GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Ship Electric and Hybrid Propulsion Systems, PG_00070362		
Field of study	Naval Architecture and Offshore Structures		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Specialty 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	1	Language of instruction	English
Semester of study	2	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Division of Marine Auxiliary Machinery -> Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Magdalena Pospieszyńska	
	Teachers	dr inż. Magdalena Pospieszyńska dr inż. Jacek Nakielski prof. dr hab. inż. Wojciech Litwin mgr inż. Jacek Frost	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	45.0	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	5.0	30.0	125

Subject objectives	To familiarize the student with issues concerning propulsion systems—particularly hybrid and electric ones—currently used for transport in the shipbuilding industry.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U01] applies acquired analytical, simulation, and experimental methods, as well as mathematical models for analysis and evaluation of shipborne and offshore systems and processes	Ability to perform the preliminary selection of components for hybrid and electric propulsion systems.	[SU3] Assessment of ability to use knowledge gained from the subject
[K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Naval Architecture and Ocean Engineering, the construction and principles of operation of marine systems, processes and their components, as well as methods and means of their design and operation	Knowledge of current trends regarding the design and selection of hybrid propulsion systems.	[SW1] Assessment of factual knowledge
[K7_U13] evaluates the feasibility and potential for utilizing new technical and technological achievements in accomplishing tasks characteristic for the field of Naval Architecture and Offshore Structures	Knowledge of the latest electric and hybrid ship propulsions.	[SU5] Assessment of ability to present the results of task
[K7_W04] demonstrates knowledge encompassing selected issues in the field of advanced knowledge, particularly in the scope of methods, techniques, tools, and algorithms specific to Naval Architecture and Ocean Engineering	Ability to identify specific propulsion systems and knowledge of the fundamentals of their design.	[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation

Subject contents

Course content – lecture

1. History of hybrid propulsion systems across various industries.
2. National and international standards and regulations.
3. Basic types of propulsion systems and engines.
4. Energy conversion systems.
5. Hybrid propulsion systems and their control systems.
6. Electric ships: types of electrical power supply for hybrid propulsion systems.
7. Fundamentals of energy consumption optimization for hybrid-powered vessels.

Course content – laboratory

Practical classes related to electric drive systems.

Course content – project

The student is required to design a hybrid/electric vessel, taking into account energy requirements and all system components.

Prerequisites and co-requisites

Knowledge of the fundamentals of electrical engineering and electronics.
Knowledge of the fundamentals of hydromechanics and general mechanics.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture – Exam	60.0%	40.0%
Laboratory – attendance + reports	60.0%	30.0%
Project – designed unit – completed project for the end of the semester	60.0%	30.0%

Recommended reading

Basic literature	Design and control of hybrid power and propulsion systems for smart ships: A review of developments. R.D. Geertsma, R.R. Negenborn, K. Visser, J.J. Hopman. Applied Energy, 2017.
Supplementary literature	Electric and hybrid vehicles. Tom Dentom. Taylor&Francis Ltd.

	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Calculation of energy demand for a hybrid-drive unit. 2. Types of hybrid drive systems. 3. Types of electric drive systems, including descriptions of their components.	
Practical activites within the subject	Not applicable	

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