

## COURSE DESCRIPTION CARD

Faculty of Electrical Engineering										
Field of study	Electrical and Electronics Engineering							Degree level and programme type	bachelor's degree, full time programme	
Specialization/ diploma path	-							Study profile	-	
Course name	Fundamentals of Control Engineering							Course code	IS-FEE-10008W	
								Course type	elective	
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	winter	
	30		30					No. of ECTS credits	6	
Entry requirements	mathematics, physics.									
Course objectives	Introducing students to structures, tasks and methods of analysis and synthesis of simple control systems. Application of different methods of controllers design for control of simple processes									
Course content	Lecture: Laplace transforms of commonly encountered time function and basic Laplace transforms. Mathematical modelling of dynamic systems. Transient-response analysis of first and second-order systems. The correlation between transient and frequency-response and s-plane diagram. Stability of linear time-invariant systems. Hurwitz and Nyquist asymptotic stability criteria. Quality parameters of control on the basis of time and frequency domain performance specifications. Process control and the tuning of three-term controllers (analytical and experimental methods). Discrete time and computer control systems. Analytical techniques required for discrete time system analysis. Design methods for discrete time controllers. Nonlinear systems - practical aspects including relaycontrolled systems (PD and PID compensation). Laboratory class: Basic methods of identification, modelling and control of simple plants. Industry PID controllers, configuration and tuning methods. Control of nonlinear systems (with relay).									
Teaching methods	lecture, laboratory class									
Assessment method	written exam (lecture), evaluation of homework reports (laboratory class)									
Symbol of learning outcome	Learning outcomes							Reference to the learning outcomes for the field of study		
LO1	has an elementary knowledge of analysis and synthesis methods of simple automatic control system and its									

	<b>constituent parts;</b>	
<b>LO2</b>	<b>is capable of evaluating the quality specifications of control system and has an elementary knowledge of basic compensation methods of control system;</b>	
<b>LO3</b>	<b>can describe procedures necessary for setting the parameters of three term controllers</b>	
<b>LO4</b>	<b>has some skills of identification and control of simple plants</b>	
<b>Symbol of learning outcome</b>	<b>Methods of assessing the learning outcomes</b>	<b>Type of tuition during which the outcome is assessed</b>
<b>LO1</b>	<b>written exam, evaluation of reports</b>	<b>L,LC</b>
<b>LO2</b>	<b>written exam, evaluation of reports</b>	<b>L,LC</b>
<b>LO3</b>	<b>written exam, evaluation of reports</b>	<b>L,LC</b>
<b>LO4</b>	<b>evaluation of reports</b>	<b>LC</b>
<b>Student workload (in hours)</b>		<b>No. of hours</b>
<b>Calculation</b>	<b>lecture attendance</b>	<b>30</b>
	<b>individual work on lecture topics</b>	<b>30</b>
	<b>preparation for and participation in exams/tests</b>	<b>15</b>
	<b>laboratory class attendance</b>	<b>30</b>
	<b>preparation for laboratory class</b>	<b>15</b>
	<b>work on reports</b>	<b>30</b>
	<b>TOTAL:</b>	<b>150</b>
<b>Quantitative indicators</b>		<b>HOURS</b>
<b>Student workload – activities that require direct teacher participation</b>		<b>60</b>
<b>Student workload – practical activities</b>		<b>120</b>
<b>Basic references</b>	<b>1. Ogata K.: Modern control engineering. Prentice-Hall International, 2004.</b> <b>2. Nise N.S.: Control Systems Engineering, 5th edition, Wiley, 2008.</b> <b>3. Åström K.J, Murray R.M.: Feedback Systems: An Introduction for Scientists and Engineers, Princeton University Press, 2008.</b> <b>4. Norman N. S.: Control systems engineering, 5th ed., John Wiley a. Sons, Hoboken 2008.</b>	
<b>Supplementary references</b>	<b>1. Kaczorek T.: Linear Control Systems, vol. 1 and 2, Research Studies Press, 1993.</b> <b>2. Presentations for lecture (on-line available).</b>	
<b>Organisational unit conducting the course</b>	<b>Department of Automatic Control and Electronics</b>	<b>Date of issuing the programme</b>
<b>Author of the programme</b>	<b>prof. Tadeusz KACZOREK, PhD Eng, Łukasz Sajewski, PhD Eng. Krzysztof Rogowski, PhD Eng.</b>	<b>08.02.2020</b>

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

S – seminar