



COURSE SPECIFICATION

Course code	full-time programme:	M#2-S2-ME-EM-110
	part-time programme:	
Course title in Polish	Eksploracja i diagnostyka maszyn i urządzeń	
Course title in English	Machinery Testing and Maintenance	
Valid from (academic year)	2024/2025	

GENERAL INFORMATION

Programme of study	MECHANICAL ENGINEERING
Level of qualification	second-cycle
Type of education	academic
Mode of study	full-time programme
Specialism	Machine Operation and Maintenance
Department responsible	Department of Maintenance, Laser and Nanoscale Technologies
Course leader	dr inż. Szymon Tofil
Approved by	dr hab. Jakub Takosoglu, prof. PŚk, Dean of the Faculty of Mechatronics and Mechanical Engineering

COURSE OVERVIEW

Course type	specialism-related	
Course status	compulsory	
Language of instruction	English	
Semester of delivery	full-time programme	Semester I
	part-time programme	Semester I
Pre-requisites	none	
Examination required (YES/NO)	YES	
ECTS value	3	

Mode of instruction		lecture	class	laboratory	project	seminar
No. of hours per semester	full-time programme	15		30		
	part-time programme					



**LEARNING OUTCOMES**

Category of outcome	Outcome code	Course learning outcomes	Corresponding programme outcome code
Knowledge	W01	Has in-depth and structured knowledge in the field of operation and diagnostics of machines and devices, in particular the knowledge necessary to understand physical phenomena occurring in all types of machines and mechanical devices and the complex relationships between them.	MiBM2_W02
	W02	Has in-depth knowledge of the terminology associated with the operation and diagnostics of machines and devices, and also knows the historical outline of technical solutions used in this area. Has knowledge of the construction of diagnostic systems, the method of measuring measurement signals and the method of processing and analyzing data used in machine diagnostics.	MiBM2_W04
	W03	Has comprehensive knowledge of surface engineering covering various issues related to the operation and diagnostics of machines and devices, e.g. surface layer modeling, assessment of the condition and durability of the surface, measurements of geometric surface parameters, basic tribological tests. Has knowledge of methods for assessing and forecasting the technical condition of machines and devices.	MiBM2_W11
Skills	U01	Able to create and implement engineering designs, including operational stages.	MiBM2_U01
	U02	Be able to skilfully select methods and advanced software to solve issues relating to the operation and diagnosis of equipment machinery.	MiBM2_U02
	U03	Is able to perform measurements of various types of quantities and parameters related to the process of operation and diagnostics of machines and devices, is able to interpret the obtained results, analyze measurement uncertainty and draw conclusions.	MiBM2_U10
	U04	Can work individually and as part of a team Can lead and take a leading role in a team, interact with others as part of the work involved in the operation and diagnosis of machinery and equipment.	MiBM2_U15 MiBM2_U16
Competence	K01	Is aware of the need to independently supplement and expand knowledge in the field of operation and diagnostics of machines and devices. Is ready to critically evaluate the knowledge they possess, the importance of knowledge in solving cognitive and practical problems and the need to acquire new information both from literature and from experts in the field of operation and diagnostics of machines and devices. Understands the need and knows the possibilities of continuous improvement (third-cycle studies, postgraduate studies, courses) aimed at improving professional, personal and social competences.	MiBM2_K01



	K02	Is aware of the importance and understanding of non-technical aspects and effects of engineering activities, including its impact on the safety of other people and the impact on the environment and responsibility related to the issues of operation and diagnostics of machines and devices. Is prepared to work in industry in the field of operation and diagnostics of machines and devices.	MiBM2_K02
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COURSE CONTENT

Mode of instruction	Topics covered
lecture	Introduction to the issues of operation of machines and devices. Technical diagnostics, basic concepts, goals and tasks. Procedures for diagnosing machines and devices - review of diagnostic methods and solutions for testing machines and devices. Diagnostic signals and symptoms. Review of systems monitoring changes in the condition of machines and devices. Assessment of the technical condition of machines and devices - carriers of information about the condition of the machine. Recognition and localization of machine states: genesis of damage. Energy transformations and sources of diagnostic information. Physical aging of machine elements. Regeneration of machine elements. The surface layer - role and importance in the operation and diagnostics of machines. Development of automated diagnostic systems using artificial intelligence methods. Distributed diagnostic systems - remote diagnostics. Diagnostics of devices using a concentrated energy stream. Diagnostics of car air conditioning systems.
laboratory	Diagnostics of operational coatings. Coating thickness measurements. Diagnostics of the surface layer after tribological tests. Diagnostics of a plasma cutter. Diagnostics of a plasma welding system. Diagnostics of a fiber laser. Measurements and analysis of electrical impulses during electro-spark machining. Computer diagnostics of the automotive air conditioning system. Computer diagnostics of the cooling system of devices using a concentrated energy stream.

