GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electric traction and traction equipment, PG_00044662		
Field of study	Transport		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
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	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	30.0	15.0	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

The student calculates the requirements for the power supply system of the vehicle in electric traction systems. They select an optimal power supply system for a given means of transportation.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W18] has proficiency in transport infrastructure as appropriate for their specialty	The student chooses a relevant power supply method of a transportation system.	[SW3] Assessment of knowledge contained in written work and projects
[K6_U13] able to select tools and methods, carry out assessments and simple tests of transport infrastructure and means of transport to an extent required of the specialty / learning profile	The student selects power sources and power system components for electrified transportation systems.	[SU2] Assessment of ability to analyse information

Subject contents

LECTURE: History of electric traction, advantages and disadvantages, comparison with steam and diesel traction. Environmental and economic issues. Traction power supply systems - DC and AC power supply. Applications, infrastructure, advantages, and disadvantages. Hybrid traction - energy storage, fuel cells - onboard and stationary applications. In-motion charging. Vehicle propulsion systems. Non-traction vehicle requirements. Characteristics of electric traction-based transportation systems. Traction calculations (theoretical journey) - applications. Energy consumption of electric traction - methods for assessing and improving energy efficiency. Unusual examples of electric traction (magnetic railways, electric airplanes).

EXERCISES: Basic physical units and relationships. Vehicle motion dynamics. Energy and electrical calculations. Vehicle power supply (energy storage, traction power grid). Calculation of theoretical journey. Selection of power supply system type and parameters.

Prerequisites and co-requisites

Basic knowledge of electrical engineering and vehicle dynamics.

<table>
<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 exercises</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Midterm exams during the semester</td><td>50.0%</td><td>50.0%</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).</td></tr>
<tr><td>Supplementary literature</td><td>1. Journals: 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</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">• To draw the traction characteristic of the vehicle and provide its limitations.
• To provide the equations of the vehicle's motion dynamics.
• To discuss the advantages and disadvantages of traction power supply systems.
• To indicate the differences in infrastructure for individual electric traction supply systems.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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