



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Environment and ecology

### Course

Field of study

Construction and Exploitation of Means of Transport

Area of study (specialization)

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

4/7

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

9

Laboratory classes

9

Other (e.g. online)

Tutorials

9

Projects/seminars

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

second person allowed

### 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. Defining the basic harmful and toxic compounds emitted to the atmosphere due to the combustion of fossil fuels. Explaining the reasons for their formation and sources in various fields: heavy industry, transport and households. Getting acquainted with the methods of measuring pollutant emissions in laboratory conditions and in real operating conditions. Presentation and analysis of methods of reducing emissions from automotive sources.

### Course-related learning outcomes

#### Knowledge

1. Knowledge of the classification of harmful and toxic compounds.
2. Knowledge of legal acts related to the emission of pollutants.
3. Knowledge of methods of reducing pollutant emissions.
4. Knowledge of general ecological conditions of means of transport.
5. Knowledge of pollutant emission measurement methodology.

#### 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 carry out pollutant emission measurements in laboratory and real conditions.

#### 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:

The exam is carried out after the series of lectures and exercises, 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. Mandatory individual reports on laboratory activities. Final credit of laboratory classes.



## Programme content

Conducting a lecture and exercises containing the following content:

1. Anthropogenic and biogenic sources of pollutant emissions.
2. Harmful and toxic compounds of exhaust gases - type, causes of their formation.
3. Pollution type approval provisions for vehicles of different categories.
4. Methods of measuring pollutant emissions in laboratory conditions.
5. Methods of measuring pollutant emissions in real operation conditions.
6. Methods of reducing emissions of pollutants - engine and non-engine.
7. Exhaust energy recovery systems.
8. Energy balance of the drive system.
9. Calculation of emission tests.

## Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.
2. Tutorials: problem solving, analysis of the research results.
3. Laboratory classes: practical exercises at research stands, preparation of a report.

## 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	80	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) <sup>1</sup>	35	2,0

<sup>1</sup> delete or add other activities as appropriate