



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 2026	Academic year of realisation of subject			2028/2029		
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 -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Emilian Piesik				
	Teachers						
Lesson types	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_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		
	[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.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		

Subject contents	<p>Course content – lecture</p> <p>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).</p>											
Prerequisites and co-requisites	<p>Knowledge concerning the probability calculus, the reliability analysis in technical systems, and the application of computer systems and programmable control systems in the industry.</p>											
Assessment methods and criteria	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:33%;">Subject passing criteria</th> <th style="width:33%;">Passing threshold</th> <th style="width:33%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Project</td> <td>60.0%</td> <td>50.0%</td> </tr> <tr> <td>Two midterm colloquiums</td> <td>60.0%</td> <td>50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Project	60.0%	50.0%	Two midterm colloquiums	60.0%	50.0%
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Recommended reading	<p>Basic literature</p> <ol style="list-style-type: none"> <li>1. Kosmowski K.T. (red.): Podstawy bezpieczeństwa funkcjonalnego, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2020.</li> <li>2. Kosmowski K.T. (Ed.): Functional safety management in critical systems, Fundacja Rozwoju Uniwersytetu Gdańskiego Gdańsk 2007.</li> <li>3. Liderman K.: Analiza ryzyka i ochrona informacji w systemach komputerowych. Wydawnictwo Naukowe PWN SA, Warszawa 2008.</li> </ol>											
	<p>Supplementary literature</p> <ol style="list-style-type: none"> <li>1. Andersen R.: Inżynieria zabezpieczeń. WNT, Warszawa 2005.</li> <li>2. Białas A.: Bezpieczeństwo informacji i usług w nowoczesnej instytucji i firmie, WNT, Warszawa 2006.</li> </ol>											
	<p>eResources addresses</p>											
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Risk graph for determining required safety integrity level (SIL).</li> <li>2. Qualitative verification of the E/E/PE system's SIL.</li> <li>3. Quantitative verification of the E/E/PE system's SIL.</li> </ol>											
Practical activities within the subject	<p>Not applicable</p>											

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