



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Vehicle powertrains [N1Trans1>SN]

### Course

Field of study

Transport

Year/Semester

3/5

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

part-time

Requirements

elective

### Number of hours

Lecture

18

Laboratory classes

9

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

4,00

### Coordinators

prof. dr hab. inż. Piotr Lijewski  
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### Lecturers

### Prerequisites

The knowledge of the basics of machine construction and mathematical analysis. The ability to analyze and synthesize information, draw conclusions, formulate and justify opinions. Being open to acquiring new social skills.

### Course objective

Understanding basic concepts related to the design and operation of vehicle powertrains, road vehicles in particule.

### Course-related learning outcomes

Knowledge:

General knowledge in the field of technology and detailed knowledge of selected issues in the discipline of transport engineering and vehicle powertrains.

examples of a malfunctioning transport systems which generate financial losses or health problems.

Skills:

Preparing and perform scienses experiments such as: measurements and computer simulations, analysis

of measurement results and prepare conclusions. Moreover design and prepare transport systems and transport means with appropriate methods.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Discussions during lectures. Exam and an individual interview, the purpose of which is to check the understanding of the essence of the issues described in the program content

### Programme content

The importance of the vehicle's propulsion system. Alternatives to the internal combustion engine in transport. Design and operation of combustion engine. Types of internal combustion engines, presentation of models and sections of engines. Information on conventional and alternative engine fuels, key information on the fuel combustion process. Characteristics of the engines. Modern design solutions for internal combustion engines. Ecological aspects of the use of powertrains, emitted toxic compounds and methods of reducing them. Trends in the development of modern vehicle powertrains, electrification of vehicle drive systems. Construction of a hybrid drive system, types of hybrid drive systems. Electric drive systems, structure and properties. Indicators and characteristics of drive systems. Energy storage of vehicle propulsion systems. Basic information about fuel cells used in vehicles.

### Course topics

none

### Teaching methods

Lecture with multimedia presentation. Discussion with students.  
Classes in the engine laboratory.

### Bibliography

Basic

1. Serdecki W. (red.): Badania silników spalinowych Laboratorium. WPP, Poznań, 2012 lub późniejsze wydania.
2. Wajand Jan A., Wajand Jan T.: Tłokowe silniki spalinowe średnio- i szybkoobrotowe. WNT, Warszawa, 2005.
3. Niewiarowski K.: Tłokowe silniki spalinowe. WKiŁ, Warszawa, 1983.
4. Merkisz J., Pielecha I., Układy mechaniczne pojazdów hybrydowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2015.
5. Merkisz J., Pielecha I., Układy elektryczne pojazdów hybrydowych. Wydawnictwo Politechniki Poznańskiej, Poznań 2015.

Additional

Scientific journals and papers (e.g. Combustions Engines, SAE, MTZ).

### Breakdown of average student's workload

|   | Hours | ECTS |
|---|-------|------|
| Total workload  | 80    | 4,00 |
| Classes requiring direct contact with the teacher   | 27    | 1,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 63    | 3,00 |