COURSE DESCRIPTION CARD - SYLLABUS

Course name
Alternative powertrains [N2Trans1-TrN>AŹN]

Course

Field of study
Transport

Year/Semester
1/1

Area of study (specialization)
Low-emission Transport

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
9

Laboratory classes
0

Other
0

Tutorials
9

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr hab. inż. Wojciech Cieślik
wojciech.cieslik@put.poznan.pl

Lecturers

Prerequisites

KNOWLEDGE: the student has basic knowledge about the design and construction of vehicle propulsion systems and alternative energy sources SKILLS: the student is able to integrate information obtained, interpret it, draw conclusions, formulate and justify opinions. SOCIAL COMPETENCES: the student is aware of non-technical aspects and effects of transport activities

Course objective

Providing basic information about the design, construction and operation of alternative powertrains in means of transport with a special focus on passenger vehicles, trucks and public transport with the latest solutions.

Course-related learning outcomes

Knowledge:
He has advanced and in-depth knowledge of transport engineering, theoretical fundamentals, tools and means used to solve simple engineering problems
Has a structured and theoretically underpinned general knowledge related to key issues of transport engineering Has an elementary knowledge of the environmental impact of machinery and technology

and global energy balances
Knows advanced methods, techniques and tools used in solving complex engineering tasks and conducting research in a selected area of transport

Skills:
Can obtain information from literature, databases and other sources (in Polish and English), integrate it, interpret and critically evaluate it, draw conclusions and formulate and substantiate opinions in a comprehensive manner.
Can plan and conduct experiments, including measurements and simulations, interpret results and draw conclusions and formulate and verify hypotheses related to complex engineering problems and simple research problems
Can assess the suitability and applicability of new developments (methods and tools) and new transport technology products

Social competences:
Understands the importance of using the latest knowledge in transport engineering to solve research and practical problems
Is aware of the need to develop professional achievements and to observe rules of professional ethics
Understands the importance of popularizing the latest developments in transport engineering

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
For discussion and ongoing preparation and activity during classes. Obligatory individual exercise reports. Written examination from the lecture material, credit for exercises based on the work done.

Programme content

Possibilities of using alternative powertrains in the means of transport. Division and characteristics of alternative fuels. Possibilities of using alternative sources of propulsion in motor vehicles and other means of transport. Possibilities of using hydrogen in vehicles: scope of internal combustion engine modifications, consequences, emission efficiency of propulsion. Possibilities of hydrogen production, storage and distribution. Construction of passenger vehicle electrical systems. Utilization of electric propulsion: methodology of electric motors and batteries selection. Range of electric vehicle. Batteries in automotive vehicles: determination of parameters. Application and generations of LPG and CNG injection systems and the possibility of adaptation of internal combustion engines to this fuel.

Course topics

none

Teaching methods

1. Lecture with multimedia presentation
2. Exercises - solving problems

Bibliography

Basic
1. Merkisz J., Pielecha I., Układy mechaniczane pojazdów hybrydowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2015
2. Merkisz J., Pielecha I., Układy elektryczne pojazdów hybrydowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2015
2. Torsten Schmidt. Pojazdy hybrydowe i elektryczne w praktyce warsztatowej. Budowa, działanie, podstawy obsługi. WKŁ, 2020
Additional
1. Pielecha I., Cieślik W., Szałek A. The use of electric drive in urban driving conditions using a hydrogen powered vehicle – Toyota Mirai. Combustion Engines. 2018, 172(1), 51-58. DOI: 10.19206/CE-2018-106
2. Marek Brzeżański, Zdzisław Juda. BOSCH Napędy hybrydowe, ogniwa paliwowe i paliwa alternatywne. WKŁ 2010

3. Pielecha I., Cieślik W., Merkisz J., Analysis of the electric drive mode use and energy flow in hybrid drives of SUVs in urban and extra-urban traffic conditions. Journal of Mechanical Science and Technology. 2019, 33(10); 5043-5050. DOI 10.1007/s12206-019-0943-4
4. Pielecha I., Cieślik W., Szałek A. Energy recovery potential through regenerative braking for a hybrid electric vehicle in a urban conditions. IOP Conference Series: Earth and Environmental Science. 2019, 214, 012013, 1-10. DOI: 10.1088/1755-1315/214/1/012013
5. Vehicle manufacturers" information material

Breakdown of average student's workload

	Hours	ECTS
Total workload	48	2,00
Classes requiring direct contact with the teacher	18	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00