



Subject card

Subject name and code	Electromobility I , PG_00058349						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
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 -> Wydział Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Aleksander Jakubowski				
	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		
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	<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? 	
Work placement	Not applicable	

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