



Subject card

Subject name and code	Automatics of Traction Equipment, PG_00041822						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2024/2025		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	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. Jacek Skibicki					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30	10.0		35.0		75
Subject objectives	The aim of the subject is to sell the subject with the current composition of the subject of the composition control of the accounting composition. In the field of control and steering of the traction vehicle and control of steering service. Issues related to autonomous traction, i.e. electric and autonomous vehicles, will also be discussed. Organizing layout management and this topic is also part of the content.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K7_U07	The student is able to perform the calculations of the theoretical ride.			[SU1] Assessment of task fulfilment		
	K7_U03	Ability to make a report from laboratory exercises.			[SU1] Assessment of task fulfilment		
	K7_U04	The student has the ability to analyze information contained in written and electronic sources.			[SU2] Assessment of ability to analyse information		
	K7_W11	The student is able to put into practice the acquired skills in the implementation of traction calculations.			[SW3] Assessment of knowledge contained in written work and projects		
	K7_W06	The student has an understanding of the current use of automation devices in electric traction.			[SW1] Assessment of factual knowledge		
	K7_W08	The student is able to analyze the results of theoretical travel calculations in terms of energy consumption optimization, energy-optimal driving, for the needs of autonomous driving of traction vehicles.			[SW3] Assessment of knowledge contained in written work and projects		

Subject contents	<p>LECTURE The introduction to the electric traction, the definition of electric transport, network and autonomous traction, electric vehicles, power supply systems. Automation of electric traction power supply equipment, automatic substations, remote control. Automation of safety devices in electric traction, security methods, circuit breakers and fuses, power line test, automatic short-circuit and earth fault protection. Elements of automation in electric vehicles, traction drives, starting control, speed control, work control during braking, mechanical, dynamic and regenerative braking. Control of vehicles supply from DC and AC voltage. Automatic drive control in autonomous vehicles, control the operation of electric and hybrid drives. Optimization of energy consumption, control the energy transmission. Data transmission in traction vehicles. Monitoring the technical condition of the vehicle, onboard diagnostics, automation components in vehicle diagnostics, functional diagnostics, testing diagnostics. The rules of properly exploitation and maintenance of traction vehicles. Automated diagnostic systems, traction, current collectors, control locomotives. Perspectives for the development of automation in transport.</p> <p>LABORATORY Resistance starting of series DC motors. Testing of induction motor drives. Testing of current-limiting circuit-breaker; Testing of traction substation. Pulse starting of DC series motors. Control of IPMSM motor. Optimisation of energy consumption in autonomous electric vehicle.</p> <p>PROJECT: Theoretical ride calculation for railway line.</p>														
Prerequisites and co-requisites	Basic knowledge of Electrical Engineering, Electronics and Computer Science														
Assessment methods and criteria	<table border="1" data-bbox="448 687 1498 824"> <thead> <tr> <th data-bbox="448 687 798 719">Subject passing criteria</th> <th data-bbox="802 687 1141 719">Passing threshold</th> <th data-bbox="1145 687 1498 719">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 725 798 757">Report from laboratory exercises</td> <td data-bbox="802 725 1141 757">60.0%</td> <td data-bbox="1145 725 1498 757">20.0%</td> </tr> <tr> <td data-bbox="448 763 798 795">Project</td> <td data-bbox="802 763 1141 795">60.0%</td> <td data-bbox="1145 763 1498 795">20.0%</td> </tr> <tr> <td data-bbox="448 801 798 824">Midterm colloquium</td> <td data-bbox="802 801 1141 824">60.0%</td> <td data-bbox="1145 801 1498 824">60.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Report from laboratory exercises	60.0%	20.0%	Project	60.0%	20.0%	Midterm colloquium	60.0%	60.0%
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Midterm colloquium	60.0%	60.0%													
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Karwowski K. (red.): Energetyka transportu zelektryfikowanego. Gdańsk, Wydawnictwo PG 2018 2. Karwowski K. (red). Energetyka transportu zelektryfikowanego. Zbiór zadań problemowych. Gdańsk, Wydawnictwo PG 2023 3. Szelaż A.: Trakcja elektryczna - podstawy. Warszawa, Oficyna Wydawnicza PW 2019 4. Czaplą J., Seruga W.: Trakcja Elektryczna w Transporcie. Warszawa, WKiŁ 1990 5. Frontczak F.: Podstacje trakcyjne i ich zasilanie. Warszawa, Kolejowa Oficyna Wydawnicza 1994 6. Gąsowski W., Durzyński Z., Marciniak Z.: Elektryczne pojazdy trakcyjne. Poznań, Wyd. Politechniki Poznańskiej 1995 7. Głowacki K., Onderka E.: Sieci trakcyjne. Bibice, EMTRAK 2002 8. Kacprzak J.: Automatyka i sterowanie elektrycznych pojazdów trakcyjnych. Warszawa, WKiŁ 1981 9. Kacprzak J., Koczara W.: Podstawy napędu elektrycznych pojazdów trakcyjnych. Warszawa, WKiŁ 1990 10. Podoski J., Kacprzak J., Mysiek J.: Zasady trakcji elektrycznej. Warszawa, WKiŁ 1980 11. Skibicki J.: Pojazdy elektryczne, część I i II. Gdańsk, Wydawnictwo PG 2010/2012 													
	Supplementary literature	<ol style="list-style-type: none"> 1. Zalewski P., Siedlecki P., Drewnowski A.: Technologia transportu kolejowego. Warszawa, WKiŁ 2004 2. Bergiel K., Karbowski H.: Automatyzacja prowadzenia pociągu. Łódź, EMI-PRESS 2005 3. Wontarski P., Kochan A.: Komputerowe systemy kierowania i sterowania ruchem kolejowym. Warszawa OWPW 2020 													
	eResources addresses	Adresy na platformie eNauczanie:													
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. What is vehicle traction characteristics? List and discuss its basic areas. 2. Why in diesel-electric vehicles are electric generators selected with a nominal power higher than the nominal power of the combustion engine? 3. Draw a diagram, discuss the advantages and disadvantages of a hybrid car in a series configuration. 4. Why is a fourth rail type overhead contact line used in some metro systems? 														
Work placement	Not applicable														