



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Environmental protection

### Course

Field of study

Aerospace engineering

Area of study (specialization)

–

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/4

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

### Number of hours

Lecture

30

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

dr hab. inż. Miłosław Kozak

Responsible for the course/lecturer:

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### Prerequisites

Knowledge: the student has basic general knowledge about the construction of the surrounding world and the laws that govern it

Skills: the student is able to integrate the obtained information, interpret it, draw conclusions, formulate and justify opinions

Social competences: the student is aware of the social and economic importance of environmental protection

### Course objective

To acquaint students with the basic concepts of environmental protection and the main ecological



threats related to the operation of technical means of transport and possible remedial actions. Shaping pro-ecological attitudes of students

### Course-related learning outcomes

#### Knowledge

1. Has an orderly, theoretically founded general knowledge covering key issues in the field of the impact of aviation on the natural environment, emission of toxic compounds from aircraft propulsion, acoustic emission of flying objects [K2A\_W08]
2. Has knowledge of the method of presenting test results in tabular and graph form, performing the analysis of measurement uncertainties [K2A\_W29]
3. Has extended knowledge of the impact of aviation on the environment, methods of reducing the emission of toxic exhaust gases, noise emissions and the use of alternative fuels [K2A\_W30]

#### Skills

1. Can assess material and environmental costs and workload for the implementation of aviation modules and on-board devices [K2A\_U14]
2. The student is able to make a comprehensive assessment of the ecological parameters of an aircraft propulsion unit based on the values of the emission factors for harmful gaseous compounds and particulate matter [K2A\_U22]

#### 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 the knowledge and content received, recognize the importance of knowledge in solving cognitive and practical problems and consult experts in the event of difficulties with solving the problem on their own [K2A\_K02]
3. Is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment, and the related responsibility for decisions [K2A\_K03]
4. 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 the achievements of technology and other aspects of engineering activities; makes efforts to provide such information and opinions in a generally understandable manner [K2A\_K08]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

LECTURE: For discussion, ongoing preparation and activity in class. Written credit.

LABORATORY: Obligatory individual reports from laboratory activities. Final credit of laboratory classes.

### Programme content



Introduction to environmental protection and ecology. Basic environmental threats from transport. Influence of consumables on environmental pollution by transport. The mechanism of formation and methods of reducing the emission of toxic exhaust components. Exhaust gas treatment. Measurement methods and standards for the emission of toxic compounds. Generation and reduction of noise and vibrations in transport. Additional activities in transport for environmental protection. Environmental hazards in the transport of dangerous goods. Recycling of vehicles and their assemblies and components. Energy consumption in transport. Transport and global warming. Methods of valuation of environmental losses caused by transport. Main assumptions of sustainable transport.

### Teaching methods

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

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

### Bibliography

#### Basic

1. J. Gronowicz: Ochrona środowiska w transporcie lądowym. Wyd. Instytutu Technologii i Eksploatacji, Poznań ? Radom, 2003.
2. J. Merkisz: Ekologiczne Problemy silników spalinowych, Tom I i II. Wyd. Politechniki Poznańskiej, Poznań, 2000.
3. J. Merkisz, J. Pielecha, S. Radzimirski: Pragmatyczne podstawy ochrony powietrza atmosferycznego w transporcie drogowym. Wyd. Politechniki Poznańskiej, Poznań, 2009.

#### Additional

1. B. Dobrzańska, G. Dobrzański, D. Kiełczowski: Ochrona środowiska przyrodniczego. Wyd. Naukowe PWN, Warszawa 2008.
2. S. Zięba: Historia myśli ekologicznej. Wyd. KUL, Lublin 2004.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for tests/exam) <sup>1</sup>	30	1,0

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