

| <b>STUDY MODULE DESCRIPTION FORM</b>  |  |  |
|---|--|--|
| Name of the module/subject<br><b>Ecological aspects of air transport</b>  |  | Code<br><b>1010601141010603813</b>   |
| Field of study<br><b>Aerospace Engineering</b>  | Profile of study<br>(general academic, practical)<br><b>general academic</b> | Year /Semester<br><b>2 / 4</b>   |
| Elective path/specialty<br><b>Aircraft Transport</b>  | Subject offered in:<br><b>Polish</b>   | Course (compulsory, elective)<br><b>obligatory</b>   |
| Cycle of study:<br><b>First-cycle studies</b>   | Form of study (full-time, part-time)<br><b>full-time</b>                     |  |
| No. of hours<br>Lecture: <b>1</b> Classes: <b>-</b> Laboratory: <b>1</b> Project/seminars: <b>-</b>   |  | No. of credits<br><b>3</b>   |
| Status of the course in the study program (Basic, major, other)<br><b>other</b>   |  | (university-wide, from another field)<br><b>university-wide</b>  |
| Education areas and fields of science and art<br><b>technical sciences</b><br><b>Technical sciences</b>   |  | ECTS distribution (number and %)<br><b>3 100%</b><br><b>3 100%</b>   |
| <b>Responsible for subject / lecturer:</b><br><br>prof. dr hab. inż. Jerzy Merkisz<br>email: jerzy.merkisz@put.poznan.pl<br>tel. (061) 665-2207<br>Faculty of Transport Engineering<br>3 Piotrowo street, 60-965 Poznan, Poland   |  |  |
| <b>Prerequisites in terms of knowledge, skills and social competencies:</b>   |  |  |
| 1   | <b>Knowledge</b>   | Basic knowledge in recycling, chemistry, noise emissions   |
| 2   | <b>Skills</b>  | Able to apply the scientific method to solve problems, implement experiments and reasoning   |
| 3   | <b>Social competencies</b>   | Student knows the limitations of their knowledge and skills, is able to accurately formulate questions, understands the need for further education |
| <b>Assumptions and objectives of the course:</b><br>Detailed knowledge and analysis of the environmental problems concerning the use of internal combustion engines in aerospace applications.<br>Research toxic emissions: analysis of existing standards and regulations, including knowledge of the latest methods of measuring emissions of harmful compounds.  |  |  |
| <b>Study outcomes and reference to the educational results for a field of study</b>   |  |  |
| <b>Knowledge:</b><br>1. Has an elementary knowledge of the life cycle of the equipment recycling machine elements and structural materials and consumables - [[K1A_W19]]<br>2. Has an elementary knowledge of the impact of machinery and technology on the environment and global energy balances - [[K1A_W20]]<br>3. Has an elementary knowledge of the impact of changes in technology on the organization of social life and the health and psyche of individuals in touch human-machine - [[K1A_W21]]<br>4. Has an elementary knowledge of the law, and especially the rights of safety, copyright and industrial property protection and its impact on the system for the development of technology - [[K1A_W22]] |  |  |
| <b>Skills:</b><br>1. Is able to use a verbal one additional foreign language at the level of everyday language - [[K1A_U02]]<br>2. Is able to prepare and present a short presentation of verbal and dedicated multimedia performance engineering tasks - [[K1A_U05]]<br>3. Is able to apply basic technical standards for the unification and security, and recycling - [[K1A_U23]]  |  |  |
| <b>Social competencies:</b>   |  |  |

1. Is able to think and act in a creative and enterprising - [[K1A\_K05]]
2. Is aware of and understands the validity of the non-technical aspects and effects of engineering activities, including its impact on the environment and the associated responsibility for decisions - [[K1A\_K02]]
3. Understands the need and knows the possibilities of lifelong learning - [[K1A\_K01]]

### Assessment methods of study outcomes

Written test

#### Course description

Issues related to the organic: production of aircraft engines, their exploitation and utilization. Technical and economic issues associated with recycling.

Issues related to combustion in aircraft engines and the formation of harmful compounds, including the breakdown between piston and jet engines. Mechanisms of toxic components of exhaust and noise. The organization of air traffic? general assumptions, and ecological aspects of the construction of airports.

Methods of measurement of toxic compounds? analyzers, chromatography, measurement of particulate emissions test. The standards and test methods for toxic emissions? forecasts of the development of standards and methods of research.; emissions testing on-board. Research aircraft engines for motor hamowniach. The specificity of toxic compounds, depending on the design parameters and operating in aircraft engines: piston and flow. Reducing emissions CO2/zuzycia fuel in aircraft engines and flying objects. Problems related to noise? basic concepts and relationships, sources of noise in aircraft noise reduction standards, the selected method of measuring noise, minimizing noise.

The impact of the quality parameters and performance of fuel on the emission of toxic substances? conventional fuels, alternative fuels, and oils silnikowe. lasu, minimizing noise.

Overview of ecological design of aircraft engines and prospects for their development.

#### Basic bibliography:

1. Stanisław Wiąckowski, Toksykologia środowiska człowieka. Wydawnictwo: Branta, 2010 ISBN: 978-83-616-6806-0.
2. Merkiż Jerzy, Mazurek Stanisław, Pokładowe Systemy Diagnostyczne Pojazdów Samochodowych. Wydawnictwa Komunikacji i Łączności WKŁ, 2006-01-01.
3. Jerzy Merkiż, Ekologiczne problemy silników spalinowych, Wyd. Politechniki Poznańskiej, Poznań 1998.
4. Merkiż J., Pielecha I., Alternatywne napędy pojazdów. Wydawnictwo Politechniki Poznańskiej, Poznań 2006.

#### Additional bibliography:

1. Wojciech Serdecki, Badania silników spalinowych. Wyd. Politechniki Poznańskiej, Poznań 2012
2. Witold M. Lewandowski, Proekologiczne źródła energii odnawialnej. WNT, Warszawa 2002

### Result of average student's workload

| Activity                          | Time (working hours) |      |
|-----------------------------------|----------------------|------|
| 1. Participation in lectures      | 30                   |      |
| 2. Office hours                   | 5                    |      |
| 3. Preparation for the final test | 10                   |      |
| Student's workload                |                      |      |
| Source of workload                | hours                | ECTS |
| Total workload                    | 75                   | 3    |
| Contact hours                     | 50                   | 2    |
| Practical activities              | 10                   | 1    |