COURSE DESCRIPTION CARD - SYLLABUS

Course name
Ecology in transport

Course

Field of study Power engineering	Year/Semester 2/3
Area of study (specialization) Ecological sources of electric energy	Profile of study general academic
Level of study Second-cycle studies	Course offered in polish
Form of study full-time	Requirements compulsory

Number of hours

Lecture 15	Laboratory classes	Other (e.g. online)
Tutorials	Projects/seminars 15	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Instytut Elektrotechniki i Elektroniki Przemysłowej

ul. Piotrowo 3A 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of electrical engineering, electrical machines, and forms and methods of energy conversion. Ability to interpret transmitted messages and effective education in the field related to energy storage and hybrid systems as well as teamwork. Ability to use IT tools needed for modeling (e.g. Matlab, Visual Studio C #).

Course objective

Providing students with knowledge related to the construction, application and modeling of energy storage systems. Acquiring the skills to solve engineering problems requiring the selection of the type and parameters of energy storage in electric and hybrid vehicles.

Course-related learning outcomes

Knowledge

Has an organized knowledge of exhaust gas cleaning systems in internal combustion vehicles and energy storage technologies, as well as the types and principles of operation of various types of storage facilities.

Has knowledge of modeling techniques for selected electricity storage.

Skills

Is able to classify and analyze the work of energy storage and selected hybrid systems.

He can choose the type and parameters of energy storage for an electric vehicle.

Is able to select and model the work of selected energy storage in motor vehicles.

Social competences

Is aware of the growing problem of global pollution and the need to protect nature.Understand various aspects and effects of electrical engineer activities, including environmental impact.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired as part of the lecture is verified during the written test, which takes place during the last lecture. The exam consists of open-ended questions, scored according to the level of difficulty. Passing threshold: 50% of points. Final issues are sent by e-mail to the group staroste using the university e-mail system 2-3 weeks before the date of passing.

Programme content

Lecture:

Pro-ecological solutions in combustion vehicles. Standard vehicle driving cycles. Ecology in combustion vehicles. Parameters characterizing electricity storage and their durability. Analysis of the demand for power and energy of motor vehicles. Advanced work models of selected energy storage (modeling of lead-acid, lithium-ion batteries, supercapacitors, fuel cells) used in vehicles.

Design:

Estimation of parameters of battery models and supercapacitors. Modeling of electrochemical durability (PbO_2, Li-Ion) energy storage. Modeling of lead-acid, lithium-ion batteries, supercapacitors, fuel cells.

Teaching methods

Lecture: multimedia presentation, illustrated with examples given on the board, initiating discussions during the lecture. Additional materials placed in the Moodle system.

Bibliography

Basic

1. Leszek Kasprzyk, Wybrane zagadnienia modelowania ogniw elektrochemicznych i 3 superkondensatorów w pojazdach elektrycznych, Poznan University of Technology Academic Journals. Electrical Engineering - 2019, Issue 101, s. 3-55.

2. Jastrzębska G.: Odnawialne źródła energii i pojazdy proekologiczne, WNT, Warszawa 2009.

3. Fuchs G., Lunz B., Leuthold M., Sauer D. U.: Technology Overview on Electricity Storage, RWTH Aachen, 2012.

4. Filipiak M., Jajczyk J., Nawrowski R., Putz Ł.: Urządzenia diagnostyczne w pojazdach samochodowych, XVII Konferencja Naukowa Zastosowanie Komputerów w Elektrotechnice, Poznań, 23-24 kwietnia 2012 r., s. 227-234.

5. Jajczyk J., Filipiak M., Dąbrowski T., Reducing the Use of Electrochemical Sources of Electricity Through the Use of Wireless Power Supply, Rocznik Ochrona Środowiska, vol. 22 no. 1, 2020, s. 444-455.

6. Filipiak M., Jajczyk J., Dobrzycki A.: The economics of use of wireless power supply in electric buses, ITM Web of Conferences, vol. 19, 01034 (2018), DOI: https://doi.org/10.1051/itmconf/20181901034.

Additional

1. Akumulatory elektryczne - Terminologia PN-88/E-01004 Polski Komitet Normalizacji Miar i Jakości.

2. Andrzej Czerwiński, Akumulatory, baterie, ogniwa. Wydawnictwa Komunikacji i Łączności, Warszawa, 2012.

3. Hariharan Krishnan S., Piyush Tagade, Sanoop Ramachandran. Mathematical Modeling of Lithium Batteries: From Electrochemical Models to State Estimator Algorithms. Springer, 2017.

4. Akumulatory do napędu pojazdów elektrycznych drogowych - Część 3: Badania dotyczące działania i trwałości (kompatybilne w ruchu kołowym pojazdy do ruchu miejskiego) PN-EN 61982-3 / Polski Komitet Normalizacyjny.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	35	1,0
Student's own work (literature studies, preparation for classes, project preparation, preparation for tests)[1] [1]	15	1,0

[1] delete or add other activities as appropriate