GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00053437		
Field of study	Electrical Engineering		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2024/2025
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	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Jarosław Guziński	
	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	5.0	65.0	100

Subject objectives

The aim of the course is to acquire knowledge and skills in the field of electric autonomous vehicles.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_K05	Student is able to assess the threats and counteract them in the electric vehicle power supply system	[SK5] Assessment of ability to solve problems that arise in practice
K6_U09	Can select the electrical equipment of an electric vehicle	[SU1] Assessment of task fulfilment
K6_K01	Is aware of continuous training in the field of electric vehicle drives	[SK2] Assessment of progress of work
K6_U10	Is able to design the electrical system of an electric vehicle	[SU1] Assessment of task fulfilment
K6_W10		

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. Overriding vehicle control. Driving direction control. Control in emergency states. Design of converters. Electric boat and aircraft drives.

Lab. The simulation part of modeling electric drives of vehicles. Laboratory exercises using electric vehicles and stationary electric drives with PMSM and BLDC motors and five-phase induction motors.

Design. Design of an electric vehicle with autonomous power supply.

Prerequisites and co-requisites

Knowledge of the basics of electrical engineering and automation

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture	60.0%	30.0%
Lab	60.0%	40.0%
Project	60.0%	30.0%

Recommended reading	Basic literature	1. Chau K.T.: Electric Vehicle Machines and Drives: Design, Analysis and Application. Wiley - IEEE, 2015. 2. Dembowski A,.: Elektryczny napęd trakcyjny. WNT. Warszawa 2019. 3. Karwowski K. (red.): Energetyka transportu zelektryfikowanego. Wyd. PG, Gdańsk 2018. 4. Szumanowski A.: Hybrid Electric Vehicle Drives Design. Wyd. NRI. Warszawa-Radom 2006. 5. Choromański W., Grabarek I., Kozłowski M., Czerepicki A., Marczuk K.: Pojazdy autonomiczne i systemy transportu autonomicznego. PWN. Warszawa 2020.
	Supplementary literature	1. Ali Emadi (Ed.): Advanced Electric Drive Vehicles. CRC Press, Taylor & Francis. 2015. 2. Ehsani, Y. Gao, S. Longo, K. Ebrahimi: Modern Electric, Hybrid Electric, and Fuel Cell Vehicles Fundamentals, Theory, and Design. M. CRC Press, 3rd Edition, 2018. 3. Merkisz. J., Pielecha I.: Alternatywne napędy pojazdów. Wyd. PP. Poznań 2006. 4. Dębicki M.: Teoria samochodu, teoria napędu. WNT. Warszawa 1969. 5. Gomółka J., Kowalczak F., Franke A.: Współczesne chemiczne źródła pradu. Wyd. MON. Warszawa 1977. 6. Węgrzyn B.: Samochody z napędem elektrycznym. WNT. Warszawa 1970.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. List and describe the types of electric vehicle drive systems. 2. Power supply system and PMSM electric drive control in the vehicle. 3. Select the motor for the electric drive of the vehicle and estimate the driving range. 4. Discuss the types of electric machines used to drive electric vehicles. 5. Present a method of converting a passenger combustion car into an electric car.	
Work placement	Not applicable	