



Subject card

Subject name and code	Internal Combustion Piston Engines, PG_00045055						
Field of study	Ocean Engineering, Ocean Engineering						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2021/2022		
Education level	first-cycle studies		Subject group				
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Faculty of Ocean Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Jacek Rudnicki				
	Teachers		dr inż. Jacek Rudnicki				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	15.0	0.0	0.0	60
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie: Silniki spalinowe tłokowe, W, C, L, sem.04, letni 21/22 (O:098110) - Moodle ID: 16434 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=16434						
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	60		10.0		30.0	100
Subject objectives	To teach the scope of applications, general construction, principles of work and selected issues concerning the operation of industrial piston engines used in water transport.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U05] can formulate a simple engineering task and its specification within the range of design, construction and operation of ocean technology objects and systems	Student explains how use the waste heat of engine. On the basic changes in engine parameters, describes interaction between engine and propeller. Demonstrates heat balance of engine, and determines values of specific parameters of theoretical cycles, as well as values of theoretical work and power, efficiency and fuel consumption per unit	[SU1] Assessment of task fulfilment
	[K6_U04] has self-education skills in order to improve professional qualifications, is ready to work in industrial environment, adheres to HSE rules and regulations	Student explains the principles of operation of supercharged and unsupercharged two- and four-stroke engines and their construction. Classifies and describes theoretical and real cycles in engines, parameters of engine operation and makes measurement of these parameters. Describes engine speed, load, universal and control characteristics. Explains how to use the waste heat of engine. On the basis of changes in engine parameters, describes interaction between engine and propeller. Demonstrates heat balance of engine and determines values of specific parameters of theoretical cycles, as well as value of theoretical work and power, efficiency and fuel consumption per unit	[SU1] Assessment of task fulfilment
	[K6_W05] has an organized knowledge on design, construction and operation of ocean technology objects and systems	Student explains the principles of operation of supercharged and unsupercharged two- and four-stroke engines. Classifies and describes theoretical and real cycles in engines, parameters of engine operation and makes measurement of these parameters. Describes engine speed, load, universal and control characteristics	[SW1] Assessment of factual knowledge
	[K6_W06] has an organized knowledge on engineering methods and design tools allowing the conducting of projects within the construction and operation of ocean technology objects and systems	Student knows the methods of designing marine propulsion systems with IC engines	[SW1] Assessment of factual knowledge
Subject contents	<p>Lecture</p> <p>Piston engines general construction and rule of working. Piston engines classification use in transport. Thermodynamic bases of piston engines work. Engines work indexes usable, quality, comparative. Basic functional systems of piston engines. Cooperation of piston engine and power receiver. Engines trends.</p> <p>Laboratory</p> <p>Preparation of engine to start-up, start-up and control during work. Influence of environment on engines work indexes. External, controlling and loading characteristics. Regulation characteristics. Universal characteristics. Influence of chosen damages on engines work indexes. Diagnosis of typical inefficiencies basing on engines work parameters.</p>		
Prerequisites and co-requisites	Subject knowledge of Thermodynamics (OIS.3017.1, OIS.4058.1) and Physics (OIS.1009.1) Knowledge of making measurements of basic physical quantities		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	51.0%	80.0%
	Practical exercise	100.0%	20.0%

Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Heywood J.B.: Internal combustion Engine Fundamentals. McGraw Hill Book, USA 1998. 2. Kijewski J.: Silniki spalinowe. WSiP, Warszawa 2002. 3. Lilly L.R.C.: Diesel Engine Reference Book, Butterworth, London 1986. 4. Piotrowski I, Witkowski K.: Okrętowe silniki spalinowe. Wyd. Trademar, Gdynia 2003. 5. Wajand J.: Tłokowe silniki spalinowe średnio- i szybkoobrotowe. WNT, Warszawa 2000. 6. Wajand J. A.: Silniki o zapłonie samoczynnym. WNT, Warszawa 1988. 7. Zając P.: Silniki pojazdów samochodowych, WKŁ, Warszawa 2009.
	Supplementary literature	<ol style="list-style-type: none"> 1. Bernhardt M., Dobrzyński S., Loth E.: Silniki samochodowe. WKŁ 1988. 2. Merkisz J.: Ekologiczne problemy silników spalinowych. Wyd. Politechniki Poznańskiej, Poznań 1999.
	eResources addresses	Silniki spalinowe tłokowe, W, C, L, sem.04, letni 21/22 (O:098110) - Moodle ID: 16434 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=16434
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"> • Present and describe the diagram of the working cycle of the naturally aspirated 4 - s engine in the p - coordinate system. • Present and describe the diagram of the working cycle of the motor 2 - p in the coordinate system p - V. • Present the combustion process in a compression-ignition engine on the graph in the p - a and T - coordinate systems (mark phases, describe characteristic points, etc.). Describe the successive combustion phases in general. • Explain the phenomenon of generating torque on the crankshaft of a piston engine (source forces, their nature, value, distribution, etc.). • Explain the concept of general efficiency of a reciprocating engine (sources of all losses during the transformation of chemical energy of fuel into mechanical energy, possibilities of their reduction, etc.). • Give the basic relationships between the main indicators of engine work (power, rotational speed, torque, specific fuel consumption, hourly fuel consumption, etc.) 	
Work placement	Not applicable	