

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Internal Combustion Engines Testing</b>		Code <b>1010621261010620308</b>
Field of study <b>Mechanical Engineering</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>3 / 6</b>
Elective path/specialty <b>Internal Combustion Engines</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>First-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>2</b> Classes: <b>-</b> Laboratory: <b>1</b> Project/seminars: <b>-</b>		No. of credits <b>3</b>
Status of the course in the study program (Basic, major, other) <b>(brak)</b>		(university-wide, from another field) <b>(brak)</b>
Education areas and fields of science and art <b>technical sciences</b>		ECTS distribution (number and %) <b>3 100%</b>
<b>Responsible for subject / lecturer:</b> DSc., DEng. Wojciech Serdecki email: wojciech.serdecki@put.poznan.pl tel. +48 61 665 2243 Faculty of Machines and Transport 3 Piotrowo street, 60-965 Poznan, Poland		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	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	<b>Skills</b>	Is able to use basic measuring equipment.
3	<b>Social competencies</b>	Is prepared to work in a team, including the adoption within the research group to different roles.
<b>Assumptions and objectives of the course:</b> To provide basic information about the research of thermal machines, in particular internal combustion engines and their functional systems.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
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]]		
<b>Skills:</b>		
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]]		
<b>Social competencies:</b>		
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]]		
<b>Assessment methods of study outcomes</b>		

Periodic control tests. Reports of the completed study. The written examination		
<b>Course description</b>		
<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>		
<b>Basic bibliography:</b>		
<ol style="list-style-type: none"> <li>Gajek A., Juda Z., Czujniki. WKŁ, Warszawa 2008.</li> <li>Serdecki W. (red) ? Badania silników spalinowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2012.</li> <li>Serdecki W. (red) ? Badania układów silników spalinowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2000</li> <li>Termodynamika. Laboratorium I miernictwa cieplnego, część 1. Praca zbiorowa, Gdańsk, Wydawnictwo Politechniki Gdańskiej 1993.</li> <li>Termodynamika. Laboratorium II. Badania maszyn i urządzeń. Praca zbiorowa, Gdańsk, Wydawnictwo Politechniki Gdańskiej 1991.</li> </ol>		
<b>Additional bibliography:</b>		
<ol style="list-style-type: none"> <li>Chwaleba A., Poniński M., Siedlecki A., Metrologia elektryczna, Warszawa, WNT 1994</li> <li>Merkisz J. Wpływ motoryzacji na skażenie środowiska naturalnego. Wydawnictwo Politechniki Poznańskiej, Poznań 1993.</li> </ol>		
<b>Result of average student's workload</b>		
<b>Activity</b>	<b>Time (working hours)</b>	
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	
<b>Student's workload</b>		
<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	87	3
Contact hours	50	2
Practical activities	37	1