



Subject card

Subject name and code	Technical Diagnostics (WOiO), PG_00042088						
Field of study	Power Engineering, Power Engineering						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2024/2025		
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			English		
Semester of study	6	ECTS credits			4.0		
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						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	15.0	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		5.0		65.0	100
Subject objectives	To teach theoretical basis of a technical diagnostics as well as explain diagnostic methods and means applied within energy machines and devices. To train practical skills within the range of engines' and working machines' diagnostics.						

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		
	[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		
	[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		
	[K6_K04] is able to formulate opinions on technical and technological processes in energy and sanitary engineering		
Subject contents	<p>Lecture: Basic notions and definitions: the concept of technical diagnostics, the notion of diagnosis and its reliability and accuracy, the notion of a diagnostic, diagnosed and diagnosing system, input and output signals and disturbances. The essence of technical diagnostics and its purpose and tasks. Forms of diagnostic activity: diagnosing, forecasting and genesis. Machine and energy system as an object of diagnosis. Diagnostic models of machines and energy systems: purposes of creating models, types of diagnostic models, principles of creating diagnostic models, practical usefulness of diagnostic models. Diagnostic methods and types of diagnostic inference about the technical condition of machines and energy systems. Diagnostic systems for the selected machines (high power engines) and energy devices and their reliability.</p> <p>Laboratory: Identification of the technical condition of the piston-cylinder and injection system of a compression-ignition engine by indicating its cylinders. Identification of the technical condition of a simple drive system using the vibration method and acoustic emission. Diagnostic examination of elements of the engine injection equipment on a test stand. Diagnostic examination of the valve timing unit of the Diesel engine on a laboratory test bed. Identification of the operational suitability of the lubricating oil by testing its viscosity. Diagnostic examination of the Diesel engine by means of the thermal imaging method (infrared camera). Determination of the chemical composition of engine exhaust gases.</p>		
Prerequisites and co-requisites	Knowledge of the subject internal combustion engines. Knowledge of the basics of the operation of energy machines and devices.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	test	51.0%	75.0%
	Reports from the performed laboratory	100.0%	25.0%

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>L. Bendkowski: Elementy diagnostyki technicznej, WAT, Warszawa 1992 rok.</p> <p>H. Czichos: Handbook of Technical Diagnostics: Fundamentals and Application to Structures and Systems. Springer Science & Business Media. 2013.</p> <p>P. Dempsey: Troubleshooting and repairing Diesel engines. McGraw Hill. USA, 2008.</p> <p>M. Hebda: Teoria eksploatacji pojazdów, WKiŁ, Warszawa 1978 rok.</p> <p>Hardin J.R. i in. A gas turbine condition-monitoring system. Naval Engineers Journal, November 1995.</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>
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	Supplementary literature	ISO 13372:2012 : Condition monitoring and diagnostics of machines Vocabulary.
	eResources addresses	Adresy na platformie eNauczenie:
Example issues/ example questions/ tasks being completed	<p>Decomposition of the research object for the needs of diagnostics.</p> <p>Diagnostic criteria.</p> <p>Methodology of indicating the Diesel engine.</p>	
Work placement	Not applicable	