



## Subject card

Subject name and code	Safety in Power Engineering, PG_00042200						
Field of study	Power Engineering, Power Engineering, Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	4	Language of instruction			Polish		
Semester of study	7	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Control Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Adam Kielak				
	Teachers		dr inż. Adam Kielak				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	E-learning hours included: 0.0						
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	30		3.0		42.0	75
Subject objectives	Introduction to the issues of security in the energy sector in the context of critical infrastructure.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	K6_K03		The student has basic knowledge about individual and societal risks associated with energy facilities of various categories, including nuclear power plants. They know the principles of action in emergency situations in relation to the levels of INES scale. They are aware of the need for proper shaping of safety culture in engineering activities to limit the adverse impact of energy technologies on the environment.			[SK2] Assessment of progress of work [SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work	
	K6_U03		The student is prepared to identify threats in industry. Knows the rules health and safety at work. Can design architecture industrial control system ICS and determine strategy for its periodic testing and diagnosing for safety integrity level SIL.			[SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject	
	K6_W06		The student knows new technologiis energetics for use in industry 4.0. They can calculate reliability indicators of electrical power systems for industrial facilities. They know the basic solutions of functional safety for industrial control systems ICS to reduce the risk of health, material and environmental losses.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects	

Subject contents	Failures of energy facilities and systems and their causes. Integrated management systems for reliability, environment, and safety. Identification of hazards and risk evaluation, considering the relationship: human - technology - environment (MTE). Occupational safety. Reliability and safety of energy facilities and distribution systems. Critical infrastructure and the importance of the power system based on various energy sources, including RES. Reliability of electricity supply. Safety of nuclear power plants. Defining emergency scenarios. Protection of facilities and protective layers in industrial facilities of elevated risk and power plants. Consequences of emergency events. F-N curves and risk criteria. Risk evaluation in the life cycle. Risk control options. The ALARP principle. Shaping safety culture. Human reliability analysis (HRA). Functional safety of industrial control systems ICS (PN-EN 61508/61511). Cybersecurity of industrial control systems (ICS) in accordance with IEC 62443, issues of protection of related OT-IT-CT technologies. Proactive safety management in energy facilities. Risk-informed decision making (RIDM).		
Prerequisites and co-requisites	Basic knowledge of the reliability of technical systems and protection technologies in industry.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		60.0%	50.0%
		60.0%	50.0%
Recommended reading	Basic literature	1. Smith D.J. Simpson K.: <i>The Safety Critical Systems Handbook: A Straightforward Guide to Functional Safety: IEC 61508 (2010 Edition), IEC 61511 (2020 Edition) &amp; Related Guidance, Fifth Edition.</i>  2. Gritzalis D. Theocharidou M. Stergiopoulos G.: <i>Critical Infrastructure Security and Resilience Theories, Methods, Tools and Technologies</i> , Springer 2019.	
	Supplementary literature	1. Kosmowski K.T. (Ed.): <i>Functional safety management in critical systems</i> . Fundacja Rozwoju Uniwersytetu Gdańskiego, Gdańsk 2007.	
	eResources addresses	Adresy na platformie eNauczanie: BEZPIECZEŃSTWO W ENERGETYCE [2023/24] - Moodle ID: 26921 <a href="https://enauzanie.pg.edu.pl/moodle/course/view.php?id=26921">https://enauzanie.pg.edu.pl/moodle/course/view.php?id=26921</a>	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		