

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Internal Combustion Engines Testing		Code 1010621161010620308
Field of study Mechanical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 3 / 6
Elective path/specialty Internal Combustion Engines	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 2 Classes: - Laboratory: 1 Project/seminars: -		No. of credits 3
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences		ECTS distribution (number and %) 1 100%
Responsible for subject / lecturer: Wojciech Serdecki, DSc, PhD, MechE, Prof. of PUT email: wojciech.serdecki@put.poznan.pl tel. +48 61 665 2243 Faculty of Machines and Transport 3 Piotrowo street, 60-965 Poznan, Poland		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Knows the basic laws of physics, in particular in the field of mechanics, electrical engineering and electronics. Knows the rules of operation of heat engines.
2	Skills	Is able to use basic measuring equipment.
3	Social competencies	Is prepared to work in a team, including the adoption within the research group to different roles.
Assumptions and objectives of the course: To provide basic information about the research of thermal machines, in particular internal combustion engines and their functional systems.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Knows the basic physical phenomena used in the methods of measuring the size that characterizes the internal combustion engines - [[K1A_W07 K1A_W08]]		
2. Knows the construction and the operation principle components of the measurement path - [[K1A_W14]]		
3. Has a broad knowledge about the construction and operation principles of internal combustion engines, in particular constructional, operational and environmental characteristics. - [[K1A_W24]]		
Skills:		
1. Is able to design a simple measuring circuit and perform measurements of quantities characterizing the combustion engine - [K1A_U09]]		
2. Is able to assess the suitability of the selected methods and measurement tools to measure the selected values characterizing the combustion engine - [K1A_U16]]		
3. Is able to plan and conduct research on a combustion engine and to interpret the results and draw conclusions - [[K1A_U17]]		
Social competencies:		
1. Understands the need of lifelong learning. - [[K1A_K01]]		
2. Is ready to comply with the principles of team work during the execution of the research task - [[K1A_K04]]		
Assessment methods of study outcomes		

Periodic control tests. Reports of the completed study. The written examination		
Course description		
<p>Fundamentals of metrology. Mathematical treatment of measuring result: measuring errors, engineering estimations and approximations, representation of technical information. Measurement techniques: engine speed and torque, engine air and fuel consumption. Estimation of typical engine operating characteristics. High-frequency pressure measurement: principles of measuring-set configuration, types of pressure diagram, pressure diagrams marking and in-coordinate location, indicator diagram measuring errors. Measurement of: fuel injection rate, fuel spray behaviour, fuel atomization. Engine pollutants measuring methods: NDIR, FID, CLD, MPD and chromatography analysis, standardized test cycles. Elements of non-conventional experimental technique (high-speed photography, VIDEO methods, emissive-absorption and laser techniques, etc.).</p>		
Basic bibliography:		
<ol style="list-style-type: none"> 1. Gajek A., Juda Z., Czujniki. WKŁ, Warszawa 2008. 2. Serdecki W. (red) ? Badania silników spalinowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2012. 3. Serdecki W. (red) ? Badania układów silników spalinowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2000 4. Termodynamika. Laboratorium I miernictwa cieplnego, część 1. Praca zbiorowa, Gdańsk, Wydawnictwo Politechniki Gdańskiej 1993. 5. Termodynamika. Laboratorium II. Badania maszyn i urządzeń. Praca zbiorowa, Gdańsk, Wydawnictwo Politechniki Gdańskiej 1991. 		
Additional bibliography:		
<ol style="list-style-type: none"> 1. Chwaleba A., Poniński M., Siedlecki A., Metrologia elektryczna, Warszawa, WNT 1994 2. Merksiz J. ? Wpływ motoryzacji na skażenie środowiska naturalnego. Wydawnictwo Politechniki Poznańskiej, Poznań 1993. 		
Result of average student's workload		
Activity	Time (working hours)	
1. Preparation for lecture	1	
2. Participation in lecture	30	
3. Learning of lectures content	2	
4. Office hours - lecture	1	
5. Preparation for the exam	10	
6. Participation in the exam	2	
7. Preparation for laboratory excersises	7	
8. Participation in laboratory excersises	15	
9. Learning of laboratory content	10	
10. Office hours	1	
11. Preparation for the final test	7	
12. Participation in the final test	1	
Student's workload		
Source of workload	hours	ECTS
Total workload	87	3
Contact hours	50	2
Practical activities	41	1