



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Ecological aspects of air transport I

### Course

Field of study

Aerospace Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

3/6

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

36

Laboratory classes

Other (e.g. online)

0

Tutorials

18

Projects/seminars

18

### Number of credit points

7

### Lecturers

Responsible for the course/lecturer:

PhD Remigiusz Jasiński

Responsible for the course/lecturer:

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### Prerequisites

Knowledge and skills acquired during the implementation of the course Ecological Aspects of Air Transport I.

### Course objective

Extending the knowledge of the impact of aviation on the environment, introducing issues related to the ecology of aviation at an advanced level.

### Course-related learning outcomes

Knowledge

1. 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]



2. Has an extended vision in the field of legal regulations regarding the certification of aviation propulsion, methodology of measuring the emission of toxic exhaust gases, methods of parameterizing the emission of harmful compounds - [K2A\_W31]

#### Skills

1. Can communicate using various techniques in the professional and other environments, using the formal notation of the structure, technical drawing, concepts and definitions of the scope of the studied field of study - [K2A\_U02]

2. Has the ability to self-educate with the use of modern didactic tools, such as remote lectures, websites and databases, didactic programs, e-books - [K2A\_U03]

3. Can obtain information from literature, the Internet, databases and other sources. Is able to integrate the obtained information, interpret and draw conclusions from it, and create and justify opinions - [K2A\_U04]

4. Can use formulas and tables, technical and economic calculations using a spreadsheet, specialized software - [K2A\_U05]

5. The student knows how to use the theoretical probability distributions. The student is able to analyze and interpret statistical data. The student is able to use the methods and tools of mathematical statistics in engineering practice - K2A\_U21]

6. The student is able to make a comprehensive assessment of the ecological parameters of an aircraft propulsion unit based on the values of 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 made - [K2A\_K03]

4. Can cooperate and work in a group, taking different roles in it - [K2A\_K04]

5. Is aware of the social role of a technical university graduate, and especially understands the need to formulate and convey 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 generally understandable manner - [K2A\_K08]



### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

**LECTURE:** Assessment of knowledge and skills on the written or oral test based on the explanation of selected issues

**EXERCISES:** Assessment of knowledge and skills on the written test on the basis of solved tasks

**LABORATORY:** Assessment of knowledge and skills on the basis of reports from classes prepared by the student

### Programme content

#### LECTURE

Dimensional distribution of solid particles, parameterization of PM emissions, determination of indicators PM<sub>10</sub>, PM<sub>2.5</sub>, PN<sub>10</sub>, PN<sub>2.5</sub>, gaseous emission factors, the impact of the use of alternative fuels on the emission of toxic compounds, analytical methods for estimating emissions from aviation, simulation methods for determining pollutant emissions from ports micro and macro aviation, methods of reducing the impact of aviation on the environment, measurement methodology for the certification of aircraft propulsion.

#### EXERCISES:

Classes provide an example of solving the task on the blackboard (from the scope presented in the lecture) along with the analysis of subsequent stages. The way students solve the problem on the blackboard is reviewed by the tutor.

#### LAB:

Practical classes using the combustion engine laboratory. Extension of the issues related to the emission of toxic compounds from jet engines.

### 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 (application of 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 conduct experiments)

### Bibliography

Basic

1. Paweł Głowacki, Stefan Szczeciński: Transport lotniczy : zagrożenia ekologiczne oraz sposoby ich ograniczania, Wydawnictwa Naukowe Instytutu Lotnictwa, 2013.



2. Włodzimierz Balicki, Ryszard Chachurski, Paweł Głowacki, Jan Godzimski, Krzysztof Kawalec, Adam Kozakiewicz, Zbigniew Pągowski, Artur Rowiński, Jerzy Szczeciński, Stefan Szczeciński: Lotnicze silniki turbinowe : konstrukcja - eksploatacja - diagnostyka. Cz. 1, Wydawnictwa Naukowe Instytutu Lotnictwa, 2010
3. Jerzy Merkisz: Ekologiczne problemy silników spalinowych, Wyd. Politechniki Poznańskiej, Poznań 1998.
4. Jerzy Merkisz, Jacek Pielecha, Emisja cząstek stałych ze źródeł motoryzacyjnych. Wyd. Politechniki Poznańskiej, Poznań 2014.

Additional

1. Sumeer Charkuj, Piotr Kozłowski, Michał Nędza: Podstawy transportu lotniczego, Konsorcjum Akademickie Kraków–Rzeszów–Zamość 2012
2. Podręczniki szkoleniowe EASA ATPL Series

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	175	7,0
Classes requiring direct contact with the teacher	100	4,0
Student's own work (literature studies, preparation for tutorials, preparation for exam) <sup>1</sup>	75	3,0

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