of Modern Sensors, Physics, Designs, and Applications,* AIP Press

& Springer, New York 2003
[3] Łysakowska B., Mzyk G. *Komputerowa symulacja układów automatycznej regulacji w środowisku MATLAB/Simulink*, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2005.

SECONDARY LITERATURE:

[1] lecture notes
[2] internet resources

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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