



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Energy management in drives

Course

Field of study

Mechanical and Automotive Engineering

Area of study (specialization)

Hybrid powertrain systems

Level of study

Form of study

Year/Semester

2/2

Profile of study

Course offered in

polish

Requirements

Number of hours

Lecture

0

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

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Wydział Inżynierii Lądowej i Transportu

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

KNOWLEDGE: the student has basic general knowledge about the construction of the surrounding world and the laws that govern it.

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 social and economic importance of internal combustion engines

Course objective

Introduction to the methodology of testing the functional properties of transport environmental pollutants and the emission of toxic compounds from hybrid drives



Course-related learning outcomes

Knowledge

Has extended knowledge of modern construction materials such as carbon plastics, composites, ceramics, in terms of their construction, processing technology and applications.

Has extended knowledge of thermodynamics and fluid mechanics to the extent necessary to understand the principle of operation and calculations of thermodynamic and flow processes occurring in working machines such as heating, cooling, drying, thermal and pressure agglomeration, etc., pneumatic transport, energy conversion, etc.

He has in-depth knowledge of the construction, principles of operation and classification of machines from a selected group.

Skills

Can write user manual and safety manual for designed work machine or vehicle.

He can estimate the potential threats to the environment and people from the designed working machine and vehicle from a selected group.

Can plan and carry out experimental research of specific processes taking place in machines and routine tests of a working machine or a vehicle from a selected group of machines.

Can perform a medium complex design of a working machine or its assembly using modern CAD tools, including tools for spatial modeling of machines and calculations using the finite element method.

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 willing to think and act in an entrepreneurial manner.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Discussion with the use of illustrative materials related to the methodology of environmental pollution measurements. Written exam

Programme content

Methods of measuring toxic compounds in the exhaust gas (analyzers: NDIR, FID, CLD, MPD, chromatography elements, measurement of solid particles, opacimeters). Standards and methods of testing the emission of toxic compounds of conventional and hybrid drives; tests of vehicles with a total mass of less than and over 3500 kg, tests of engines for other than automotive use, forecasts for the development of standards and test methods Polish legislation on pollutant emissions, including hybrid drives. Methods for measuring pollution in drives of road, rail and sea transport units (mainly hybrid). Fundamentals of unconventional research methods (fast photography, VIDEO technique, emission and



absorption techniques, laser, etc.). Measurement methods used in static tests. Methodology of research tests intended for dynamic research. Methodology for measuring pollutants in real conditions of hybrid drive traffic. Construction and operation of mobile analyzers for the measurement of gaseous compounds and solid particles (in terms of mass, number and diameter distribution).

Teaching methods

problem lecture / conversation lecture / lecture with multimedia presentation

Bibliography

Basic

1. Pielecha J. (red.), Badania emisji zanieczyszczeń silników spalinowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2017
2. Merkisz J., Pielecha J., Radzimirski S., New Trends in Emission Control in the European Union. Springer Tracts on Transportation and Traffic, Vol. 1, 2014.
3. Merkisz J. Fuć P., Pielecha J., Metody pomiaru emisji związków szkodliwych spalin w rzeczywistych warunkach ruchu pojazdów samochodowych. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa–Poznań 2014.

Additional

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

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,0
Classes requiring direct contact with the teacher	15	0,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	10	0,5

¹ delete or add other activities as appropriate