



Subject card

Subject name and code	Fundamentals of Engines and IC Drives, PG_00040097						
Field of study	Mechanical Engineering, Mechanical Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject				2022/2023	
Education level	first-cycle studies	Subject group				Optional subject group Subject group related to scientific research in the field of study	
Mode of study	Part-time studies	Mode of delivery				at the university	
Year of study	3	Language of instruction				Polish	
Semester of study	5	ECTS credits				5.0	
Learning profile	general academic profile	Assessment form				exam	
Conducting unit	Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor						
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	22.0	0.0	15.0	0.0	0.0	37
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	37		11.0		77.0	125
Subject objectives	The aim of the course is to teach students the basics of internal combustion engines construction and functioning, problems of environmental impact of engines and construction of vehicles, work machines and other equipment propulsion systems wit IC engines.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_W11] possesses knowledge on design, technology and manufacturing of machine parts, metrology, and quality control; knows and understands methods of measuring and calculating basic values describing the operation of mechanical systems, knows basic calculating methods applied to analyse the results of experiments		Student differentiates IC engine design solutions, indicates the right solutions in particular case, presents calculation models and evaluates their usability, classifies propulsion systems with IC engines, describes design of vehicles hybrid drives.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects	
	[K6_W08] possesses basic knowledge including the methodology of designing machine parts, mechanical devices, selection of construction materials, manufacturing and operation, with the lifetime cycle		Student interprets construction of internal combustion engines, recognizes engine components, specifies methods of thermal and mechanical resistance calculation, recognizes exploitation damages, describes construction of propulsion systems with IC engines, interprets construction and functioning of vehicles hybrid drives.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects	
	[K6_U03] is able to identify, formulate and develop the documentation of a simple design or technological task, including the description of the results of this task in Polish or in a foreign language and to present the results using computer software or other aiding tools		Student designs internal combustion engine, projects engine components, makes thermal and mechanical resistance calculation, makes drawings of engine parts, proposes design solutions of propulsion systems with IC engines, chooses propulsion system components from catalogs, evaluates usefulness of proposed solutions.			[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools	

Subject contents	LECTURE:General info: the principle of operation of internal combustion engines, hydrocarbon and alternative fuels. Working parameters of IC engines, heat balance. Performance characteristics and field of operation of IC engines. Fuel supply in SI and CI engines. Basics of propulsion systems with IC engines: propulsion systems of vehicles. working machines, compressors and electric generators. Effects of IC engines on environment, toxic components of exhaust gases, impact of construction and exploitation factors on harmful emissions. LABORATORY EXERCISES: Disassembly and assembly of engine parts, identification of parts and measurement techniques. Measurements of basic parameters of IC engines. Drive system of a volumetric compressor. Investigation of the fuel supply system of CI engines. Diagnostics of fuel supply and ignition systems of SI engines. Diagnostic measurements of the content of toxic components in exhaust gases.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Reports of the laboratory experiments	100.0%	10.0%
	Final exam	60.0%	90.0%
Recommended reading	Basic literature	1. Heywood J.B.: Internal combustion engines fundamentals. McGraw-Hill Book Company. New York 1998. 2. Taylor C.F.: The Internal Combustion Engines in Theory and Practice. The M.I.T. Press, Cambridge, Massachusetts 1980.	
	Supplementary literature	1. Fenton J.: Gasoline engine analysis. Mechanical Engineering Publications Ltd., London 1986.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>1. Give the definition of engine forced induction, name the methods of forced induction and their advantages and weaknesses. Draw a scheme of turbocharger connected to an engine.</p> <p>2. Explain the knock phenomenon during combustion in a spark ignition engine. Name construction and exploitation factors which have influence on the formation and intensity of this phenomenon.</p> <p>3. Calculate brake torque M_o of a four stroke, four cylinder IC engine with the cylinder diameter $D = \dots$ mm and stroke $S = \dots$ mm. Indicated mean effective pressure $p_i = \dots$ kPa and mechanical efficiency $\eta = \dots\%$.</p>		
Work placement	Not applicable		