ASSESSMENT METHODS

Outcome code	Methods of assessment					
	Oral examination	Written examination	Test	Project	Report	Other
W01		X	X			
W02		X	X			
W03		X	X			
U01			X		X	X
U02			X		X	X
U03			X		X	X
U04			X		X	X
K01						X
K02						X

ASSESSMENT TYPE AND CRITERIA

Mode of instruction	Assessment type	Assessment criteria
lecture	examination assessment	Obtaining at least 50% of points in the written examination covering the content of the lectures.
laboratory	non-examination assessment	Positive completion of course reports. Successful completion of the final colloquium. Achievement of at least 50% marks.



**OVERALL STUDENT WORKLOAD**

ECTS weighting												
No.	Activity type	Student workload										Unit
		full-time programme					part-time programme					
		L	C	Lb	P	S	L	C	Lb	P	S	
1.	Scheduled contact hours	15		30								h
2.	Other contact hours (office hours, examination)	4		2								h
3.	Total number of contact hours	51										h
4.	Number of ECTS credits for contact hours	2,0										ECTS
5.	Number of independent study hours	24										h
6.	Number of ECTS credits for independent study hours	1,0										ECTS
7.	Number of practical hours	50										h
8.	Number of ECTS credits for practical hours	2,0										ECTS
9.	Total study time	75										h
10.	ECTS credits for the course <i>1 ECTS credit = 25-30 hours of study time</i>						3					ECTS

READING LIST

1. Bogdan Antoszewski, Wojciech Żórawski, Przewodnik do ćwiczeń laboratoryjnych z eksploatacji maszyn, Wydawnictwo Politechniki Świętokrzyskiej 2013
2. Dindorf R., Woś P., Przetworniki i układu pomiarowe w systemach hydraulicznych i pneumatycznych, Wydawnictwo Politechniki Świętokrzyskiej, miejsce wydania, Kielce, 2014
3. P. Wróblewski, Jerzy Kupiec – Diagnostowanie podzespołów i zespołów pojazdów samochodowych. WKiŁ, 2015
4. Stanisław Kowalczyk – Nadzorowanie obsługi pojazdów samochodowych. WSiP, 2015
5. Torsten Schmidt – Klimatyzacja samochodowa w praktyce warsztatowej. WKiŁ, 2020
6. Nizinski S., Michalski R.: Diagnostyka obiektów technicznych. Wyd. Instytutu Technologii Eksploatacji, Radom-Olsztyn, 2002
7. Żółtowski B. Cempel C. pod red.: Inżynieria diagnostyki maszyn. PTDT i ITE, Radom, 2004
8. H. Gunther - Diagnostowanie silników wysokoprężnych, WKiŁ 2002
9. J. Mercisz, S Mazurek - Pokładowe systemy diagnostowania pojazdów samochodowych, WKiŁ, 2004
10. Bogdan Żółtowski - Podstawy diagnostyki maszyn. Wyd. ATR Bydgoszcz 1996
11. Lesław Będkowski - Elementy diagnostyki technicznej. WAT 1991
12. Stanisław Legutko, Eksploatacja maszyn, Wydawnictwo Politechniki Poznańskiej 2007
13. Stanisław Borkowski, Jacek Selejda, Szymon Salamon, Efektywność eksploatacji maszyn i urządzeń, Częstochowa 2006
14. Bronisław Słowiński, Inżynieria eksploatacji maszyn, Politechnika Koszalińska, 2014
15. Lech Dwiliński, Podstawy eksploatacji obiektu technicznego, Oficyna Wydawnicza Politechniki Warszawskiej 2006
16. Stanisław F. Ścieszka, Marcel Żołnierz, Eksploatacja Maszyn. Cz. I i II. Wydawnictwo Politechniki Śl., Gliwice 2012
17. Stanisław Oziemski, Efektywność eksploatacji maszyn. Podstawy techniczno ekonomiczne, Radom Wydawnictwo ITE 1999
18. Polish Standards / European Standards

