

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Research on Vehicle Powertrains</b>		Code <b>1010621361010622433</b>
Field of study <b>Transport</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>3 / 6</b>
Elective path/specialty <b>Ecology of Transport</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>-</b> Project/seminars: <b>-</b>		No. of credits <b>1</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> <b>Technical sciences</b>		ECTS distribution (number and %) <b>1 100%</b> <b>1 100%</b>
<b>Responsible for subject / lecturer:</b>  prof. dr hab. inż. Jacek Pielecha, prof. nadzw. email: jacek.pielecha@put.poznan.pl tel. 61 665 2118 Faculty of Transport Engineering ul. Piotrowo 3 60-965 Poznań		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	student has a basic knowledge about the construction and operation principle of vehicles propulsion units
2	<b>Skills</b>	student is able to read technical drawings and diagrams related to vehicles propulsion units
3	<b>Social competencies</b>	Understand the relationship between the construction, design and implementation of vehicle propulsion units
<b>Assumptions and objectives of the course:</b> Provide the basic knowledge about vehicles propulsion units research. Acquainted with the measuring devices used during tests of propulsion units and their functional systems		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
1. Has a basic knowledge concerning to the lifecycle of vehicles propulsion units - [K1A_W14]		
2. Has a basic knowledge about methods, techniques, tools and materials used for vehicles propulsion units testing - [K1A_W16]		
3. Has a knowledge about typical engineering technologies in the field of vehicles propulsion units testing - [K1A_W21]		
<b>Skills:</b>		
1. Is able to use the analytical and experimental methods for formulating and solving problems associated with vehicles engines testing - [K1A_U07]		
2. Is able to identify the research methods, interpret the results and draw conclusions in work related to engine testing - [K1A_U08]		
3. Is able to analyze and evaluate the functional properties of the existing test methods and measuring devices used in the environmental pollution measurements - [K1A_U10]		
<b>Social competencies:</b>		
1. Is aware of and understands the validity of the non-technical aspects and effects of engineering activities, including its impact on the environment, and has the responsibility for decisions - [K1A_K02]		
2. Is able to creative and enterprising thinking and acting - [K1A_K07]		
3. Is able to appropriately define priorities for implementation specified tasks - [K1A_K05]		

<b>Assessment methods of study outcomes</b>		
Discussion with use of visual materials related to research in the field of powertrain for different vehicles. The written examination		
<b>Course description</b>		
<p>Measurement of following parameters: engine rotational speed, engine torque, engine power output, air and fuel consumption. Also measurement of combustion parameters, like: in-cylinder pressure (with rules for the selection of the measuring channel elements, types of indicator diagrams and their characteristic points, errors in indicating process). Types and construction of the propulsion units. Propulsion units of road, rail and sea. Components of the drive units. Selected aspects of metrology. Construction and components of the measurement system.</p> <p>Issues connected with control tests in European Union and Unated States of America. Control tests of vehicles in case of gaseous compounds exhaust emission. Road tests of cars and trucks equipped with SI and CI engines. Ability to assess fuel consumption using a two-dimensional probability density histograms. Rating emissivity of different propulsion systems including hybrid and start-stop systems Vehicle emission measurements during real operation, using a mobile analyzer (measurement of gaseous components and the particulates? Qualitative and quantitative assessment. Carrying out exhaust emission research from engines fueled with different types of fuels (gasoline, diesel, gas) on engine test beds. Determination of exhaust emission histograms defining operation conditions of vehicles and their engines. Determination of emissivity vehicle under different conditions of their work. Determination of brake specific emission from vehicles in different operating conditions. Determination of brake specific emission from vehicles in actual and future homologation tests. Evaluation of the exhaust emission from vehicles with different mileage. Methodology for vehicle exhaust emission assesement in real traffic conditions using data from the vehicle's diagnostic system</p>		
<b>Basic bibliography:</b>		
1. Serdecki W. (red).: Badania silników spalinowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2017 2. ISO: Reciprocating internal combustion engines ? Exhaust emission measurement ? Part 1: Test-bed measurement of gaseous and particulate emission. Draft International Standard ISO/DIS 8178-1.2,1995		
<b>Additional bibliography:</b>		
1. Merkisz J., Pielecha I., Alternatywne napędy pojazdów. Wydawnictwo Politechniki Poznańskiej, Poznań 2006		
<b>Result of average student's workload</b>		
Activity	Time (working hours)	
1. Participation in the lecture	30	
2. Consulting	2	
3. Exam preparation	2	
4. Exam	1	
<b>Student's workload</b>		
Source of workload	hours	ECTS
Total workload	35	1
Contact hours	30	1
Practical activities	5	0