GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Functional safety and information security, PG_00062386						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2023		Academic year of realisation of subject	2025/2026			
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						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	15.0	0.0	45
	E-learning hours included: 0.0						
	Additional information: Lecture, presentations and auxiliary materials. Project, 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_U06	The student knows the basic devices of safety automatics. The student is able to assess risk due to loss criteria. The student knows how to design an automation system to reduce the risk of losses in the context of a layered safety system.	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K6_W07] has basic knowledge related to control and automation systems	Students will know how to determine the required PLr or SILr of the safety function. How to verify these levels against on the basis of a probabilistic model of an industrial automation and control system in design. The student will be familiar with the basic principles of of cyber security concerning related technologies operational, IT and cloud OT-IT-CT.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_U07] can build and analyze models of systems and systems in the field related to control systems and automation	The student knows the fundamentals of methodical basis of identifying hazards associated with operation of machinery and production lines and industrial installations. It has the knowledge of how to define safety functions, taking into account the results of risk analysis and assessment, in order to rationally reduce the risk of accidents and human errors, environmental and material damage. The student knows the solutions of a layered safety system and knows how to analyse them. The student knows how to select hardware architecture solutions that perform the safety function.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task

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. Project: 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	60.0%	50.0%
Project	60.0%	50.0%

Recommended reading

Basic literature

1. Kosmowski K.T. (red.): Podstawy bezpieczeństwa funkcjonalnego, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2020.

2. Kosmowski K.T. (Ed.): Functional safety management in critical systems, Fundacja Rozwoju Uniwersytetu Gdańskiego Gdańsk 2007.

3. Liderman K.: Analiza ryzyka i ochrona informacji w systemach komputerowych. Wydawnictwo Naukowe PWN SA, Warszawa 2008.

	Supplementary literature	1. Andersen R.: Inżynieria zabezpieczeń. WNT, Warszawa 2005. 2. Białas A.: Bezpieczeństwo informacji i usług w nowoczesnej instytucji i firmie, WNT, Warszawa 2006.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	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	