

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Internal Combustion Engines		Code 1010621351010600244
Field of study Transport	Profile of study (general academic, practical) (brak)	Year /Semester 3 / 5
Elective path/specialty Railway Transport	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 4
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 Technical sciences		ECTS distribution (number and %) 4 100% 4 100%
Responsible for subject / lecturer: prof. dr hab. inż. Jerzy Merkisz email: jerzy.merkisz@put.poznan.pl tel. 61-665-2207 Faculty of Transport Engineering ul. Piotrowo 3 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Students have basic knowledge of machine design and are familiar with mechanics and dynamics of solids
2	Skills	Students can apply their knowledge to understand traction engines
3	Social competencies	Students are aware of their career development
Assumptions and objectives of the course: Traction engines design and the function of their main working units		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Students have theoretical background in engines work and design (cycles and basic thermodynamic laws). - [K1A_W13]		
2. Students know how to assess the engine work (parameters, characteristics). - [K1A_W14]		
3. Students know the structure and function of all engine systems and units. - [K1A_W14, K1A_W18]		
4. Students are familiar with the dynamometer and basic measuring methods applied in engine characteristics. - [K1A_W16]		
Skills:		
1. Students are able to explain how particular engine systems work - [K1A_U01]		
2. Students can assess and compare engines - [K1A_U04]		
3. Students can expound traction engines? design and operation - [K1A_U02]		
4. Students are capable of carrying out engine tests including measurement and determining engine characteristics - [K1A_U07]		
5. Students can assess the engine quality and compare it with other sources of energy - [K1A_U10]		
Social competencies:		
1. Students are aware of engine?s influences on the environment - [K1A_K02]		
2. Students can analyze and evaluate the suitability of an engine for particular power train - [K1A_K06]		
3. Students are able to justify recommended specifications and conditions of use - [K1A_K03]		

Assessment methods of study outcomes		
Written examination, assessment for laboratory tasks		
Course description		
<p>Key words: pressure, work, power (theoretical, indicated, effective and friction); engine efficacy and fuel consumption</p> <p>Cycles: theoretical, in real conditions, values of pressure as well as temperature at specific cycle points</p> <p>Characteristics: full power, load, and general</p> <p>The structure and operation of: cam- and crankshaft, cooling system, charging system, EGR, all parts of fuel system, pump-injectors, CR control system</p> <p>Emission: directives for reducing emission, emission measurements, working conditions during measurement</p>		
Basic bibliography:		
<p>1. Serdecki W. (red.): Badania silników spalinowych ? Laboratorium. WPP, Poznań, 2012 lub późniejsze wydania.</p> <p>2. Wajand Jan A., Wajand Jan T.: Tłokowe silniki spalinowe średnio- i szybkoobrotowe. WNT, Warszawa, 2005.</p> <p>3. Niewiarowski K.: Tłokowe silniki spalinowe. WKiŁ, Warszawa, 1983.</p>		
Additional bibliography:		
1. Materiały producentów silników, konferencyjne i branżowe: Combustion Engines, MTZ, SAE .		
Result of average student's workload		
Activity	Time (working hours)	
1. Lectures	30	
2. Laboratories	15	
3. Revision, reporting	8	
4. Preparation for lectures and laboratory classes	8	
5. Consultations	6	
6. Studying for exam, examination	10	
Student's workload		
Source of workload	hours	ECTS
Total workload	77	4
Contact hours	48	3
Practical activities	29	1