



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Ecological aspects of combustion engines

Course

Field of study

Construction and Exploitation of Means of Transport

Area of study (specialization)

Internal Combustion Engines

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

DEng. Andrzej Ziółkowski

email: andrzej.j.ziolkowski@put.poznan.pl

tel. +48 61 665-21-41

Faculty of Civil and Transport Engineering

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge: The student should have general knowledge of chemistry, physics and mathematics. In addition, he should have knowledge of the construction of the vehicle and the operation of the internal combustion engine. He should have a general knowledge of environmental hazards.

Skills: The student is able to integrate the obtained information, interpret it, draw conclusions, formulate and justify opinions, has a general knowledge of health and safety.

Social competences: The student is able to integrate the obtained information, interpret it, draw conclusions, formulate and justify opinions, has a general knowledge of health and safety.



Course objective

Learning about the basic threats to the natural environment caused by anthropogenic human activity. Getting acquainted with the methods of measuring pollutant emissions in laboratory conditions and in real operating conditions. Getting to know the methodology of conducting Real Driving Emissions measurements and the construction and operation of PEMS instruments. Presentation and analysis of methods of reducing emissions from automotive sources.

Course-related learning outcomes

Knowledge

1. Knowledge of methods of reducing pollutant emissions.
2. Knowledge of general ecological conditions of means of transport.
3. Knowledge of pollutant emission measurement methodology.
4. Knowledge of the methodology of emission measurements according to Real Driving Emissions.
5. Knowledge of PEMS type measuring equipment

Skills

1. Ability to classify vehicle categories.
2. Ability to analyze the factors shaping the ecological process in the transport sector.
3. Ability to analyze legal acts concerning the approval of vehicles of various categories with regard to pollutant emissions.
4. Ability to calculate emission tests.
5. Ability to conduct pollutant emission measurements in laboratory conditions.
6. Ability to conduct pollutant emission measurements in real operating conditions.
7. Ability to use PEMS apparatus.
8. Ability to calculate emission tests.

Social competences

1. Possibility of shaping ecological awareness in the social environment.
2. Awareness of social threats in terms of environmental protection.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Assessment carried out after the lectures, covering the program content presented during the classes. The most important ones include: biogenic and anthropogenic sources of pollutant emissions, toxic compounds and the causes of their formation, approval regulations in the field of pollutant emissions



for vehicles of various categories, methods of measuring pollutant emissions, methods of reducing pollutant emissions, methods of exhaust energy recovery.

Programme content

Conducting a lecture and exercises containing the following content:

1. Anthropogenic and biogenic sources of pollutant emissions.
2. Pollutant emission approval provisions for vehicles of different categories.
3. Methods of measuring pollutant emissions in laboratory conditions.
4. Methods of measuring pollutant emissions in real operation conditions.
5. Construction and operation of PEMS apparatus.
6. Methodology of determining research routes compliant with RDE.
7. Methods of reducing pollutant emissions - engine and non-engine.
8. Exhaust energy recovery systems.
9. Energy balance of the drive system.
10. Calculation of emission tests.

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.

Bibliography

Basic

1. Fuc. P., Merkisz J., Lijewski P., Fizykochemiczne aspekty budowy i eksploatacji filtrów cząstek stałych. Wydawnictwo Politechniki Poznańskiej, 2016.
2. Merkisz J., Pielecha J., Emisja cząstek stałych ze źródeł motoryzacyjnych. Wydawnictwo Politechniki Poznańskiej, 2014.
3. Merkisz J., Fuć P., Pielecha J., Metody pomiaru emisji związków szkodliwych spalin w rzeczywistych warunkach ruchu pojazdów samochodowych. Oficyna Wydawnicza Politechniki Warszawskiej 2014.
4. Jacyna M., Merkisz J., Kształtowanie systemu transportowego z uwzględnieniem emisji zanieczyszczeń w rzeczywistych warunkach ruchu drogowego. Oficyna Wydawnicza Politechniki Warszawskiej 2014.
5. Wajand J.A., Wajand J.T., Tłokowe silniki spalinowe średnio- i szybkoobrotowe, WNT, 2005.



Additional

1. Pielecha J., Badania emisji zanieczyszczeń silników spalinowych. Wydawnictwo Politechniki Poznańskiej 2017.
2. Serdecki W., Badania silników spalinowych. Wydawnictwo Politechniki Poznańskiej, 2012.
3. Scientific articles of journals: Combustion Engines, Transportation Research, Transportation
4. Digital library of Society of Automotive Engineers

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	30	1,0

¹ delete or add other activities as appropriate