

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electric Vehicles, PG_00053420									
Field of study	Automation, Robotics and Control Systems									
Date of commencement of studies	October 2022		Academic year of realisation of subject			2025/2026				
Education level	first-cycle studies		Subject group							
Mode of study	Full-time studies		Mode of delivery			at the university				
Year of study	4		Language of instruction			Polish				
Semester of study	7		ECTS credits			3.0				
Learning profile	general academic profile		Assessment form			assessment				
Conducting unit	Faculty Of Electrical	aculty Of Electrical And Control Engineering -> Wydziały Politechniki Gdańskiej								
Name and surname	Subject supervisor	prof. dr hab. inż. Jarosław Guziński								
of lecturer (lecturers)	Teachers									
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM		
of instruction	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 classes includ plan	n didactic ed in study	Participation in consultation hours		Self-study		SUM		
	Number of study hours	30			5.0			75		
Subject objectives	The aim of the course is to acquire knowledge and skills in the field of electric electromobility. The aim of the course is to get knowledge and skills in the field of electromobility, in particular electric drives, electric motors, power-electronic converters and charging systems used in electric vehicles as well as issues related to self-driving cars.									
Learning outcomes	Course outcome		Subject outcome			Method of verification				
	[K6_U01] can obtain information from literature, databases and other sources; integrate the information obtained, interpret it and draw conclusions, formulate and justify opinions		analyzes literature, databases and technical documentation relating to electric vehicle drive systems.			[SU2] Assessment of ability to analyse information				
	[K6_U03] can prepare and present a presentation on the problems and results of an engineering task		performs the conversion of a combustion engine vehicle into an electric vehicle with the calculation of the individual system components and a preliminary analysis of the vehicle's performance			[SU1] Assessment of task fulfilment				
	[K6_W10] has basic knowledge related to mechatronics and robotics systems		knows thestructure of various type electric vehicles as well construction and operating principles of the basic components of the vehicle			[SW1] Assessment of factual knowledge				
	[K6_W06] knows the structure of computers and microprocessors and the tasks of operating systems, has basic knowledge of the basics of computer software, drivers, microprocessor technology, design of simple algorithms and the operation of information networks		knows the algorithms for controlling electric vehicle drive motors			[SW1] Assessment of factual knowledge				

Subject contents	 Lecture. Introductory news. Energy demand, battery capacity assessment, vehicle energy consumption meters, driving range estimation. Energy storage and converters for cooperation with energy sources: batteries, flywheel, fuel cells, supercapacitors. Automatic systems of converter drive of vehicles with electric motors. Vehicle drives with permanent magnet motors. Electric drives in hybrid vehicles: diesel-electric. Methods of controlling electric motors in vehicles. Sensorless control. Powerelectronic converters in electric vehicles. Battery charging systems. Superior vehicle control. Self-driving cars. Hydrogen technologies in electric vehicles. Design of an electric vehicle with battery supply. Lab. Simulation part: Steer-By-Wire (SBW) in cars, electric vehicle drive system with PMSM motor and FOC sensorless control method, two-wheeled vehicle control. Experimental part: torque and speed control of the induction motor for building speed-torque characteristics of the electric vehicle, control of the electric drive with an PMSM motor for electric vehicle. 						
Prerequisites and co-requisites	Knowledge of the basics of electrical engineering and automation						
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade				
and criteria	Lab	60.0%	50.0%				
	Project	60.0%	50.0%				
Recommended reading	Basic literature	 Chau K.T.: Electric Vehicle Machines and Drives: Design, Analysis and Application. Wiley - IEEE, 2015. Dembowski A,.: Elektryczny napęd trakcyjny. WNT. Warszawa 2019. Karwowski K. (red.): Energetyka transportu zelektryfikowanego. Wyd. PG, Gdańsk 2018. Szumanowski A.: Hybrid Electric Vehicle Drives Design. Wyd. NRI Warszawa-Radom 2006. Choromański W., Grabarek I., Kozłowski M., Czerepicki A., Marczuk K.: Pojazdy autonomiczne i systemy transportu autonomicznego. PWN. Warszawa 2020. 					
	Supplementary literature	 Ali Emadi (Ed.): Advanced Electric Drive Vehicles. CRC P Taylor & Francis. 2015. Ehsani, Y. Gao, S. Longo, K. Ebrahimi: Modern Electric, H Electric, and Fuel Cell Vehicles Fundamentals, Theory, ar Design. M. CRC Press, 3rd Edition, 2018. Merkisz. J., Pielecha I.: Alternatywne napędy pojazdów. W Poznań 2006. Dębicki M.: Teoria samochodu, teoria napędu. WNT. War: 1969. Gomółka J., Kowalczak F., Franke A.: Współczesne chem źródła pradu. Wyd. MON. Warszawa 1977. Węgrzyn B.: Samochody z napędem elektrycznym. WNT. Warszawa 1970. 					
	eResources addresses	Adresy na platformie eNauczanie:					
Example issues/ example questions/ tasks being completed	 Design an electric drive system to replace internal combustion engine in selected car. Run and investigate drive system of EV with an induction motor. Run and investigate drive system of EV with an PMSM motor. 						
Work placement	Not applicable						

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