



Subject card

Subject name and code	Functional safety and information security, PG_00059836						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Control Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Emilian Piesik					
	Teachers	dr inż. Adam Kielak dr inż. Emilian Piesik					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	E-learning hours included: 0.0						
	Additional information: Lecture, presentations and auxiliary materials. Laboratory, instructions.						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study		SUM
	Number of study hours	45	3.0		27.0		75
Subject objectives	Transfer basic engineering knowledge to students concerning identification of hazards, and the risk analysis and assessment in technical systems useful for designing the control systems with regard to the functional safety requirements.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W07	Student knows how to determine required safety integrity level PLr or SILr of safety functions and how to verify these levels based on probabilistic model of industrial automation and control system in design. He/she knows basic principles of cybersecurity of converged operation, information and cloud technologies OT-IT-CT.			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
	K6_U06	Student knows methodological basics of hazards identification concerning machinery and manufacturing lines, and industrial installations. He/she possess knowledge how to define safety functions regarding results of the risk analysis and assessment to reduce rationally risk of accidents and the health, environmental and material losses.			[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	LECTURE Safety and security solutions in technical systems. Definitions of risks, individual and societal risks. As low as reasonably practicable (ALARP) rule, risk matrix, required risk reduction. The concept of functional safety of the control and protection systems. Designing of electric/ electronic/ programmable electronic (E/E/PE) systems. Examples of functional safety solutions in the industry. Reliability and functional safety of the machinery control systems. Classifying the control systems according to standards: PN-EN 954, PN-EN 13849 and PN-EN 62061. Performance levels (PL). Analysis of hazards and defining safety-related functions. Determining safety integrity level (SIL) based on the risk assessment according to PN-EN 61508. Diagnostic coverage (DC) of subsystems. Verifying SIL using qualitative and quantitative methods. Protection layers according to PN-EN 61511. Layers of protection analysis (LOPA) method. Designing of the safety instrumented systems (SIS) and the alarm system (AS). Information security in computer systems. Criteria of risk assessment. Determining levels of information protection. Methods and solutions of the information security in the network: access control, audit, antivirus protection and fire walls. Security of information transmission and data bases. Examples of protection systems and information protection in the industry. Hazards identification and assessment of the risk factors. LABORATORY Determining required performance levels (PL) of safety functions implemented in the machine control system. Technical realisation and verification performance level (PL) on examples of a machine protection device and light curtain. Determining required SIL for safety-related functions. Verifying SIL, designing and implementing the structure of protection system KooN. PLCs for safety-related applications. Protection layers (BPCS, human-operator and alarm system, SIS/ESD).		
Prerequisites and co-requisites	Knowledge concerning the probability calculus, the reliability analysis in technical systems, and the application of computer systems and programmable control systems in the industry.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Two midterm colloquiums	50.0%	65.0%
	Practical exercises in laboratory	50.0%	35.0%
Recommended reading	Basic literature		
	Supplementary literature		
	eResources addresses		
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Risk graph for determining required safety integrity level (SIL). 2. Qualitative verification of the E/E/PE system's SIL. 3. Quantitative verification of the E/E/PE system's SIL. 		
Work placement	Not applicable		