



Subject card

Subject name and code	Electromobility I , PG_00058349						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2027/2028	
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 Electrified Transportation -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Aleksander Jakubowski					
	Teachers						
Lesson types	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_W06] knows the construction and operation of transformers, electronic circuits, electrical machines, low and high temperature electrolysers, electrical drive systems, their modeling and industrial applications; knows the principles of the processing, use and rational use of electricity, including the principles of electric traction in various transport systems, knows the hazards from electrical equipment						
	[K6_U03] can formulate a specification of engineering tasks of a practical nature related to the field of study, can prepare and present a presentation on the problems and results of an engineering task						

Subject contents	<p>Course content – lecture 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.</p> <p>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.</p>											
Prerequisites and co-requisites	Basic knowledge of electrical engineering, electronics and computer science.											
Assessment methods and criteria	<table border="1" data-bbox="451 492 1487 622"> <thead> <tr> <th data-bbox="451 492 794 526">Subject passing criteria</th> <th data-bbox="794 492 1141 526">Passing threshold</th> <th data-bbox="1141 492 1487 526">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 526 794 582">Preparation for the exercise, Report submission</td> <td data-bbox="794 526 1141 582">60.0%</td> <td data-bbox="1141 526 1487 582">40.0%</td> </tr> <tr> <td data-bbox="451 582 794 622">Exam</td> <td data-bbox="794 582 1141 622">60.0%</td> <td data-bbox="1141 582 1487 622">60.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Preparation for the exercise, Report submission	60.0%	40.0%	Exam	60.0%	60.0%
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Exam	60.0%	60.0%										
Recommended reading	Basic literature	<p>Rufer A., Energy Storage Systems and Components. Taylor & Francis Group, 2018.</p> <p>Abad G., Power Electronics and Electric Drives for Traction Applications. Wiley, 2017.</p> <p>Karwowski K. (red.), Energetyka transportu zelektryfikowanego. Poradnik inżyniera. Wyd. Politechniki Gdańskiej. Gdańsk, 2018.</p> <p>Hayes J.G., Goodarzi G.A.: Electric Powertrain. Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles. Wiley 2018.</p>										
	Supplementary literature	<p>Sørensen B., Renewable Energy conversion, transmission and storage. Academic Press 2007.</p> <p>Dicks A. L., Rand D. A. J., Fuel Cell Systems Explained. Wiley 2018.</p> <p>IEEE Vehicular Technology Magazine</p> <p>Equipment datasheets and manufacturer catalogues</p>										
	eResources addresses											
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 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? 											
Practical activities within the subject	Not applicable											

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