GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	TRANSPORT ENERGY, PG_00040993		
Field of study	Transport		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2022/2023
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
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. Mikołaj Bartłomiejczyk	
	Teachers	dr inż. Aleksander Jakubowski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	30.0	0.0	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	5.0	25.0	75

Subject objectives

Student designs and models the traction power supply systems for urban transport and railway; calculates the energy efficiency of vehicles and transportation systems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U06] able to integrate knowledge of mathematics, physics, electronics, power engineering, traffic engineering, civil engineering of transport and other fields by applying a system based approach, including non-technology aspects (economics, psychology, sociology, environment, health and safety), able to define the effect these fields have on the development of transport systems, able to use new technical and technological achievements and assess their utility for transport	Ability to select elements of the electric vehicle power supply system.	[SU2] Assessment of ability to analyse information
[K7_W10] has broad knowledge of means of transport	He is able to choose the appropriate means of transport from the point of view of reducing energy demand	[SW3] Assessment of knowledge contained in written work and projects
[K7_W11] has basic knowledge of energy in transport	He can analyze the energy supply of the traction system	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	LECTURE Functions and specificity of energetic of land, air and sea transport. Electric traction power supply systems in the world. Electrical and mechanical designs of traction substations. Overhead catenary line. Traction storage energy systems - electrochemical batteries, super capacitors, flywheels and hybrid systems. Contactless supply to traction vehicles. Basic methods and algorithms of calculation of traction power supply system. The calculation of the supply system including road traffic congestion. Modeling supply system of electric traction. Simulations methods. Mathematical models of dynamic cooperation the current collector with the catenaries. Effect of network parameters and the traction current collector on the quality of current collection. Network Diagnostics of catenaries, current collector, and their cooperation in dynamic conditions. The impact of the traction supply station, catenaries and electric vehicles on the environment in AC and DC supply system. The specificity of the ship electrical engineering, aircraft. Power of motor transport - cars with combustion engine, electric and hybrid propulsion motor energy consumption of auxiliary equipment and devices. Electromobility. EXERCISES Calculation of traction characteristics. Calculation of the resistance of movement. Implementation of the theoretical method. Calculation of the voltage drops and of currents load in the traction power supply system. Calculation of network parameters and the traction substation. The power bilance, efficienty of the propulsion. Regenerative braking, using of the storage energy systems - especially in the trolleybus traction. PROJECT Study design of the transport systems, e.g. railway, tramway, or trolley electrification.
Prerequisites and co-requisites	Basic knowledge of electrical engineering, electric traction, transport.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project	60.0%	25.0%
Midterm colloquium	60.0%	50.0%
Practical exercise	60.0%	25.0%

Recommended reading

Basic literature	Steimel A.: Electric Traction and Motive Power and Energy Supply. Basic and Practical Experience. München: Oldenbourg Industrieverlag 2007. Westbrook M. H.: The electric car. Development and future of battery, hybrid and fuel-cell cars (IEE power series; no. 38). Karwowski K. (red.): Energetyka transportu zelektryfikowanego. Poradnik inżyniera. Wyd. PG, 2020. Dąbrowski T.: Sieci i podstacje trakcyjne. Warszawa: WKŁ 1986. Szeląg A., Drążek Z., Maciołek T.: Elektroenergetyka miejskiej trakcji elektrycznej. Radom 2017.Siłka W.: Teoria ruchu samochodu. Warszawa: WNT 2002. Szeląg A.: Wpływ napięcia w sieci trakcyjnej 3 kV DC na parametry energetyczno-trakcyjne zasilanych pojazdów. Radom 2013. Głowacki K., Onderka E.: Sieci trakcyjne. Bibice: EMTRAK 2002. Kneba Z., Makowski S.: Zasilanie i sterowanie silników. WKiŁ, Warszawa 2004. Siłka W.: Energochłonność ruchu samochodu. WNT, Warszawa 1997. Karwowski K. (red.): Energetyka transportu zelektryfikowanego. Zbiór zadań. Wyd. KIET, 2021
Supplementary literature	1. Magazines: Technika Transportu Szynowego, Elektrische Bahnen, Revue Generale des Chemins de Fer. Energies. 2. Internet: www.pkp.com.pl, www.transportszynowy.200.pl, www.kieppe-elektrik.com, www.pesa.pl, www.railway-technology.com, www.railroaddata.com, www.raileurope.com, www.trainweb.org
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. Draw the traction characteristics of the vehicle and give its limitations. 2. Give the equations of the dynamics of the vehicle. 3. Discuss the rules for the implementation of the theoretical simulation method of calculation of traction power supply system. 4. How to determine the energy consumption of a vehicle?
Work placement	Not applicable