



## Subject card

Subject name and code	Malfunctions and Professional Evaluations in Power Engineering, PG_00033728						
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	2021/2022				
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery	at the university				
Year of study	2	Language of instruction	Polish				
Semester of study	4	ECTS credits	3.0				
Learning profile	general academic profile	Assessment form	assessment				
Conducting unit	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	dr inż. Patrycja Puzdrowska dr inż. Beata Pałczyńska mgr inż. Dominik Kreft dr inż. Michał Ziółko prof. dr hab. inż. Zbigniew Korczewski dr inż. Jacek Rudnicki					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie: Awaryjne i ekspertyzy w energetyce, W, sem.04, letni 21/22, (MK_38/2) - Moodle ID: 18317 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18317">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18317</a> Awaryjne i ekspertyzy w energetyce, W, sem.04, letni 21/22, (MK_38/2) - Moodle ID: 18317 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18317">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18317</a>						
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	6.0	9.0	75		
Subject objectives	1. Acquaint students with the issues of reliability of stationary and non-stationary power systems in terms of the complexity of their construction forms and operating conditions and the resulting risks of technical failures.  2. Present the basic methods of diagnostic operation in relation to the main components of such systems.						
Learning outcomes	Course outcome	Subject outcome	Method of verification				
	K6_W06	He knows the most common, primary causes of failure of technical energy systems resulting from the operating conditions. He knows the basic forms and means of diagnostic operation in relation to the main components of energy systems.	[SW1] Assessment of factual knowledge				
	K6_W08	He knows the basic construction forms of stationary and non-stationary energy systems.	[SW1] Assessment of factual knowledge				

