



Subject card

Subject name and code	Power Engineering and Telematics in Transportation, PG_00063601						
Field of study	ENERGETYKA I TELEMATYKA TRANSPORTU						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2025/2026		
Education level	second-cycle studies		Subject group		Specialty subject group Subject group related to scientific research in the field of study		
Mode of study	Part-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Electrified Transportation -> Faculty of Electrical and Control Engineering -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Mikołaj Bartłomiejczyk				
	Teachers		dr hab. inż. Mikołaj Bartłomiejczyk				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	10.0	0.0	0.0	30
	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	30		5.0		40.0	75
Subject objectives	The aim of the subject is to expand knowledge on electric transport systems, in the field of networked and autonomous vehicles. The student will learn advanced methods and algorithms for calculating these systems, including mathematical models of the traction power supply system and models of electrochemical batteries. In addition, the student will acquire general knowledge of telematics systems and skillfully apply selected telematics technologies in transport.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W07] has an in-depth, theoretically grounded knowledge of electromechanical systems and their electromechanical systems and their design, electrotraction systems power supply and electrical energy storage devices		Performs and interprets the results of energy analysis of the transport system		[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym		
	[K7_U11] is able to analyse the variability of electricity loads, calculate power and energy losses, can carry out cost accounting		Performs technical and economic analysis of the traction energy system		[SU1] Ocena realizacji zadania		
	[K7_K02] is aware of the impact of engineering activities on the environment, understands the the non-technical effects of those activities		Determines the energy demand of individual means of transport		[SK5] Ocena umiejętności rozwiązywania problemów występujących w praktyce		

Subject contents	Course content – lecture LECTURE Tasks and specificity of land, air and sea transport energy. Electric traction power supply systems. Traction substations. Traction networks, especially for high speeds. Remote control systems in traction power supply. Vehicle energy. Traction energy storage devices electrochemical batteries, supercapacitors, kinetic and hybrid storage devices. Methods and algorithms for calculating traction power supply systems. Modeling the electric traction power supply system. Telematics devices. Intelligent transport systems. Development trends in transport. Electric vehicle charging systems. Electric buses. Ecodriving energy-saving techniques for driving an electric vehicle. Measurement analysis of the traction power supply system. Intelligent electric vehicle charging systems. Smart Grid traction systems. Energy consumption for the vehicle's own needs. HVAC system. OPEN AIR Construction of a traction network. Construction of a traction substation. Remote control system for the electric traction power supply system - construction and operation. Traction substation. Technical facilities for urban transport. Course content – laboratory Field laboratories: - traction substation - tram/trolleybus depot - traction substation remote control center - traction photovoltaic power plant - stationary energy storage		
Prerequisites and co-requisites	Basic understanding of electric traction, power electronics and informatics.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	60.0%	75.0%
	Development task	60.0%	25.0%
Recommended reading	Basic literature	1. Praca zbiorowa, red. Strojny J.: Trakcja elektryczna prądu stałego. Układy zasilania. Podręcznik INPE dla elektryków. Zeszyt 27.SEP-COSiW, Warszawa, 2009. 2. Adamski A.: Inteligentne systemy transportowe. Uczelniane Wydawnictwa Naukowo Techniczne AGH, Kraków 2003. 3. Bartłomiejczyk M., Jakubowski A., Jarzębowski L., Judek S., Karwowski K., Mizan M., Skibicki J., Wilk A. (2023). Energetyka transportu zelektryfikowanego. Zbiór zadań problemowych 4. Bartłomiejczyk M., Jarzębowski L., Judek S., Karkosińska-Brzozowska N., Karwowski K., Mizan M., Skibicki J., Wilk A. (2020). Energetyka transportu zelektryfikowanego: Poradnik inżyniera.. Gdańsk: Politechnika Gdańska 5. Skibicki J.: Pojazdy elektryczne - część I. Gdańsk: Wydaw. PG, 2010. 6. Skibicki J.: Pojazdy elektryczne - część II. Gdańsk: Wydaw. PG, 2012.	
	Supplementary literature	1. Bartłomiejczyk M., Połom M.: <i>Multiaspect measurement analysis of braking energy recovery</i>. Energy Conversion and Management, Vol. 127, (2016) 2. Bartłomiejczyk M., Połom M.: <i>The impact of the overhead line's power supply system spatial differentiation on the energy consumption of trolleybus transport: planning and economic aspects</i>. Transport, Vol. 32, nr 1 (2017), s.1-12, 3. Bartłomiejczyk M.: <i>Smart grid technologies in electric power supply systems of public transport</i>. Transport, Vol. 33, nr 5 (2018) 4. Bartłomiejczyk M.: <i>Super capacitor energy bank MEDCOM UCER-01 in Gdynia trolleybus system</i>. IECON 2016 - 42nd Annual Conference of the IEEE Industrial Electronics Society, 23-26.10.2016, Florencja, Włochy 5. Bartłomiejczyk M.: <i>Dynamic charging of electric buses</i>. Warsaw, De Gruyter Poland, 2018, 97 s. ISBN 978-3-11-064507-1, DOI: 10.2478/9783110645088 6. Bartłomiejczyk M.: <i>Driving performance indicators of electric bus driving technique: naturalistic driving data multicriterial analysis</i>. IEEE Transactions on Intelligent Transportation Systems	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Power systems of electric traction in the world. 2. Methods for the calculation of traction power supply systems. 3. Traction energy storage. 4. Telecommunication systems in transportation. 5. Charging system of electrical vehicles 6. Smart Grid systems		
Practical activities within the subject	Not applicable		

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