COURSE DESCRIPTION CARD - SYLLABUS

Course name

Energy management in drives

Course

Field of study

Mechanical and Automotive Engineering

Year/Semester

2/2

Area of study (specialization)

Hybrid powertrain systems

Profile of study

Level of study

Course offered in

polish

Form of study

Requirements

Number of hours

Lecture

0

Laboratory classes

9

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

dr inż. Wojciech Cieślik

email: wojciech.cieslik@put.poznan.pl

tel. 61-2244502

Wydział Inżynierii Lądowej i Transportu

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

KNOWLEDGE: the student has a basic knowledge of the design and construction of internal combustion engine system components

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 non-technical aspects and effects of the operation of internal combustion engines and their impact on the natural environment

Course objective

Providing basic information on the construction, design and operation of internal combustion engines, taking into account the latest solutions.

Course-related learning outcomes

Knowledge

Has extensive knowledge of modern machine manufacturing technologies in the field of designing the production process of machine parts and their assembly using computer CAM tools.

Has a general knowledge of the types of research and methods of testing working machines with the use of modern measurement techniques and data acquisition.

Has extended knowledge of the standards for working machines in the field of methods of calculating and testing machines, safety, including road safety, environmental protection as well as mechanical and electrical interface.

Skills

Can formulate and test hypotheses related to simple research problems.

Is able to carry out basic measurements of mechanical quantities on the tested working machine with the use of modern measuring systems.

Can communicate on specialist topics with a diverse audience.

Can lead the team's work.

Social competences

He is ready to critically assess his knowledge and received content.

Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on its own.

Is ready to fulfill professional roles responsibly, taking into account changing social needs, including:

- developing the professional achievements,

- maintaining the ethos of the profession,

- observing and developing the rules of professional ethics and acting towards the observance of these rules.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

For discussion, ongoing preparation and activity in class. Mandatory individual reports on laboratory activities. Written completion of the laboratory classes.

Programme content

Measurements of quick-changing pressures in the cylinder of an internal combustion engine. Methods of indicating internal combustion engines. Analysis of fuel injection and atomization in internal combustion engines. Optical methods of injection and combustion diagnostics. Internal and external balance of an internal combustion engine. Energy balance of various types of drive systems. Energy flow

management in electric and hybrid drive systems. Internal combustion engine operation conditions in alternative drive systems (series drives, parallel drives (mild, full hybrid)).

Teaching methods

1. Laboratories - solving problems, teaching laboratories

Bibliography

Basic

1. Ireneusz Pielecha. Optyczne metody wtrysku i spalania benzyny. Wydawnictwo Politechniki Poznańkiej 2017

2. Wojciech Serdecki. Badania silników spalinowych. Wydawnictwo Politechniki Poznańkiej 2012

3. Sławomir Luft. Podstawy budowy silników. WKŁ Warszawa 2009

4. Merkisz J. Pielecha I., Układy mechaniczne pojazdów hybrydowych, Wydawnictwo Politechniki Poznańskiej, Poznan 2015.

5. Merkisz J. Pielecha I., Układy mechaniczne pojazdów hybrydowych, Wydawnictwo Politechniki Poznańskiej, Poznan 2015.

6. Schmidt T. Pojazdy hybrydowe i elektryczne w praktyce warsztatowej, WKŁ, Warszawa 2020

Additional

1. Andreas Wimmer, Josef Glaser. Indykowanie silnika. Warszawa 2004

2. Cieślik W., Pielecha I. Evaluation of mixture swirl in the cylinder chamber in a conceptual system with combustion surrounded by inactive gases. Combustion Engines. 2018, 175(4), 40-47. doi:10.19206/CE-2018-406

3. Pielecha I., Cieslik W. Thermodynamic analysis of indexes of operation of the engine with direct fuel injection for idle speed and acceleration. Journal of Thermal Analysis and Calorimetry. Mai 2016. doi: 10.1007/s10973-016-5544-1

4. Publikacje w czasopiśmie Combustion Engines

Breakdown of average student's workload

	Hours	ECTS
Total workload	15	1,0
Classes requiring direct contact with the teacher	9	0,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	6	0,5

[1] delete or add other activities as appropriate