



## Subject card

Subject name and code	Reliability and safety of machines and energy systems , PG_00055916						
Field of study	Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2025/2026		
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			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Siłowni Okrętowych -> Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Zbigniew Korczewski				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	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		2.0		18.0	50
Subject objectives	To teach students the theoretical foundations of reliability and safety of machines and energy systems, as well as familiarize with the methods used for testing and assessing reliability as well as analyzing and assessing safety.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W06] knows classic and developmental energy technologies, rules for the selection and operation of heat and energy devices and installations, basic principles of energy systems operation, basic issues regarding the reliability of energy devices and diagnostics, environmental effects of energy technologies used, methods of using renewable energy sources		Student knows the basic notions within the range of reliability of machine and power systems as well as methods of testing and assessing reliability. Student knows the basic elements of the H-T-S safety system, safety indicators, methods of the risk assessing and analysing for complex energy systems.		[SW1] Assessment of factual knowledge		
	[K6_W13] has basic knowledge of the operation of energy equipment in the field of thermal power plants, thermal and energy and heating systems, internal combustion engines, compressors and rotating machines, has basic knowledge of the regulation of energy equipment and methods of their selection depending on the needs		Student knows the operational causes of the failures and faults of the energy machines and devices.		[SW1] Assessment of factual knowledge		
	[K6_W12] has basic knowledge of the life cycle and repairs of energy equipment in the field of thermal power stations, thermal and energy systems and heating systems, internal combustion engines and compressors as well as rotating machines		Student is able to classify technical condition of the energy machines and devices. He distinguishes the known and recognisable operation unserviceable states of the engines and working machines applied in energy systems.		[SW1] Assessment of factual knowledge		

Subject contents	<p>Lecture: Basic concepts and definitions of the theory of reliability and safety: the concept of reliability, durability, readiness and safety, the concept of damage, the state of full and partial viability (disabled), the concept of safety, accident, loss, threat and risk - risk criterion. Physical aspects of reliability and safety of power machines and devices: causes of damage, basic mathematical models used in reliability tests, models of changes in technical conditions, methods of selecting mathematical models for reliability tests, reliability indicators. Reliability testing and assessment methods. Engineering methods of reliability analysis. Reliability structures of machines and energy devices: serial structure, parallel structure, series-parallel structure. Reliability of a human operator: the concept of operator error, methodology for evaluating operator reliability. Security structure and security models of energy systems. Methods of analysis and assessment of the security of energy systems.</p> <p>Labs: Shaping the reliability of power systems with a serial and parallel structure. Point and interval estimation of parameters of reliability models. Comparing the reliability of power machines and devices using different mathematical models. Verification of hypotheses about the distribution of time for the correct operation of power machines and devices. Estimation of statistical reliability indicators. Estimation of safety indicators. Shaping the security of energy systems</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		60.0%	75.0%
		100.0%	25.0%
Recommended reading	Basic literature	Modarres M.: What Every Engineer Should Know About Reliability and Risk Analysis. New York - Basel - Hong Kong 1993.	
	Supplementary literature	Modarres M.: What Every Engineer Should Know About Reliability and Risk Analysis. New York - Basel - Hong Kong 1993.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>Reliability of energy systems with a series and parallel structure.</p> <p>Forman curve.</p>		
Work placement	Not applicable		