

**COURSE SPECIFICATION**

Course code	full-time programme:	<b>M#2-S2-ME-EM-109</b>
	part-time programme:	
Course title in Polish	<b>Badania i eksploatacja pojazdów samochodowych</b>	
Course title in English	<b>Automotive Testing and Maintenance</b>	
Valid from (academic year)	<b>2024/2025</b>	

**GENERAL INFORMATION**

Programme of study	<b>MECHANICAL ENGINEERING</b>
Level of qualification	<b>second-cycle</b>
Type of education	<b>academic</b>
Mode of study	<b>full-time programme</b>
Specialism	<b>Machine Operation and Maintenance</b>
Department responsible	<b>Department of Automotive Engineering and Transport</b>
Course leader	<b>dr inż. Emilia Szumska</b>
Approved by	<b>dr hab. Jakub Takosoglu, prof. PŚk, Dean of the Faculty of Mechatronics and Mechanical Engineering</b>

**COURSE OVERVIEW**

Course type	<b>specialism-related</b>	
Course status	<b>compulsory</b>	
Language of instruction	<b>English</b>	
Semester of delivery	full-time programme	<b>Semester I</b>
	part-time programme	<b>Semester I</b>
Pre-requisites		
Examination required (YES/NO)	<b>YES</b>	
ECTS value	<b>3</b>	

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

**LEARNING OUTCOMES**



Category of outcome	Outcome code	Course learning outcomes	Corresponding programme outcome code
Knowledge	W01	Student possesses a profound understanding of modern automotive engineering trends, especially regarding materials, components, and powertrain systems.	MiBM2_W02 MiBM2_W07
	W02	Student has an in-depth knowledge of automotive vehicle research, encompassing its goals, methods, and measurement equipment.	MiBM2_W03 MiBM2_W08
	W03	Student has a deep understanding of the safety, environmental, and fuel economy regulations that drive vehicle design, and how these factors influence engine and powertrain engineering.	MiBM2_W09
Skills	U01	Student is able to select appropriate research methodologies for solving particular issues in automotive engineering.	MiBM2_U02 MiBM2_U09 MiBM2_U15
	U02	Student can perform laboratory and field tests on vehicles, analyze and interpret the data obtained, and draw relevant conclusions.	MiBM2_U01 MiBM2_U04 MiBM2_U10
	U03	Student can assess the impact of various factors on vehicle performance and operation parameters.	MiBM2_U01 MiBM2_U02 MiBM2_U11
Competence	K01	Student recognizes the importance of independent study in automotive research and engineering.	MiBM2_K01
	K02	Student is aware of the environmental and societal impacts of automotive technology.	MiBM2_K02

## COURSE CONTENT

Mode of instruction	Topics covered
lecture	<p>Vehicle operation issues: technical and economic aspects; the impact of operating conditions on the durability and reliability of motor vehicles. Vehicle repair and maintenance systems. Fundamentals of automotive vehicle testing: objectives, methods, and measurement equipment.</p> <p>Modern vehicle design trends, including the latest components and materials. Safety, fuel efficiency, comfort, and environmental considerations in vehicle design. Advanced control systems for braking, steering, suspension, and safety features.</p> <p>A comprehensive analysis of internal combustion engine requirements, operation, and testing. This includes a review of current exhaust emission standards such as Euro, exploration of modern engine designs tailored to environmental regulations, and a detailed examination of both type approval and in-service testing procedures.</p> <p>An inclusive analysis of alternative powertrain technologies for automotive applications, including research into their development, performance, and safety implications. The specific operational requirements and challenges associated with these systems will also be explored.</p> <p>The significance of autonomous technologies in the automotive industry. Technological aspects and practical challenges associated with the deployment and operation of autonomous vehicles and advanced driver assistance systems (ADAS).</p>



laboratory	<p>Experimental road tests of motor vehicles: Analysis of the influence of operating conditions on tire slip angles. Investigation of vehicle dynamics during braking maneuvers and the impact of various operating conditions on braking efficiency. Evaluation of vehicle motion trajectories based on selected motion parameters such as speed, acceleration, and aerodynamic drag.</p> <p>Investigation of parameters and assessment of internal combustion engine operation: Study of the influence of fuel injection timing on engine performance indicators. Determination and analysis of engine indicator diagrams. Determination of heat release characteristics. Investigation of the influence of selected functional system components on exhaust emissions. Determination of engine heat balance. Investigation of engines fueled by gaseous fuel or dual-fuel.</p> <p>Research on passive and active safety systems in vehicles: Evaluation of the effectiveness of safety systems in simulated road conditions. Testing of selected components of passive and active safety systems using high-speed cameras. Investigation and analysis of static driver comfort in motor vehicles.</p> <p>Simulation-based studies of operational parameters of vehicles with different types of powertrains.</p>
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**ASSESSMENT METHODS**

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

**ASSESSMENT TYPE AND CRITERIA**

Mode of instruction	Assessment type	Assessment criteria
lecture	non-examination assessment	Successful completion of the final exam. Achieving a minimum of 50% of the points on the test.
laboratory	non-examination assessment	To pass the laboratory course, students must receive a passing grade on all lab reports. The final grade is the average of all grades obtained.

**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.	<b>Total number of contact hours</b>	<b>51</b>										h	





4.	<b>Number of ECTS credits for contact hours</b>	<b>2,0</b>		ECTS
5.	<b>Number of independent study hours</b>	<b>24</b>		h
6.	<b>Number of ECTS credits for independent study hours</b>	<b>1,0</b>		ECTS
7.	<b>Number of practical hours</b>	<b>50</b>		h
8.	<b>Number of ECTS credits for practical hours</b>	<b>2,0</b>		ECTS
9.	<b>Total study time</b>	<b>75</b>		h
10.	<b>ECTS credits for the course</b> <i>1 ECTS credit = 25-30 hours of study time</i>	<b>3</b>		ECTS

### READING LIST

1. Uzdowski M., Abramek K.F., Garczyński K.: Eksploatacja techniczna i naprawa, WKŁ, Warszawa 2003.
2. Abramek K.F., Uzdowski M.: Pojazdy samochodowe. Podstawy obsługi i napraw. WKŁ, Warszawa 2009.
3. Bocheński C. : Badania kontrolne samochodów, WKŁ, Warszawa 2000.
4. Orzełowski S.: Naprawa i obsługa pojazdów samochodowych. WSziP, Warszawa, 2008.
5. Badania silników spalinowych, redaktor naukowy Wojciech Serdecki. Wydawnictwo Politechniki Poznańskiej, Poznań 2012.
6. Postrzednik S., Żmudka Z.: Termodynamiczne oraz ekologiczne uwarunkowania eksploatacji tłokowych silników spalinowych. Wyd. Politechnika Śląska, Gliwice 2007.
7. Sitek K., Syta S.: Badania stanowiskowe i diagnostyka. Wydawnictwo Komunikacji i Łączności, Warszawa 2011.