Subject contents	<p><b>Lecture:</b> The concept of damage, malfunction, technical failure, expertise in the operation of complex energy systems. Design forms of various energy systems, risk of technical failures. Processes of destruction of structural elements of machines and energetic devices: fatigue, erosion, corrosion, contamination (deposits), jamming. Typical damage to piston and turbine drive engines. Typical damage to reduction gears and shaft line couplings. Problems of loss of coaxiality of shaft lines in drive units in various energy systems. Methods and means of diagnostic operation used in the operation of energy systems: endoscopy, vibroacoustics, thermal-flow diagnostics. The role of measurements in the performance of operational expertise, stationary and mobile measuring systems. Vibration measurements and their spectral-correlation analysis. Protection and interlock systems in the control of energy systems, start-up, transient processes, shutdown, work in systems. <b>Laboratory:</b> Assessment of the drive shaft fatigue in a rotary mechanical system on the basis of energy balancing of processes. Dimensioning of damages to structural elements of machines with the use of a video endoscope. Determination of the voltage-current characteristics of a direct current generator in a diesel generator set in equal load conditions. Determination of diesel engine exhaust emission characteristics in the conditions of actually introduced changes in flow resistance in the intake air duct. Determination of the energy performance of a diesel engine in various technical conditions on the basis of indication. Calibration of measuring instruments. Measurements using an oscilloscope. Measurements of RLC elements parameters. Power measurements in three-phase circuits. Short-circuit loop impedance measurements. Earth resistance measurement. Testing of residual current devices. Location of faults in power cables.</p>											
Prerequisites and co-requisites	Knowledge of the basics of machine building and electrical engineering.											
Assessment methods and criteria	<table border="1" data-bbox="450 598 1489 701"> <thead> <tr> <th data-bbox="450 598 794 633">Subject passing criteria</th> <th data-bbox="794 598 1139 633">Passing threshold</th> <th data-bbox="1139 598 1489 633">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="450 633 794 669">Colloquium</td> <td data-bbox="794 633 1139 669">51.0%</td> <td data-bbox="1139 633 1489 669">75.0%</td> </tr> <tr> <td data-bbox="450 669 794 701">Labs</td> <td data-bbox="794 669 1139 701">100.0%</td> <td data-bbox="1139 669 1489 701">25.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Colloquium	51.0%	75.0%	Labs	100.0%	25.0%
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Recommended reading	Basic literature	<p>A. Adamkiewicz, R. Michalski, W. Zeńczak: Wybrane problemy technologii konwersji energii w okrętowych systemach energetycznych. Wydawnictwo KARPRINT, Lublin 2012 rok.</p> <p>M. Hebda: Teoria eksploatacji pojazdów, WKiŁ, Warszawa 1978 rok.</p> <p>J. Konieczny: Wstęp do teorii eksploatacji urządzeń, WNT, Warszawa 1971 rok.</p> <p>Z. Korczewski: Endoskopia silników okrętowych. AMW Gdynia, 2008.</p> <p>Z. Korczewski: Diagnostyka eksploatacyjna okrętowych silników spalinowych- tłokowych i turbinowych. Wybrane zagadnienia. Wydawnictwo PG, Gdańsk 2017.</p> <p>Z. Korczewski: Identyfikacja procesów gazodynamicznych w zespole sprężarkowym okrętowego turbinowego silnika spalinowego dla potrzeb diagnostyki, AMW, Gdynia 1998 rok.</p> <p>S. Kluj: Diagnostyka urządzeń okrętowych, WSM Gdynia 2000 rok.</p> <p>Jerzy A. Krzyżanowski, Jerzy Głuch: Diagnostyka ciepło-przepływowa obiektów energetycznych, Wydawnictwo IMP PAN, Gdańsk 2004.</p> <p>W. Kurowski: Podstawy diagnostyki systemów technicznych. Metodologia i Metodyka, Politechnika Warszawska, Warszawa 2008 rok.</p> <p>J. Lewitowicz i inni: Podstawy eksploatacji statków powietrznych. Tom 1-7. Wydawnictwo Instytutu Technicznego Wojsk Lotniczych. Warszawa 2001-2009.</p> <p>A . Miller: Maszyny i Urządzenia ciepłne i energetyczne. Wydawnictwa Szkolne i Pedagogiczne. Warszawa 1996 rok.</p> <p>S. Niziński, H. Pelc: Diagnostyka urządzeń technicznych, WNT, Warszawa 1980 rok.</p> <p>M Orkisz: Modelowanie turbinowych silników odrzutowych. Biblioteka Naukowa Instytutu Lotnictwa, Warszawa 1997 rok.</p> <p>T. Opara: Metrologiczne aspekty badania zjawisk zachodzących w stożku rozpylania wtryskiwaczy paliwa lotniczych silników turbinowych. WAT Warszawa 1996.</p> <p>M. Mazur: Terminologia techniczna, WNT, Warszawa 1961 rok.</p> <p>S. Niziński: Eksploatacja obiektów technicznych, Biblioteka problemów eksploatacji, Radom 2002 rok.</p> <p>S. Niziński, H. Pelc: Diagnostyka urządzeń technicznych, WNT, Warszawa 1980 rok.</p> <p>S. Szczeciński i inni: Lotnicze silniki turbinowe. Konstrukcja, Eksploatacja, Diagnostyka. Część I i II. WKiŁ, Instytut Lotnictwa, Warszawa 2010 rok.</p> <p>S. Szczeciński i inni: Historia i perspektywy rozwoju napędów lotniczych. Biblioteka Naukowa Instytutu Lotnictwa, Warszawa 2005 rok.</p>
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		B. Żółtowski: Leksykon diagnostyki technicznej, ATR Bydgoszcz 1996 rok.
	Supplementary literature	ISO 13372:2012 : Condition monitoring and diagnostics of machines Vocabulary.
	eResources addresses	Awarie i ekspertyzy w energetyce, W, sem.04, letni 21/22, (MK_38/2) - Moodle ID: 18317 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18317">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18317</a> Awarie i ekspertyzy w energetyce, W, sem.04, letni 21/22, (MK_38/2) - Moodle ID: 18317 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18317">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18317</a>
Example issues/ example questions/ tasks being completed		Local disappearance of honing grooves on the surface of the cylinder liner of a piston internal combustion engine, the so-called "polishing effect" of the cylinder surface is the result of ...
Work placement		Not applicable