



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Unmanned aerial vehicles reliability and safety [S1Lot2-BSP>NiBBSP]

Course

Field of study

Aviation

Year/Semester

3/5

Area of study (specialization)

Unmanned Aerial Vehicles

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

0

Other

0

Tutorials

15

Projects/seminars

0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Knowledge: The student understands the concept of a system and is able to define social systems, systems in transport. The student has basic knowledge of historians, has knowledge of the reliability of technical tools. The student is able to calculate entries to the path of elementary and preliminary steps. The student is fluent in a suite of computer office programs. The student understands the requirements for system testing. The student placed the competences at the disposal of the tasks indicated for implementation.

Course objective

Learning elementary methods, procedures, models and characteristics in the field of reliability issues of technical objects and acquiring the ability to apply them

Course-related learning outcomes

Knowledge:

1. has extended and in-depth knowledge of mathematics including algebra, analysis, theory of differential equations, probability, analytical geometry as well as physics including the basics of classical mechanics, optics,

- electricity and magnetism, solid state physics, thermodynamics, useful for formulating and solving complex technical tasks related
- 2. has structured, theoretically based general knowledge covering key issues in the field of technical thermodynamics, fluid mechanics, in particular aerodynamics
- 3. has detailed knowledge related to selected issues in the field of construction of manned and unmanned aircraft, in the field of on-board equipment, control systems, communication and recording systems, automation of individual systems, has basic knowledge of flight simulation training devices and simulation methods used to solve air transport issues
- 4. has detailed knowledge related to selected issues in the field of navigation, flight mechanics and piloting techniques, use of simulators, flight principles, its preparation, as well as related procedures operational

Skills:

- 1. is able to obtain information from various sources, including literature and databases, both in Polish and English, integrate it properly, interpret and critically evaluate it, draw conclusions, and comprehensively justify the opinions he/she formulates
- 2. is able to properly use information and communication techniques that are used at various stages of implementing aviation projects
- 3. use the knowledge he/she possesses - formulate and solve complex and atypical problems and perform tasks in conditions that are not fully predictable, formulating and solving tasks related to civil aviation, apply appropriately selected methods, including analytical, simulation or experimental methods
- 4. the student is able to use theoretical probability distributions. The student is able to analyze and interpret statistical data. The student is able to apply the methods and tools of mathematical statistics in engineering practice

Social competences:

- 1. understands that in technology, knowledge and skills very quickly become outdated
- 2. is aware of the importance of knowledge in solving cognitive and practical problems and seeking expert opinions in the event of difficulties with an independent solution and knows examples and understands the causes of malfunctioning engineering projects that led to serious financial or social losses or to serious loss of health or even life
- 3. is aware of the social role of a graduate of a technical university, in particular understands the need to formulate and communicate to the public, in an appropriate form, information and opinions on engineering activities, technical achievements, as well as the achievements and traditions of the engineering profession, co-organizing activities for the social environment and initiating activities for the public interest

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: on the basis of a written test.

Classes: based on the evaluation of the developed exercise reports.

Programme content

Introduction to the subject matter. Program, hour structure, literature, course of credit. Technical facilities as subjects of reliability assessment. Objects not renewed and renewed. Object damage. Reliability tests of technical facilities. Life models of non-renewed and renovated objects. Reliability of non-renewable facilities - probabilistic reliability characteristics. Reliability of non-renewable facilities -

statistical reliability characteristics. Selected elements of structural reliability. Classification of reliability structures - simple. . Simple structures: serial, parallel, series-parallel, parallel-serial. General formula for reliability. SMS I and II safety management systems, safety models used in aviation
Safety systems, performance and leading safety indicators.

Course topics

Discussion of technical objects as reliability entities, discussion of non-renewable and renewed objects and damages to objects. Focus on reliability studies of technical objects and their life models. Discussion of reliability characteristics and classification of reliability structures. Presentation of SMS and safety models used in aviation.

Teaching methods

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

monographic (specialist) character

The exercise and projekt 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

Bibliography

Basic:

1. Inżynieria niezawodności, Por. pod red. J. Migdalskiego, Wyd. ATR Bydgoszcz i Ośr. Badań Jakości Wyd.

"ZETOM", Warszawa, 1992.

2. Kadziński A., Niezawodność obiektów technicznych. E-skrypt Politechniki Poznańskiej, Poznań, 2018, niepublikowany, przekazywany na pierwszym wykładzie.

3. Karpiński J., Korczak E., Metody oceny niezawodności dwustanowych systemów technicznych. Wyd. Omnitech Press, Instytut Badań Systemowych, Warszawa, 1990.

4. Migdalski J., Podstawy strukturalnej teorii niezawodności. Skrypt Politechniki Świętokrzyskiej, Kielce, 1978.

5. Poradnik niezawodności. Podstawy matematyczne, Wydawnictwa Przemysłu Maszynowego ?WEMA?, Warszawa 1982.

6. Żółtowski J., Wybrane zagadnienia z podstaw konstrukcji i niezawodności maszyn. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2004

Additional:

1. Bobrowski D., Modele i metody matematyczne teorii niezawodności w przykładach i zadaniach, WNT, Warszawa, 1985.

2. Jaźwiński J., Ważyńska-Fiok K., Niezawodność systemów technicznych. Wyd. Naukowe PWN, Warszawa 1990.

3. Kadziński A., Niezawodność pojazdów szynowych. Ćwiczenia laboratoryjne, Wyd. Politechniki Poznańskiej, Poznań 1992.

4. Niezawodność i eksploatacja systemów. Pod redakcją Wojciecha Zamojskiego. Wyd. Politechniki Wrocławskiej, Wrocław 1981

5. Radkowski S., Podstawy bezpiecznej techniki. Oficyna Wyd. Politechniki Warszawskiej, Warszawa 2003.

6. Słowiński B., Podstawy badań i oceny niezawodności obiektów technicznych. Wyd. Uczelniane Wyższej Szkoły Inżynierskiej w Koszalinie, Koszalin 1992.

7. Żółtowski J., Podstawy niezawodności maszyn. Wyd. Politechniki Warszawskiej, Warszawa 1985.

6. Markowski A.S. (red.), Zapobieganie stratom w przemyśle. Część III. Zarządzanie bezpieczeństwem procesowym. Wyd. Politechniki Łódzkiej, Łódź, 2000.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	2,00