COURSE DESCRIPTION CARD - SYLLABUS

Course name
Personal transport devices [S1Elmob1>PO10-UTO]

Course

Field of study
Electromobility

Year/Semester
4/7

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

A student starting this course should have basic knowledge in the field of electrical engineering and electrical machines, as well as the ability to effectively self-study, as well as work in a laboratory group.

Course objective

Discussion of the latest design and construction solutions related to electric individual transport vehicles. Getting to know the regulations and guidelines related to the movement of such vehicles.

Course-related learning outcomes

Knowledge:
1. The student has basic knowledge of the theory of automation and control used in hybrid and electric vehicles, including autonomous ones.
2. The student has an organized knowledge of sensors, security systems, comfort and monitoring as well as communication with users in technical systems related to the field of study.

Skills:
1. The student is able to use literature sources, integrate the obtained information, evaluate it and interpret it and draw conclusions in order to solve complex and unusual problems in the field of electromobility
2. The student is able to, when formulating and solving tasks related to electromobility, see their systemic and non-technical aspects, including environmental, economic and legal
3. The student is able to compare various technical solutions, evaluate them in terms of selected utility, economic, ecological, legal and ethical criteria

Social competences:
1. The student understands the importance of improving professional, personal and social competences; The student is aware that knowledge and skills in the field of electromobility are evolving rapidly.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: The knowledge and skills acquired during the lecture are verified in a written test, as well as partial grades during each class as part of the activity.
Laboratory: The skills acquired during laboratory exercises are verified on the basis of projects / tasks performed by students. Before starting a given series of laboratory exercises, students take a test on the Moodle platform that allows them to verify their knowledge and skills. In class, continuous assessment takes place - activity and verification of social competences related to team work. Passing the overall laboratory exercises requires completion of all exercises, completion of the reports indicated by the teacher and passing the tests.

Programme content

Lecture:
Review and types of electric individual transport vehicles; Structures of electric individual transport vehicles (e.g. electric bicycles, electric unicycles, electric skateboards / scooters, electric wheelchair / scooter drive module); Energy sources in vehicles. New construction materials. Motors and actuators in electric personal transport vehicles; Electric drive control of individual transport vehicles;.
Lab:
Implementation of laboratory exercises in the field of:
- testing of a brushless motor
- testing the drive system of an electric individual transport vehicle
- testing of the wireless electricity transmission system for charging the batteries of individual vehicles

Course topics

Lecture:
Introduction, definitions, term dictionaries, visions of development. EU directives, legal standards, Review and types of electric individual transport vehicles; Structures of electric individual transport vehicles (e.g. electric bicycles, electric unicycles, electric skateboards / scooters, electric wheelchair / scooter drive module); Energy sources in vehicles - classification, requirements, operational parameters, infrastructure for wired / wireless charging of electric personal transport vehicles; New construction materials. Energy storage in electric individual transport vehicles. Motors and actuators in electric personal transport vehicles; Electric drive control of individual transport vehicles; Environmental aspects of urban transport, smart metropolises, cities in terms of electric individual transport vehicles (sensors, location).
Lab:
Implementation of laboratory exercises in the field of:
- testing of a brushless motor mounted in the wheel hub
- testing the drive system of an electric skateboard / scooter
- wheelchair drive system testing
- testing of the wireless electricity transmission system for charging the batteries of individual vehicles
- study of the energy recovery system in electric individual transport vehicles
- development of a mobile application to control the drive system of an electric individual transport

vehicle

Teaching methods

Lecture: presentation of issues with the use of multimedia, examples (e.g. computational) given on the blackboard, discussion on problem issues
Laboratory: performing laboratory exercises in teams under the supervision of the teacher

Bibliography

Basic:
1.Crowder R.: Electric Drives and Electromechanical systems, Elsevier, 2006
2. Chun T. Rim, Chris Mi. Hoboken: Wireless power transfer for electric vehicles and mobile devices , John Wiley & Sons, 2017.
3. Przepiórkowski J.: Silniki elektryczne w praktyce elektronika, Wydawnictwo BTC, Warszawa 2007.
4. Wiak S., Welfle H.: Silniki tarczowe w napędach lekkich pojazdów elektrycznych , Wydawnictwo Politechniki Łódzkiej, Łódź 2001.
5.Krykowski K.: Silniki PM BLDC, właściwości, sterowanie, aplikacje, Wydawnictwo BTC, Legionowo 2015.
6.Yeadon W.H. , Yeadon A.W. : Handbook of small electrical motors, McGraw-Hill, 2001

Additional:
1. Glinka T.: Maszyny Elektryczne wzbudzane magnesami trwałymi, Wydawnictwo Politechniki Śląskiej, Gliwice 2002.
2. Jastrzębska G.: Odnawialne źródła energii i pojazdy proekologiczne - Jednośladowe pojazdy z napędem elektrycznym. WNT, 2007.
3. Scientific articles and publications in the field of design, construction, power supply and location of electric personal transport vehicles.
4. Technical and operational documentation of systems used in the classroom.

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00