SYLLABUS

Course description

Course code	Course	Silniki spalinowe	
ME/O/I/NST/C8a		Internal combustion engines	
Language of instruction	English		
Academic year	2025/2026		
field of study:	Mechanical Engineering		
field of specialisation:	All		
Educational level	first-cycle studies		
Education profile	General academic		
Mode of study	Part-time studies		
Semester(s)	6		
Affiliation with a group of classes	C. Group of courses to choose from		
Course status	Electable		
Types of classes, instruction hours, ECTS credits	Types of classes	Number of instruction hours	Number of ECTS credits
	Lecture	8[h]	5ECTS
	Classes	[h]	
	Lab	24[h]	
Linkage of the course – with the education profile	Related to the conducted scientific activity in the discipline to which the field of study is assigned		ECTS
Linkage of the course – with qualifications	It is used to acquire engineering competences by the student		5 ECTS
Linkage of the course – with science discipline	Mechanical engineering		5 ECTS
Form of teaching	Traditional – classes organized at the University /classes conducted using distance learning methods and techniques		
Prerequisites	not valid		
Department	Faculty of Mechanical Engineering		
Coordinator	PhD Tomasz Skrzek		
The website of the basic organizational unit	http://wm.uniwersytetradom.pl		
E-mail address, phone number of the coordinator	t.skrzek@urad.edu.pl		

LEARNING OUTCOMES, CURRICULUM CONTENT, TEACHING CLASSES, VERIFICATION OF LEARNING OUTCOMES

Learning Objective:	The goal of the course is to familiarize students with the detailed construction of piston internal combustion engines, including the components and their interaction. The course also aims to introduce various design solutions used in different

	types of engines and teach students how to measure key engine parameters and analyze these measurements in the context of engine performance and diagnostics.
Curriculum Content:	**Lecture**: presentation of the course syllabus, assessment criteria, literature, and health and safety regulations. Classification of internal combustion engines. Detailed construction of cylinder blocks and cylinder heads in different types of engines. Detailed construction of crankshaft-piston systems; engine balancing. Detailed construction of valve timing systems; variable valve timing systems. Detailed construction of fuel supply systems for spark-ignition (SI) engines; direct fuel injection systems. Detailed construction of fuel supply systems for compression-ignition (CI) engines; common rail system. Emission reduction systems in SI and CI engines. Development prospects for internal combustion engines. **Laboratory exercises**: Introduction to the procedure for testing internal combustion engines on a dynamometer; introduction to the methodology of internal combustion engine testing and methods for measuring basic quantities describing engine operation. Correction of dynamometer measurement results due to atmospheric conditions. Determination of the air excess ratio in the fuel-air mixture through direct measurement of air and fuel consumption. Measurement preparation for the external speed characteristic of an internal combustion engine. Graphical presentation of measurement and calculation results for speed characteristics. Preparation of load characteristics for a CI engine. Indicator diagram of a piston internal combustion engine. Analysis of the effect of changes in control parameters on the indicator diagrams. Diesel injection parameters and the combustion process in a common rail fuel system. Exhaust gas analysis for an SI engine. Exhaust gas analysis for a CI engine. Evaluation of the effectiveness of a three-way catalytic reactor. Methodology for testing engines on a chassis dynamometer. Chassis dynamometer testing, engine power measurement with road condition simulation, and result analysis.
Didactic (educational) methods:	**Lecture** with the use of multimedia techniques, including elements of discussion on various design solutions presented by the lecturer using slides and films. **Laboratory exercises** utilizing research stations and modern measuring equipment involve practical familiarization with different design solutions and performing measurements to prepare various engine characteristics.
Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade:	The condition for passing the course is to achieve all the required learning out comes specified for the course. In the case of the lecture, the grade is based on the result of a test. Laboratories are graded based on the average scores from the entry tasks and the acceptance of subsequent reports on the exercises performed by the instructor.

