GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electromobility I , PG_00058349		
Field of study	Hydrogen Technologies and Electromobility		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study 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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Electrical Engineering of Transport -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Leszek Jarzębowicz	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	15.0	0.0	0.0	45

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	45	6.0	49.0	100

Subject objectives

The student learns the characteristics of independently-powered and hybrid electric vehicles found in road and rail transportation, as well as marine, aviation, and military and space applications. Acquires skills in programming an autonomous electric vehicle and its driving functions. The student is able to select the type and capacity of energy storage for a given vehicle and its driving cycle. Evaluates the environmental impact of a vehicle with a given propulsion system. Estimates the cost of implementation and operation of electromobility solutions.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W16] has knowledge of the current state and the latest development trends related to the field of study.	The student is able to select the type and capacity of energy storage that allows the vehicle to meet the range and driving profile requirements.	[SW3] Assessment of knowledge contained in written work and projects
[K6_W10] knows the principles of the processing, use and rational use of electricity, including the principles of electric traction in various transport systems	The student is able to justify the selection of an energy storage unit for a vehicle, taking into account economic and environmental aspects, as well as the applicability of the solution.	[SW2] Assessment of knowledge contained in presentation
[K6_U12] can formulate a specification of simple engineering tasks of a practical nature related to the field of study	The student knows the techniques of energy-efficient driving (eco-driving) and can use them to reduce the energy intensity of the vehicle.	[SU3] Assessment of ability to use knowledge gained from the subject
[K6_W15] he has knowledge of the construction, principles of operation and operation of electromagnetic energy converters used in transport systems and systems.	The student knows the structures of drive and power systems of electric vehicles.	[SW1] Assessment of factual knowledge

Subject contents	LECTURE: Energy intensity of catenary hybrid electric vehicles; Vehicular and stationary energy storage. BMS and EMS systems. Vehicle fuel cell converters and controls. Powertrain structures of electric and hybrid vehicles. Methods of assessment of the energy intensity of electric and hybrid vehicles. Micromobility. Economic and environmental consequences of electromobility development. Electromobility in marine, aerospace and military technology. Unusual applications of electromobility - levitating vehicles, mobile robots, exoskeletons and nanorobots. LABORATORY: Communication and control of a mobile robot. Autonomous vehicle operation. Active cruise control. Selection of parameters of a rail hybrid vehicle. Control of an unmanned aerial vehicle. Basics of eco-driving.
Prerequisites and co-requisites	Basic knowledge of electrical engineering, electronics and computer science.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Exam	60.0%	60.0%
Preparation for the exercise, Report submission	60.0%	40.0%

Recommended reading	Basic literature	Rufer A., Energy Storage Systems and Components. Taylor & Francis Group, 2018. Abad G., Power Electronics and Electric Drives for Traction Applications. Wiley, 2017. Karwowski K. (red.), Energetyka transportu zelektryfikowanego. Poradnik inżyniera. Wyd. Politechniki Gdańskiej. Gdańsk, 2018. Hayes J.G., Goodarzi G.A.: Electric Powertrain. Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles. Wiley 2018.
	Supplementary literature	Sørensen B., Renewable Energy conversion, transmission and storage. Academic Press 2007. Dicks A. L., Rand D. A. J., Fuel Cell Systems Explained. Wiley 2018. IEEE Vehicular Technology Magazine Equipment datasheets and manufacturer catalogues
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Compare energy storage devices used in electric vehicles. 2. Discuss the definition of a hybrid vehicle, give examples using power train block diagrams. 3. Outline the advantages and disadvantages of using fuel cells to power vehicles 4. Discuss the impact of electromobility on the carbon footprint of transportation. What is the CO2 equivalent emissions?	
Work placement	Not applicable	