



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Powertrains in transportation

### Course

Field of study

Aerospace engineering

Area of study (specialization)

–

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

### Number of hours

Lecture

18

Laboratory classes

9

Other (e.g. online)

0

Tutorials

9

Projects/seminars

0

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

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Faculty of Civil Engineering and Transport

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

### Prerequisites

Knowledge: Basic knowledge of physics, mechanics, fluid mechanics, thermodynamics. The student has knowledge of the basics of machine construction. The student has a basic knowledge of mathematical analysis.

Skills: The ability to think analytically, conduct a cause-and-effect analysis

Social competences: The student demonstrates elementary social competences adequate to the place and situation, is open to acquiring new social skills.



### Course objective

Acquainting with the types and construction of drives of means of transport and the consequences of their use. Review of contemporary designs of drives in means of transport.

### Course-related learning outcomes

#### Knowledge

1. Has extended knowledge necessary to understand the profile subjects as well as specialist knowledge about the construction, operation, air traffic management, safety systems, economic, social and environmental impact in the field of aviation and aerospace [K2A\_W01]
2. Has detailed knowledge related to selected issues in the field of manned and unmanned aerial vehicles, in the field of on-board equipment, control systems, communication and registration systems, automation of individual systems [K2A\_W03]
3. Has detailed knowledge related to selected issues in the field of ground handling of aircraft and propulsion systems, including logistic aspects [K2A\_W19]
4. Has an extended vision in the field of legal regulations regarding the certification of aviation propulsion, methodology of measuring emissions of toxic exhaust gases, methods of parameterization of the emission of harmful compounds [K2A\_W31]

#### Skills

1. Can use formulas and tables, technical and economic calculations using a spreadsheet, specialized software [K2A\_U05]
2. Can draw a diagram and a complex machine element in accordance with the rules of technical drawing, can create a system diagram, select elements and perform basic calculations of the electrical and electronic system of assemblies of machines or aviation and space devices [K2A\_U06]
3. Can analyze objects and technical solutions, can search in catalogs and on manufacturers' websites ready components of machines and devices, including transport and storage means and devices, assess their suitability for use in own technical and organizational projects [K2A\_U09]
4. Can assess material and environmental costs as well as labor costs for the implementation of aviation modules and on-board devices [K2A\_U14]

#### Social competences

1. Understands the need for lifelong learning; can inspire and organize the learning process of other people [K2A\_K01]
2. Is ready to critically evaluate his knowledge and received content, recognize the importance of knowledge in solving cognitive and practical problems and consult experts in the event of difficulties with solving the problem on his own [K2A\_K02]
3. Is aware of the social role of a technical university graduate, and especially understands the need to formulate and transmit to the society, in particular through the mass media, information and opinions



on technological achievements and other aspects of engineering activities; makes efforts to provide such information and opinions in a commonly understandable manner [K2A\_K08]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

LECTURE: written exam from the content presented during the lecture

TUTORIALS: written test on the subject of tasks carried out during the classes

LABORATORY: written reports on laboratory classes

### Programme content

History of the development of drives for means of transport. Theoretical foundations of drive operation. Principle of operation of a reciprocating internal combustion engine and basic components. Division of engines and their application. Characteristics of internal combustion engines. Principle of operation, design and characteristics of engines. Tendencies and directions of development of internal combustion engines and other drives. Alternatives to the internal combustion piston engine in transport.

### Teaching methods

Informative (conventional) lecture (providing information in a structured way) - may be of a course (introductory) or monographic (specialist) character.

The exercise method (subject exercises, practice exercises) - in the form of auditorium exercises (applying the acquired knowledge in practice - may take various forms: solving cognitive tasks or training psychomotor skills; transforming a conscious activity into a habit through repetition).

Laboratory (experiment) method (students independently carry out experiments).

### 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. Dzierżanowski P., Kordziński W., Otyś J., Łyżwiński M., Szczeciński S., WiatrekR.: Napędy Lotnicze. Turbinowe silniki odrzutowe. WKŁ, Warszawa 1983.
5. Dzierżanowski P., Kordziński W., Otyś J., Szczeciński S., WiatrekR.: Napędy Lotnicze. Turbinowe silniki śmigłowe i śmigłowcowe. WKŁ, Warszawa 1985.



Additional

### Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	40	1,0
Student's own work (literature studies, preparation for tests/exam) <sup>1</sup>	60	3,0

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