



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Reliability and safety systems in an airline entity

### Course

Field of study

Aviation and cosmonautics

Area of study (specialization)

Aviation safety and management

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/5

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

45

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

### Number of credit points

6

### Lecturers

Responsible for the course/lecturer:

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Wydział inżynierii Lądowej i Transportu

Piotrowo 3; 60-965 Poznań

Responsible for the course/lecturer:

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### Prerequisites

Knowledge: basic knowledge of transport safety, basic knowledge of air transport; knowledge of mathematics, physics and the basics of the probability theory in the field presented during the studies.

Skills: the ability to solve research problems using scientific methods the ability to find cause-and-effect relationships based on the acquired knowledge.

Social competences: the ability to precisely formulate questions; the ability to define important priorities in solving the tasks set for him ability to formulate a research problem and search for its solution, independence in problem-solving, ability to cooperate in a group.



### Course objective

Learning and acquiring the ability to apply models, characteristics, methods of analyzing the reliability of elements of anthropotechnical systems as well as analyzing and mapping safety systems in air transport.

### Course-related learning outcomes

#### Knowledge

1. The student has ordered and theoretically founded general knowledge in the field of key technical issues (on-board equipment, as well as on-board and terrestrial electronic communication systems) and detailed knowledge of selected issues of reliability of anthropotechnical systems and knowledge in the field of analysis and mapping of security systems.
2. Has ordered, theoretically founded general knowledge covering key issues in the field of flight safety and risk assessment.
3. Has detailed knowledge related to selected issues in the field of human capabilities and limitations while operating the aircraft in flight, as well as the possibilities and limitations of the air ambulance system.
4. Knows the basic methods and tools used in the process of solving tasks related to the reliability of elements in anthropotechnical systems.

#### Skills

1. Has the ability to self-educate with the use of modern didactic tools, such as remote lectures, websites and databases, teaching programs, e-books.
2. Can obtain information from literature, the Internet, databases and other sources. Can integrate the obtained information, interpret and draw conclusions from it, as well as create and justify opinions.
3. Can plan and carry out a research experiment using measuring equipment, computer simulations, can perform measurements such as temperature measurements with liquid, thermistor, thermocouple thermometers, speed and flow rate using turbine, laser and ultrasonic flow meters, interpret the results and draw conclusions .
4. Can, when formulating and solving tasks in the field of transport, apply appropriately selected analytical methods.
5. Can determine the properties of anthropotechnical systems elements in the form of reliability characteristics.

#### Social competences

1. The student is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment, and the responsibility for the decisions made.
2. Can interact and work in a group, assuming different roles in it.



3. Can think and act in an entrepreneurial way, incl. finding commercial applications for the conducted analyzes, bearing in mind not only the business benefits, but also the social benefits of the conducted activity.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: knowledge and skills assessment in a written or oral exam based on the explanation of selected issues.

Classes: a final test covering the issues discussed during the exercises.

Laboratory: ongoing assessment of the student's activity in the classroom, preparation and evaluation of student reports after each class.

### Programme content

Reliability of renewable and non-renewed technical objects: basic reliability characteristics, selected issues of structural reliability, failure tree analysis, reliability model of technical objects operation with non-zero recovery time. Reliability tests of technical objects. Human reliability: classification and quantitative structure of humans errors (operator / pilot), analysis of selected hazard sources as factors escalating human errors in air transport systems, methodology of human reliability analysis (HRA) - description of methods with examples. Safety systems (SB) against the background of risk management methods. Basic concepts and definitions of SB. Models of safety systems. Elements and procedures of creating models of safety systems: identification of safety functions, selection of risk reduction measures, identification of threats. Methods of analyzing the functioning of the SB. Examples of SB in air 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 conduct experiments).

### Bibliography

Basic

1. Cempel C., Teoria i inżynieria systemów. Wyd. Instytutu Technologii Eksploatacji - PIB, Radom 2006
2. Center for Chemical Process Safety. (2001). Layer of Protection Analysis - Simplified Process Risk Assessment. Center for Chemical Process Safety/AIChE



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4. Harms-Ringdahl, L. Guide to safety analysis for accident prevention, IRS Riskhantering AB, Stockholm, Sweden 2013, [www.irisk.se/sabook](http://www.irisk.se/sabook)
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7. Szymanek A., Bezpieczeństwo i ryzyko w technice. Wyd. Politechniki Radomskiej, Radom 2006
8. Zintegrowany System Bezpieczeństwem Transportu. Tom 1 i 2. Redaktor pracy zbiorowej Krystek R., Politechnika Gdańska, Gdańsk 2009, WKŁ, Warszawa 2009
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10. Makarowski R., Smolicz T., Czynniki ludzkie w operacjach lotniczych, ADRIANA AVIATION, Kosowizna, 2012
11. Lewitowicz J., Kustroń K., Podstawy eksploatacji statków powietrznych, Własności i właściwości eksploatacyjne statku powietrznego, Wyd. ITWL, Warszawa, 2003
12. Zagdański Z., Stany awaryjne statków powietrznych, Wyd. ITWL, Warszawa, 1995

#### Additional

1. Podręcznik zarządzania bezpieczeństwem, Doc 9859 ICAO Organizacja Międzynarodowego Lotnictwa Cywilnego, wydanie pierwsze 2006
2. Romanowska-Słomka I., Słomka A., Zarządzanie ryzykiem zawodowym. Wydawnictwo Tarbonus, Tarnobrzeg, 2005
3. Lewitowicz J. (red.) Podstawy eksploatacji statków powietrznych, Badania eksploatacyjne statków powietrznych, Wyd. ITWL, Warszawa, 2007
4. Domicz J., Szutowski L., Podręcznik pilota samolotowego, Wyd. Technika/Aerotechnika, Poznań 2008
5. Szutowski L., Poradnik pilota samolotowego, Wyd. Avia-test, Poznań 2007



### Breakdown of average student's workload

	Hours	ECTS
Total workload	145	6,0
Classes requiring direct contact with the teacher	105	4,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	40	2,0

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