



## Subject card

Subject name and code	Transport Power Engineering, PG_00018181							
Field of study	Electrical Engineering							
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024			
Education level	first-cycle studies	Subject group						
Mode of study	Full-time studies	Mode of delivery			at the university			
Year of study	3	Language of instruction			Polish			
Semester of study	6	ECTS credits			4.0			
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. Jacek Skibicki					
	Teachers							
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM	
	Number of study hours	30.0	15.0	0.0	15.0	0.0	60	
	E-learning hours included: 0.0							
Address on the e-learning platform: <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11807">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11807</a>								
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	60		5.0		35.0		100
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			
	K6_U09	The student is able to select the parameters of the electrotraction power supply system based on theoretical ride calculations.			[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools			
	K6_W10	The student knows the principles of selecting a means of transport to meet transport needs and is able to assess the energy economy of individual transport systems.			[SW1] Assessment of factual knowledge			
	K6_K01	The student is able to analyze and search bibliographic resources.			[SK2] Assessment of progress of work			
	K6_K05	Can identify emergency situations.			[SK5] Assessment of ability to solve problems that arise in practice			
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 balance, efficiency 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	No requirements.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercise	60.0%	25.0%
	Midterm colloquium	60.0%	50.0%
	Project	60.0%	25.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"> <li>• Karwowski K. (red.): Energetyka transportu zelektryfikowanego. Poradnik inżyniera. Wyd. PG, 2020.</li> <li>• Dąbrowski T.: Sieci i podstaje trakcyjne. Warszawa: WKŁ 1986.</li> <li>• Szelał A., Drażek Z., Maciolek T.: Elektroenergetyka miejskiej trakcji elektrycznej. Radom 2017.</li> <li>• Siłka W.: Teoria ruchu samochodu. Warszawa: WNT 2002.</li> <li>• Szelał A.: Wpływ napięcia w sieci trakcyjnej 3 kV DC na parametry energetyczno-trakcyjne zasilanych pojazdów. Radom 2013.</li> <li>• Głowacki K., Onderka E.: Sieci trakcyjne. Bibice: EMTRAK 2002.</li> <li>• Kneba Z., Makowski S.: Zasilanie i sterowanie silników. WKiŁ, Warszawa 2004.</li> <li>• Siłka W.: Energochłonność ruchu samochodu. WNT, Warszawa 1997.</li> <li>• Steimel A.: Electric Traction and Motive Power and Energy Supply. Basic and Practical Experience. München: Oldenbourg Industrieverlag 2007.</li> <li>• Westbrook M. H.: The electric car. Development and future of battery, hybrid and fuel-cell cars (IEE power series; no. 38).</li> <li>• Frontczak F. Podstaje trakcyjne i ich zasilanie. KOW 1994.</li> <li>• Karwowski K. (red.): Energetyka transportu zelektryfikowanego. Zbiór zadań problemowych. Wyd. PG, 2023.</li> </ul>	
	Supplementary literature	1. Magazines: Technika Transportu Szynowego, Elektrische Bahnen, Revue Generale des Chemins de Fer. Energies.	
	eResources addresses	Uzupełniające Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Draw the traction characteristics of the vehicle and give its limitations.</li> <li>2. Give the equations of the dynamics of the vehicle.</li> <li>3. Discuss the rules for the implementation of the theoretical simulation method of calculation of traction power supply system.</li> <li>4. How to determine the energy consumption of a vehicle?</li> </ol>		
Work placement	Not applicable		