GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Power Engineering and Telematics in Transportation, PG_00018252		
Field of study	Electrical Engineering		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
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 hab. inż. Mikołaj Bartłomiejczyk	
	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 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] Assessment of knowledge contained in written work and projects
[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] Assessment of task fulfilment
[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] Assessment of ability to solve problems that arise in practice

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. Course content – laboratory On Site Technical Visits: - Traction substation - Traction/trolleybus depot - Remote control center for traction substations - Traction photovoltaic power plant - Stationary energy storage facility
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
Development task	60.0%	25.0%
Midterm colloquium	60.0%	75.0%

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., Jarzębowicz L., Judek S., Karwowski K., Mizan M., Skibicki J., Wilk A. (2023). Energetyka transportu zelektryfikowanego. Zbiór zadań problemowych 4. Bartłomiejczyk M., Jarzębowicz 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.: *Multiaspect measurement analysis of breaking energy recovery*. Energy Conversion and Management, Vol. 127, (2016) 2. Bartłomiejczyk M., Połom M.: *The impact of the overhead line's power supply system spatial differentiation on the energy consumption of trolleybus transport: planning and economic aspects*. Transport, Vol. 32, nr 1 (2017), s.1-12, 3. Bartłomiejczyk M.: *Smart grid technologies in electric power supply systems of public transport*. Transport, Vol. 33, nr 5 (2018) 4. Bartłomiejczyk M.: *Super capacitor energy bank MEDCOM UCER-01 in Gdynia trolleybus system*. IECON 2016 - 42nd Annual Conference of the IEEE Industrial Electronics Society, 23-26.10.2016, Florencja, Włochy 5. Bartłomiejczyk M.: *Dynamic charging of electric buses*. Warsaw, De Gruyter Poland, 2018, 97 s. ISBN 978-3-11-064507-1, DOI: 10.2478/9783110645088 6. Bartłomiejczyk M.: *Driving performance indicators of electric bus driving technique: naturalistic driving data multicriterial analysis*. 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 activites within the subject	Not applicable

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