GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Ship Power Plants I, PG_00060561		
Field of study	Naval Architecture and Offshore Structures		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	8.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Jacek Rudnicki	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	45.0	30.0	0.0	15.0	0.0	90

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	90	9.0	101.0	200

Subject objectives

Teach the principles of selecting and evaluating the main components of internal combustion-mechanical, ship propulsion systems Propulsion systems and methods of analyzing cooperation their elements. Introducing the typical solutions of marine propulsion systems and development trends in this field.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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 explains and analyzes all power and efficiency relationships in power plant energy systems. Defines indicators for evaluating the power system of ships.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[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	Explains, based on relevant diagrams, the principles of engine and propeller cooperation in different floating conditions. Constructs a list of similar vessels. Calculates and draws characteristics of propulsion systems based on approximate formulas.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
[K6_W05] has an organized knowledge on design, construction and operation of ocean technology objects and systems	Student classifies and defines the scope of application of different types of ship power plants. Lists and describes the interdependencies between the distinguished components of the propulsion system. Presents the characteristics and principles of selection of ship propulsors. Presents types, characteristics, principles of selection of main propulsion engines and defines their evaluation indicators. Explains the principles of selection of the ship's propulsion system.	[SW1] Assessment of factual knowledge

Subject contents	Lecture: Classification and scope of application of various types of ship power plants, basic concepts and definitions. Principles of layout (spatial location) of machinery spaces on a ship. The scope of application of various types of power plants on sea transport ships. Schema of power and efficiency in energy systems of the power plant, comprehensive assessment indicators. Basic elements of the power transmission line from main engine to propeller, their general characteristics, typical design solutions and selection rules. Marine propellers range of applications. Characteristics and preliminary selection of the propeller. Main propulsion engines - types and comparative analysis of the scope of their applications. Classification, general construction and principle of operation of self-ignition engines - specificity of marine main propulsion engines. Real cycles of self-ignition engines. Usage characteristics - selected design and energy indicators of marine piston engines. Engine layout and load diagrams. Selection of a marine main propulsion engine. Ecological aspects of the use of marine power plants. Exercises Estimation of supply power, power plant power and efficiency of main and utilization boilers using statistical data and regression methods use the list of seagoing vessels.Determine the values of the basic quantities that characterize the drive system on the basis of the diagram of power and efficiency in this system. Determination of the value of the overall energy efficiency of the power plant in its different variants with the consideration of waste heat utilization and the use of shaft generators. Use of approximate formulas to determine fuel consumption and ship float range. Basic engine operation indicators. Determination of engine characteristics on the basis of operational measurements. Analysis of the real cycle of a compression-ignition engine on the basis of an indicator diagram. Heat balance of a slow-speed engine in the aspect of selection of heat exchangers and pumps conditioning its correct functioning. Project Conceptual design of a combustion-mechanical, intermediate, propulsion system of a cargo ship according to individualized input data and design assumptions, including, among other things: determination of the structure of the system and estimation of the value of the main performance indicators on the basis of a list of similar ships developed independently and statistical methods, calculations and selection of essential components (engines, gears, couplings, shafts) taking into account their supply in the market.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquiums	51.0%	80.0%
Project	100.0%	20.0%

Recommended reading	Basic literature	1. Balcerski A.: Siłownie okrętowe. Skrypt Politechniki Gdańskiej 1990. 2. Cudny K.: Linie wałów okrętowych. Wyd. Morskie, Gdańsk 1990. 3. Basic Principles of Ship Propulsion. MAN Diesel & Turbo, www.man-es.com/marine, Copenhagen, 4. Górski Z., Giernalczyk M.: Siłownie okrętowe. Akademia Morska w Gdyni, 2014. 5. Michalski R.: Siłownie okrętowe. Obliczenia wstępne oraz ogólne 6. zasady doboru mechanizmów i urządzeń pomocniczych instalacji 7. siłowni okrętowych. Skrypt Politechniki Szczecińskiej, Szczecin 1987. 8. Urbański P.: Podstawy napędu statku. Fundacja rozwoju AM Gdynia 2005. 9. Wojnowski W.: Okrętowe siłownie spalinowe. Skrypt AMW 2002. 10. Woud H.K., Stapersma D.: Design of propulsion and electric power generation systems IMAREST London 2002.
	Supplementary literature	1. Urbański P.: Gospodarka energetyczna na statkach. Wyd. Morskie, Gdańsk 1978 2. Wyd. zb.: Poradnik okrętowca. Wyd. Morskie, Gdynia 1960. 3. Przepisy klasyfikacji i budowy statków morskich.
	eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. Ship power plant efficiency. 2. Open water propeller characterization. 3. Propulsion and propeller efficiency hull efficiency, relative rotative efficiency, propeller efficiency - open water, propeller efficiency behind hull, propulsive efficiency, shaft efficiency, total efficiency. 4. Propeller thrust T, torque Q and power N reacting on main engine 5. Engine Layout and Load Diagrams - power functions and logarithmic scales, propulsion and engine running points. 6. Electricity generation on the ship. 7. Waste heat utilization - typical examples.
Work placement	Not applicable