

GDAŃSK UNIVERSITY

Subject card

Subject name and code	Reliability and Diagnostics, PG_00036207								
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			Obligatory subject group in the field of study 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	3		Language of instruction			Polish			
Semester of study	5		ECTS credits			5.0			
Learning profile	general academic profile		Assessment form			exam			
Conducting unit					ontrol Er	l naineeri	na		
Name and surname	Subject supervisor	-> Faculty of Electrical and Control Engineering dr hab. inż. Marcin Śliwiński							
of lecturer (lecturers)	Teachers								
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM	
of instruction	Number of study hours	30.0	15.0	15.0	0.0		0.0	60	
	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	60		8.0		57.0		125	
Subject objectives	The student has knowledge concerning the methods and tools of reliability analysis, and diagnosis of devices and systems in automatics and robotics.								
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	[K6_W11] knows the hazards arising from devices, installations, systems and technical systems, basic principles of occupational health and safety, taking into account the role of control and security systems in controlling automation and robotics facilities		The student has advanced knowledge of diagnostic methods for processes and installations with taking into account automation and robotics systems automation and robotics. He/she knows architecture industrial control systems ICS control and protection systems and their importance in ensuring reliability and business continuity, as well as human and environmental safety.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects			
	[K6_U06] has the preparation necessary to work in an industrial environment, applies the principles of occupational health and safety		The student has knowledge about indicators various reliability issues categories of industrial facilities and systems. He knows different things modeling methods probabilistic systems, especially safety related systems.			[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools			

A Basic concepts and definitions of reliability theory. The failure mechanisms of technical objects. The failure failu	Subject contents	LECTURE						
Random events and definitions of probability. Probability calculus. Venn diagrams. Independent and dependent events. Conditional probability. Bayes rule. Random variables and distributions: discrete and continuous. Examples of distributions: Bernoulli, Poisson, exponential: their parameters and characteristic values. Application of probability calculus in neliability analysis of systems of various structures. LABORATORY Analysis of the operation time to failure: functions and reliability indices. Selected distributions in andom variables in distributions in the operation time to failure in committee of concerning to the operation of measures and functions of uncellative analysis using FMECA method. Probabilistic modelling of systems using fault tree method. Failure mode, effect and criticality analysis using FMECA method. Probabilistic modelling of systems using fault tree method (FT). Prerequisites Knowledge concerning basic rules of devices functioning in technical systems. Basics of the probability and variability and variability. Probability calculus and statistics using fault tree ware do 0.0% Recommended reading Basic ilterature 1. Zo E: An introduction to the basics of reliability and variability. Prove the distribution of systems and variability. Prove the distribution of the system calculus and statistics. Using equilible calculates and statistics using every. Work: Jon Ware Charaby Deprecentisties and calculates and statistics. Using equilible transmitter every. Work: Jon Ware Charaby Deprecents and uncellible prove and theadility. Thevel Charaby Deprecents and uncellible prov		reliability measures. Probabilistic models of elements. Distributions of random variable used in the reliability analysis. The estimation of exponential distribution parameter. Calculation of mean time to failure (MTTF) and mean time between failures (MTBF). Reliability data bases. Failure mode effect and criticality analysis (FMECA). Typical reliability structures: series, parallel and mixed. Redundancy and KooN architecture. Reliability block diagram (RDB) method. Logical and probabilistic modeling of systems. Fault tree (failure and errors) method (FT). Minimal cuts and minimal paths. Markov processes and graphs in probabilistic modeling. Functional safety of the control and protection systems. Safety integrity level (SIL) of safety-related function. Determining required SIL from a risk graph and verifying SIL based on a probabilistic model of the system. Quality and reliability management in technical systems in a life cycle. Technical diagnostics.						
dependent events. Conditional probability. Bayes rule. Random variables and disributions: disorblet and continuous. Examples of distributions. Benoulli, their parameters and characteristic values. Application of probability calculus in reliability analysis of systems of various structures. LABORATORY Analysis of the operation times to failure: functions and reliability indices. Selected distributions in random variables in reliability analysis. Parameter estimation of exponential distributions (PLC). Calculation of mode, effect and criticality analysis using FMECA method. Probabilistic modeling of systems using fault tree method (FT). Prerequisites Knowledge concerning basic rules of devices functioning in technical systems. Basics of the probability calculus and statistics. Using engineering software. Assessment methods and criterial passic rules of devices functioning in technical systems. Basics of the final grade laboratory do.0% do.0% do.0% Recommended reading Subject passing criteria Passing threshold Percentage of the final grade laboratory do.0% do.0% Supplementary literature 1. Zio E: An introduction to the basics of reliability and risk analysis. New Jersey. World Scientific, 2007. Recommended reading Basic literature 1. Zio E: An introduction to the basics of reliability and risk analysis. New Jersey. World Scientific, 2007. Recommended reading distributions and part of a subtraction of Dielechnik Clarafskate, distributions effects and Statistical Methods. New York: Scientific Equipment. With an analysis. Teleship for theory. Models and Statistical Methods. Net York: Scientific Equipment. With an analysis. Teleship		TUTORIALS						
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	Work placement	Not applicable						