



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Research on emissions in transportation

### Course

Field of study

Year/Semester

Transport

3/6

Area of study (specialization)

Profile of study

Ecology of Transport

general academic

Level of study

Course offered in

First-cycle studies

Polish

Form of study

Requirements

part-time

elective

### Number of hours

Lecture

Laboratory classes

Other (e.g. online)

9

9

0

Tutorials

Projects/seminars

0

0

### Number of credit points

1

### Lecturers

Responsible for the course/lecturer:

Responsible for the course/lecturer:

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Faculty of Civil and Transport Engineering

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### Prerequisites

Knowledge: the student has a basic knowledge in chemistry, thermodynamics and maths

Skills: student is able to read chemical equations and technical drawings related to construction of measuring devices

Social competencies: understand the relationship between the construction and implementation of measuring devices

### Course objective

Introduction to the carrying out the functional tests of combustion engines and exhaust emissions



## Course-related learning outcomes

### Knowledge

The student has knowledge of important development trends and the most important technical achievements and of other related scientific disciplines, in particular transport engineering

The student knows the basic techniques, methods and tools used in the process of solving tasks in the field of transport, mainly of an engineering nature engineering

### Skills

The student can properly use information and communication techniques, applicable at various stages of the implementation of transport projects

The student has the ability to formulate tasks in the field of transport engineering and their implementation using at least one of the popular tools

The student is able to make a critical analysis of the functioning of transport systems and other technical solutions and to evaluate these solutions, including: is able to effectively participate in the technical inspection and assess the transport task from the point of view of non-functional requirements, has the ability to systematically conduct functional tests

### Social competences

The student is aware of the importance of knowledge in solving engineering problems, knows examples and understands the causes of malfunctioning transport systems that have led to serious financial and social losses or to serious loss of health and even life

The student understands that in technology, knowledge and skills very quickly become obsolete

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Discussion with illustrative materials use, related with measurement of exhaust emission in transport tasks. The written exam

## Programme content

Issues connected with control tests in European Union and United States of America. Control tests of vehicles in case of gaseous compounds exhaust emission. Road tests of cars and trucks equipped with SI and CI engines. Ability to assess fuel consumption using a two-dimensional probability density histograms. Rating emissivity of different propulsion systems including hybrid and start-stop systems. Vehicle emission measurements during real operation, using a mobile analyzer (measurement of gaseous components and the particulates? Qualitative and quantitative assessment. Carrying out exhaust emission research from engines fueled with different types of fuels (gasoline, diesel, gas) on engine test beds. Determination of exhaust emission histograms defining operation conditions of vehicles and their engines. Determination of emissivity vehicle under different conditions of their work. Determination of brake specific emission from vehicles in different operating conditions. Determination of brake specific emission from vehicles in actual and future homologation tests. Evaluation of the



exhaust emission from vehicles with different mileage. Methodology for vehicle exhaust emission assesment in real traffic conditions using data from the vehicle's diagnostic system

### Teaching methods

seminar lecture / lecture with multimedia presentation, laboratory / experiment execution / experiment design / observation / measurement

### Bibliography

#### Basic

1. Pielecha J. (red.), Badania emisji zanieczyszczeń silników spalinowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2017.
2. Merkisz J. Fuć P., Pielecha J., Metody pomiaru emisji związków szkodliwych spalin w rzeczywistych warunkach ruchu pojazdów samochodowych. Oficyna Wydawnicza Poli-techniki Warszawskiej, Warszawa?Poznań 2014
3. Merkisz J., Pielecha J., Emisja cząstek stałych ze źródeł motoryzacyjnych. Wydawnictwo Politechniki Poznańskiej, Poznań 2014.
4. Sher E. ? Handbook of Air Pollution from Internal Combustion Engines. Pollutant Formation and Control. Academic Press. Boston 1998.
5. Merkisz J., Pielecha J., Radzimirski S., New Trends in Emission Control in the European Union. Springer Tracts on Transportation and Traffic, Vol. 1, 2014.

#### Additional

1. Merkisz J., Mazurek S., Pielecha J., Pokładowe urządzenia rejestrujące w pojazdach, Wydawnictwo Politechniki Poznańskiej, Poznań 2007.
2. Merkisz J., Pielecha I., Alternatywne napędy pojazdów. Wydawnictwo Politechniki Poznańskiej, Poznań 2006.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	33	1,0
Classes requiring direct contact with the teacher	18	0,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	15	0,5

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