COURSE DESCRIPTION CARD - SYLLABUS

Course name

Hybrid powertrains in transportation

Course

Field of study

Transport

Year/Semester

3/6

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

15

Projects/seminars

0

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

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Faculty of Civil and Transport Engineering

Piotrowo 3 street, 60-965 Poznan

Responsible for the course/lecturer:

Prerequisites

KNOWLEDGE: the student has a basic knowledge of the design and construction of components and systems of hybrid drives

SKILLS: the student is able to integrate the obtained information, interpret it, draw conclusions, formulate and justify opinions

SOCIAL COMPETENCES: the student is aware of the importance and understands the non-technical aspects and effects of transport activities

Course objective

Providing basic information on the construction and construction of hybrid drives in passenger vehicles, trucks and buses, taking into account the latest solutions

Course-related learning outcomes

Knowledge

The student has extended and in-depth knowledge of physics useful for formulating and solving selected technical tasks, in particular for correct modeling of real problems

The student has ordered and theoretically founded general knowledge in the field of key issues of technology and detailed knowledge in the field of selected issues in this discipline of transport engineering

The student has knowledge of important development trends and the most important technical achievements and of other related scientific disciplines, in particular transport engineering

Skills

The student is able to properly plan and conduct perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions

The student is able, when formulating and solving tasks in the field of transport, to apply appropriately selected methods, including analytical, simulation or experimental methods

The student is able - in accordance with the given specification - to design (create a model of a fragment of reality), formulate a functional specification in the form of use cases, formulate non-functional requirements for selected quality characteristics) and implement a device or a widely understood system in the field of means of transport, using appropriate methods, techniques and tools

The student is able to design elements of means of transport using data on environmental protection

Social competences

The student understands that in technology, knowledge and skills very quickly become obsolete

The student is aware of the importance of knowledge in solving engineering problems, knows examples and understands the causes of malfunctioning transport systems that have led to serious financial and social losses or to serious loss of health and even life

The student can think and act in an entrepreneurial way, incl. finding commercial applications for the created system, taking into account not only business benefits, but also social benefits of the conducted activity

The student correctly identifies and solves dilemmas related to the profession of a transport engineer

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

For discussion, ongoing preparation and activity in class. Written credit. Mandatory individual reports from exercises and laboratories.

Programme content

Possibilities of using hybrid drives in means of transport. Division and characteristics of hybrid drives (series, parallel and mixed systems). Elements and structure of the drive train, examples of hybrid drive structures in passenger cars, trucks and buses. Internal combustion and electric drive: connection methods and analysis of operating states. Examples of the construction of hybrid drives in various means of transport. Hybrid hydraulic drives, advantages, disadvantages, application possibilities. Hybrid drives with fuel cells. Emissivity of hybrid drives: their advantages and disadvantages. Development trends of hybrid drives.

Teaching methods

1. Lecture with multimedia presentation

2. Exercises - solving problems

3. Laboratory

Bibliography

Basic

1. Merkisz J., Pielecha I.: Układy mechaniczne pojazdów hybrydowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2015.

2. Merkisz J., Pielecha I.: Układy elektryczne pojazdów hybrydowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2015

3. Merkisz J., Pielecha I.: Alternatywne napędy pojazdów. Wydawnictwo Politechniki Poznańskiej, Poznań 2006.

4. Merkisz J., Pielecha I.: Alternatywne paliwa i układy napędowe pojazdów. Wydawnictwo Politechniki Poznańskiej, Poznań 2004.

5. Czerwiński A.: Akumulatory, baterie, ogniwa. WKiŁ, Warszawa 2005.

6. Szumanowski A.: Akumulacja energii w pojazdach, WKiŁ, Warszawa 1984.

Additional

1. Conference materials on hybrid drives

2. Combustion Engines quarterly

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	4,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	45	2,0

[1] delete or add other activities as appropriate