



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Research on vehicle powertrains [S1Trans1>BJNP]

### Course

Field of study

Transport

Year/Semester

3/6

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

elective

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

1,00

### Coordinators

prof. dr hab. inż. Jacek Pielecha

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### Lecturers

### Prerequisites

Knowledge: student has a basic knowledge about the construction and operation principle of vehicles propulsion units Skills: student is able to read technical drawings and diagrams related to vehicles propulsion units. Social competencies: understand the relationship between the construction, design and implementation of vehicle propulsion units

### Course objective

Provide the basic knowledge about vehicles propulsion units research. Acquainted with the measuring devices used during tests of propulsion units and their functional systems

### Course-related learning outcomes

Knowledge:

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

The student has knowledge of ethical codes regarding transport engineering, is aware of the dangers related to environmental protection and understands the specificity of mission-critical systems

### Skills:

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

The student is able - in accordance with the given specification - to design (create a model of a fragment of reality), formulate a functional specification in the form of use cases, formulate non-functional requirements for selected quality characteristics) and implement a device or a widely understood system in the field of means of transport, using appropriate methods, techniques and tools

### 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:

Learning outcomes presented above are verified as follows:

Discussion with use of visual materials related to research in the field of powertrain for different vehicles.  
The written examination

### Programme content

Measurement of following parameters: engine rotational speed, engine torque, engine power output, air and fuel consumption. Also measurement of combustion parameters, like: in-cylinder pressure (with rules for the selection of the measuring channel elements, types of indicator diagrams and their characteristic points, errors in indicating process). Types and construction of the propulsion units. Propulsion units of road, rail and sea. Components of the drive units. Selected aspects of metrology. Construction and components of the measurement system. 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 assessment in real traffic conditions using data from the vehicle's diagnostic system.

### Course topics

none

### Teaching methods

seminar lecture / lecture with multimedia presentation

### Bibliography

Basic

1. Pielecha J. (red.), Badania emisji zanieczyszczeń silników spalinowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2017
2. ISO: Reciprocating internal combustion engines ? Exhaust emission measurement ? Part 1: Test-bed measurement of gaseous and particulate emission. Draft International Standard ISO/DIS 8178-1.2,1995.
3. Merkisz J., Pielecha J., Radzimirski S., New Trends in Emission Control in the European Union. Springer

Tracts on Transportation and Traffic, Vol. 1, 2014.

4. Merkiś J., Pielecha J., Emisja cząstek stałych ze źródeł motoryzacyjnych. Wydawnictwo Politechniki Poznańskiej, Poznań 2014.

5. Merkiś 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. Merkiś J., Pielecha I., Alternatywne napędy pojazdów. Wydawnictwo Politechniki Poznańskiej, Poznań 2006.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	35	1,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	5	1,00