



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Ecological aspects of aviation [S1Lot2>EAL]

### Course

Field of study

Aviation

Year/Semester

2/4

Area of study (specialization)

Aircraft Engines and Airframes

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

0

### Number of credit points

1,00

### Coordinators

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### Lecturers

### Prerequisites

Knowledge: The student has a basic knowledge of air transport. Skills: The student is able to associate and integrate the obtained information, analyze the phenomena occurring in the environment, draw conclusions, formulate and justify opinions. Social competences: The student is able to independently search for information in the literature and knows the rules of discussion; ability to formulate a research problem and search for its solution, independence in problem-solving, ability to cooperate in a group.

### Course objective

The aim of the course is to familiarize students with the impact of aviation on the environment, to present principles and methods for assessing the negative impact of air transport on the environment.

### Course-related learning outcomes

Knowledge:

1. Has ordered, theoretically founded general knowledge in the field of technology and various means of air transport, about the life cycle of means of transportation, both hardware and software, and in particular about the key processes taking place in them.
2. Has basic knowledge of environmental protection in transport, is aware of the risks associated with

environmental protection and understands the specificity of the impact of mainly air transport on the environment as well as social, economic, legal and other non-technical conditions of engineering activities

3. Has basic knowledge of aviation law, organizations operating in civil aviation and knows the basic principles of state aviation functioning, has basic knowledge of key issues in the functioning of civil aviation

Skills:

1. Can solve tasks using the rules of air traffic and design a runway in accordance with the applicable ICAO requirements
2. Is able to design elements of means of transport with the use of data on environmental protection
3. Is able to design means of transport with appropriate internal requirements (e.g. regarding environmental protection)

Social competences:

1. Understands that in technology, knowledge and skills very quickly become obsolete
2. Is aware of the importance of knowledge in solving engineering problems and knows examples and understands the causes of faulty engineering projects that have led to serious financial and social losses, or to a serious loss of health and even life
3. Is aware of the social role of a technical university graduate, in particular understands the need to formulate and provide the society, in an appropriate form, with information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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The knowledge and skills of the lecture will be tested in the form of a written test at the end of semester.

### Programme content

1. Environmental costs of transportation, energy transformations in aviation, latest statistics on the aviation sector and its impact on the environment.
2. Model combustion process vs. real combustion process, exhaust gas components.
3. Mechanisms of gaseous compound and particulate matter formation, including nucleation, aggregation, and volatile fraction.
4. Energy and environmental assessment of airport operations.
5. Measurement equipment, procedures, and applicable regulations.
6. Alternative propulsion systems and sustainable fuels.

### Course topics

1. Energy aspects of transport
2. Products of fuel combustion in aircraft engines
3. Processes of formation of toxic compounds
4. Impact of airport operations on the environment
5. Methods of measuring noise emissions and toxic compounds
6. Methods of reducing the impact of aviation on the environment
7. The latest scientific achievements in the field of aviation ecology

### Teaching methods

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

### 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 Godzinski, 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 Merkiś: Ekologiczne problemy silników spalinowych, Wyd. Politechniki Poznańskiej, Poznań 1998

Additional:

1. Sumeer Charkuj, Piotr Kozłowski, Michał Nęcza: 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                                                                                                                          | 25    | 1,00 |
| Classes requiring direct contact with the teacher                                                                                       | 15    | 0,50 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 10    | 0,50 |