



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Environment and ecology

### Course

Field of study

Mechanical and Automotive Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

15

Projects/seminars

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

DEng. Andrzej Ziółkowski

Responsible for the course/lecturer:

second person allowed

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### 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

Has basic knowledge in the field of chemistry, in the construction of the periodic table of elements and their properties, the theory of chemical bonds, organic and inorganic compounds, types of chemical reactions, chemical analysis: in the scope enabling understanding of lectures on metal and non-metal materials, protection sciences environment, fuels and lubricants, building materials and soil, biomechanics and biological materials processed by agricultural and food machinery.

Has extended basic knowledge necessary to understand specialist subjects and specialist knowledge about the construction, construction methods, manufacturing and operation of a selected group of working, transport, thermal and flow machines covered by the diploma path.

Has elementary knowledge of the impact of machinery and technology on the natural environment and global energy balances.

Has elementary knowledge of the impact of technology changes on the organization of social life as well as the health and psyche of individuals in human-machine contact.

#### Skills

Can properly use modern equipment for measuring major physical quantities, used in machine research and production control.

Can competently advise on the selection of a machine for a given application in the industry covered by the selected diploma path based on the acquired knowledge about a given group of machines.

Can create a system diagram, select elements and perform basic calculations using ready-made computational packages of mechanical, hydrostatic, electric or hybrid machine drive system.

#### Social competences

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 his own.

Is ready to fulfill social obligations and co-organize activities for the benefit of the social environment.

### 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	100	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>	55	2,0

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