COURSE DESCRIPTION CARD - SYLLABUS

Course name
Certification of hydrogen systems [S2Elmob1-PAiME>CUW]

Course

Field of study
Electromobility

Year/Semester
2/3

Area of study (specialization)
Alternative Fuels and Energy Storage

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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Lecturers

Prerequisites

In the basic scope, concerning the operation of vehicle drive systems In the basic scope, concerning chemistry and physics from high school Logical thinking, learning with understanding, using textbooks and searching for information from scientific publications (along with the ability to search Internet databases).

Course objective

Providing students with knowledge about testing and certification of hydrogen system components in relation to means of transport

Course-related learning outcomes

Knowledge:
Has advanced and in-depth knowledge of the design, diagnostics and operation of drive systems for hybrid and electric vehicles, including traction; knows the basic processes occurring in the life cycle of technical systems of hybrid and electric vehicles, including traction ones

Has general knowledge of environmental protection problems related to the implementation of selected chemical processes used in the recycling of materials and substances used in electromobility and the use of alternative fuels
Has knowledge of development trends, new achievements in the field of electromobility and dilemmas of modern civilization, especially in terms of the impact of changes in the ways of powering vehicles on the natural environment

Skills:
He can use the knowledge of the latest technical and technological achievements in the design of unusual devices and systems in the field of electromobility
Is able to obtain information (in Polish and English) from various sources, interpret it, critically evaluate it, analyze it and synthesize it, as well as draw conclusions and formulate and justify opinions

Social competences:
He understands that in the area of technology, knowledge and skills are rapidly devaluing, which requires their constant supplementation
He is aware of the need to develop his professional achievements and observe the rules of professional ethics

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Completion of the course ends with a written final test

Programme content

Presentation of issues related to standards within the certification of hydrogen systems
Presentation of issues related to the certification of hydrogen drive system components
Presentation of issues related to hydrogen storage in vehicles
Presentation of issues related to the transmission of hydrogen in vehicles
Presentation of issues related to the adaptation of workshop halls to the repair of hydrogen-powered vehicles
Legal and certification conditions for hydrogen refueling stations
Vehicle approval procedures for hydrogen propulsion
Vehicle approval procedures for hydrogen propulsion
Legal conditions and certification of installations for the production of green hydrogen containing photovoltaic panels and wind turbines

Course topics

The topics of the course include:
-Certification of hydrogen systems;
-Hydrogen storage;
-Operation of hydrogen vehicles;
-Conditions for the maintenance of hydrogen vehicles;
-Hydrogen refueling stations;
-Homologation of hydrogen vehicles;
-Production of hydrogen useful for powering vehicles.

Teaching methods

Lecture with multimedia presentation

Bibliography

Basic:
1. UNECE Regulation 134 2019/795
2. Regulation of the European Parliament 79/2009
3. EU Commission Regulation No. 406/2010
4. Draft regulation on procedures for the design, construction, commissioning and inspection of refueling stations for hydrogen-powered vehicles, 2019/633/BG

5. Report 300. ECONOMY. A hydrogen alternative.
6. SAE J2601 - Refueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles
7. SAE J2719 standard - a standard defining the quality of hydrogen fuel for commercial vehicles equipped with fuel cells.
8. ISO 14687:2019 standard - standard specifying the quality characteristics of hydrogen fuel

Additional:
1. PN-EN 17124
2. PN EN 17127
3. PN EN ISO 17268
4. Team of Economic Advisors TOR: Transport as the key to the development of hydrogen technologies in Poland, Report of the Wodór2030.pl project
5. Tarnaka M. Development of Residential PEFC Cogeneration System in Osaka Gas. World Gas Conference. Amsterdam 2006.
6. European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) signed in Geneva on September 30, 1957 - a legal act covering a number of areas related to the transport of dangerous goods

Breakdown of average student's workload

	Hours	ECTS
Total workload	28	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	13	0,50