GDAŃSK UNIVERSITY OF TECHNOLOGY

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: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11807

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 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.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="2">No requirements.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Practical exercise</td><td>60.0%</td><td>25.0%</td></tr>
<tr><td>Midterm colloquium</td><td>60.0%</td><td>50.0%</td></tr>
<tr><td>Project</td><td>60.0%</td><td>25.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>• 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.
• 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).
• Frontczak F. Podstacje trakcyjne i ich zasilanie. KOW 1994.
• Karwowski K. (red.): Energetyka transportu zelektryfikowanego. Zbiór zadań problemowych. Wyd. PG, 2023.</td></tr>
<tr><td>Supplementary literature</td><td>1. Magazines: Technika Transportu Szynowego, Elektrische Bahnen, Revue Generale des Chemins de Fer. Energies.</td></tr>
<tr><td>eResources addresses</td><td>Uzupełniające
Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">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?</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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