Learning outcomes for the course in relation to the field of study learning outcomes and the type of classes				Methods of verifying learning outcomes	
Learning outcome number	Description of the learning outcomes for the course (PEU) A student who has passed the course (**W**) knows and understands / (**U**) can / (**K**) is ready to:	Field of study learning outcome (KEU)	Types of classes	Form of verification (credits)	Methods of testing and assessment
W1	The student knows the detailed construction of a piston internal combustion engine, recognizes and describes various design solutions, and can identify different types of engine	K_WG09	lecture	written exam	Theoretical test

	characteristics.				
U1	The student can present the development path of engine systems and identify the interdependencies between the key parameters describing engine performance.	K_UW07	laboratory work	written work and laboratory report	Control work
K1	The student is aware of the ongoing changes in the construction of internal combustion engines and the need to continually update their knowledge, as well as the risks associated with the operation of internal combustion engines.	K_KR06	laboratory work	written work and laboratory report	Control work

Literature and teaching aids
1. G. Pawlak, P. Płochocki, P. Simiński, T. Skrzek. Emergency fueling unit for means of heavy transport affected by electromagnetic pulse. Scientific Reports 2022 2. G. Pawlak, P. Płochocki, P. Simiński, T. Skrzek "The experimental verification of the multi-fuel IC engine concept with the use of jet propellant-8 (JP-8) and its blends with pure rapeseed oil" International Journal of Energy and Environmental Engineering 2021 3. Luft S.: Podstawy Budowy silników. WKŁ. Warszawa 2003 4. https://ftp.idu.ac.id/wp-content/uploads/ebook/tdg/ADVANCED%20ENGINE%20TECHNOLOGY%20AND%20PERFORMANCE/Introduction_to_Internal_Combustion_Engines.pdf 5. Colin R. Ferguson Allan T. Kirkpatrick. Internal Combustion Engines Applied Thermosciences. Third Edition. Mechanical Engineering Department Colorado State University 2016. Available online: http://repo.darmajaya.ac.id/4348/1/Internal%20Combustion%20Engines_%20Applied%20Thermosciences%20%28%20PDFDrive%20%29.pdf 6. Wajand J.A., Wajand J.A. Tłokowe silniki spalinowe, WNT W-wa 1997 7. Heywood John. Internal Combustion Engine Fundamentals. Mcgraw-Hill Education Ltd., Mcgraw-Hill Education Ltd. 2018 8. Praca zbiorowa pod redakcją A. Kowalewicza, Laboratorium silników spalinowych, Wyd. WSI Radom 1996 9. https://www.faa.gov/sites/faa.gov/files/12_amtp_ch10_0.pdf 10. Seredecki W. Badania silników spalinowych. Wydawnictwo Politechniki Poznańskiej 2017

Student workload required to achieve the assumed learning outcomes – the balance of ECTS credits		
Attendance, participation	Student workload [h].	
	Student's self-study hours Classes without a teacher (ZBN)	Classes
Participation in lectures/classes/lab	X	32[h]
Preparation for lectures/classes/lab	93 [h]	X
Total student workload	93[h]/ 3.7ECTS	32[h]/ 1,3ECTS
ECTS points per subject	5 ECTS	

Additional information, comments
In the case of students with special needs, including disabilities, and chronic illnesses, the methods and forms of verification of learning outcomes specified above (in the syllabus) are adapted to the individual needs of these students, as appropriate. Detailed rules and forms of support for students with special needs, including those with disabilities and chronically ill, during classes, credits, and exams are specified in: University Regulations (Regulamin Studiów Uniwersytetu Technologiczno-Humanistycznego w Radomiu), Study Regulations (Zasady Studiowania), and Procedure for Ensuring Accessibility of the Educational Process to Students with Special Needs, Including Those with Disabilities and Chronically ill (Procedura dotycząca zapewnienia dostępności procesu kształcenia studentom ze szczególnymi potrzebami, w tym: z niepełnosprawnością, przewlekle chorych).