COURSE DESCRIPTION CARD - SYLLABUS

Course name
Wired and wireless charging systems for electric vehicles

Course

Field of study
Electromobility

Year/Semester
3/5

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars
15

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
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Faculty of Control, Robotics and Electrical Engineering

Piotrowo 3A Street, 60965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge - Basic information in the field of electronics and power electronics.

Skills - The ability to effectively self-educate in a field related to the chosen field of study; the ability to make the right decisions when solving simple tasks and formulating problems in the field of widely understood power electronics.

Competences - The student is aware of expanding his competences, demonstrates readiness to work in a team, the ability to comply with the rules applicable during lectures, laboratories and exercises.

Course objective

Getting to know the properties and basic characteristics of power electronic semiconductor elements. Getting acquainted with the structure, principle of operation and properties of the power electronic converters used and selected methods of their control.

Course-related learning outcomes

Knowledge

1. The student should have knowledge of the structure, principles of operation and properties of semiconductor power devices used in power electronics.

2. The student should have knowledge of the structure, operation and properties of basic power electronics systems, with particular emphasis on the applications used in the broadly understood electromobility.

3. The student is to have basic knowledge of the methods of controlling power electronic converters, with particular emphasis on closed-loop control systems.

Skills

1. The student will be able to use the knowledge of the proper operation (including charging) of electric and hybrid vehicles.

2. The student will be able to propose an optimal solution for vehicle charging systems depending on the adopted criteria - incl. selection of converter structure and control algorithms.

3. The student will be able to propose a method of using renewable energy sources for charging electric or hybrid vehicles.

Social competences

1. The student understands the importance of knowledge in solving problems and improving professional, personal and social competences.

2. The student is aware that the knowledge and skills in the technique quickly become obsolete.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

- evaluation of knowledge and skills demonstrated in the solved written test of a problem nature.

- continuous assessment, rewarding activity and substantive content of statements.

Project:

- verification of the satisfaction of the implemented project task in groups.

Programme content

Types and properties of charging systems (vehicle internal and external systems), (legal conditions for their operation), wired charging systems: division (V2G), standardization, examples of solutions, dedicated converter systems, infrastructure of electric vehicle charging systems - construction and use of points (charging stations, systems for supervising the correct charging of various types of energy storage, the use of renewable energy sources to power vehicle charging points, converter systems dedicated to wire and wireless transmission of electricity, methods of charging energy storage in CC and CV modes.

Teaching methods

Lecture: presentation of issues with the use of multimedia, illustrated with examples given on the board, discussion of the issues.

Project: implementation in groups of design tasks with the use of digital systems commissioning tools and simulation tools.

Bibliography

Basic

1. Frąckowiak L., Januszewski S., Power electronics. Th. 1, Semiconductor devices and power electronics modules, Publishing House of the Poznań University of Technology, Poznań 2001.

2. Mikołajuk K., Fundamentals of power electronics analysis, Państwowe Wydawnictwo Naukowe, Warsaw 1998.

3. Strzelecki R., Supronowicz H., Power factor in AC power systems and methods of its improvement, Oficyna Wydawnicza Politechniki Warszawskiej, Warsaw 2000.

4. Larry E. Erickson, Jessica Robinson, Gary Brase, Solar Powered Charging Infrastructure for Electric Vehicles, CRC Press (8 December 2017).

5. DR A B RAJIB HAZARIKA PHD FRAS AES, ELECTRIC VEHICLE THEORY FOR FUTURE APPLICATIONS: NEVER CHARGE YOUR ELECTRIC VEHICLE, AMAZON KINDLE (July 13, 2020).

6. Research Projects - Objectives to Conclusion - for PhD, MTech, MS, and BTech Electrical Engineering students, GetElectricVehicle, 2020.

Additional

1.Chalecki M., Hybrid and electric vehicles in workshop practice. Construction, operation, basics of service, WKŁ, 2018.

2. Applicable standards and legal regulations.

3. Catalog notes of manufacturers of charging stations.

Breakdown of average student's workload

	Hours	ECTS
Total workload	105	4,0
Classes requiring direct contact with the teacher	55	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation of a report on the laboratory exercise, preparation for exam) [1]	50	2,0

[1] delete or add other activities as appropriate