COURSE DESCRIPTION CARD - SYLLABUS

Course name
Airframes construction [S1Lot2-SLiPL>KP2]

Course

Field of study
Aviation

Year/Semester
3/5

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
elective

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
30

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

1 Knowledge: Basic knowledge of mechanics, aircraft airframe construction, metrology, strength of materials, non-destructive testing. 2 Skills: Is able to apply the scientific method in solving problems, conducting experiments and drawing conclusions. 3 Social competences Is aware of the limitations of his/her own knowledge and skills; is able to formulate questions precisely, understands the need for further education.

Course objective

Familiarizing students with the issues of aircraft operation (airframe structure elements). Familiarizing them with currently used operating and diagnostic systems that increase the safety of aircraft operation. Familiarizing them with basic aircraft structures and methods of testing their strength. Familiarizing students with the principles of strength calculations of aircraft structures. Familiarizing them with currently used systems supporting the design of aircraft structures.

Course-related learning outcomes

Knowledge:
1. The student has knowledge of aviation safety and management. The student knows the concept of the

human factor and methods of assessing human reliability, has detailed knowledge related to selected issues in the field of human capabilities and limitations during aircraft operation in flight, its impact on health and
2. has the ability to self-educate using modern teaching tools, such as remote lectures, Internet sites and databases, teaching programs, e-books

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 exhaustively justify the
opinions he formulates
2. is able to appropriately use information and communication techniques, which are used at various stages of the implementation of aviation projects
3. is able to see legal aspects in the process of formulating and solving air transport tasks, in particular to use
aspects of European and national aviation law
4. is able to assess - at least to a basic extent - various aspects of risk associated with a logistics project in air
transport
5. is able to organize, cooperate and work in a group, assuming different roles in it and is able to appropriately define priorities for the implementation of a task specified by himself or others
6. is able to plan and implement the process of his own permanent learning and knows the possibilities of further education (second and third degree studies, postgraduate studies, courses and exams conducted by universities, companies and professional organizations)

Social competences:
1. is able to think and act in an entrepreneurial manner, including finding commercial applications for the system being created, taking into account not only the business benefits but also the social benefits of the conducted activity
2. 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
3. correctly identifies and resolves dilemmas related to the performance of the profession of an aviation and astronautics engineer

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written test

Programme content

-General information on types of aircraft structures. Materials used for the production of aircraft airframe components. Concepts related to the probability and reliability of aircraft structures. Probability of operation in
an airworthy condition. Technical operation of aircraft. Technical maintenance of aircraft in practice. The influence of various factors on the wear of the aircraft airframe. Non-destructive testing of aircraft structures. Problems of assessing the technical condition of the aircraft reliability and operational durability. Technical services for the maintenance and repair of airframe components. Operational flight safety factors. Aircraft safety in the context of aviation law and regulatory requirements.
PART - 66 (THEORY - 33 hrs.)
MODULE 7A. TECHNICAL MAINTENANCE ACTIVITIES
7.8 Riveting
Riveted joints, arrangement and pitch of rivets;
Tools used for riveting and immersed riveting; Testing of riveted joints. [2]
7.14.2 Composites and non-metals Making adhesives; Environmental conditions; Test methods. [2]
MODULE 11B. PISTON AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS
11.2 Airframe Structures - General Concepts
b) Construction methods: stressed skin fuselage, formers, stringers, bulkheads, frames, doublers, struts, ties,
beams, floor structure, reinforcement, methods of insulation removal, corrosion protection, wing,

empennage
and engine equipment;
Structural assembly techniques: riveting, bolting, bonding;
Surface protection methods such as chromating, anodizing, painting; Surface cleaning;

Course topics

Presentation of general information on types of aircraft structures. Discussion of materials used in the production of aircraft airframe components. Presentation of concepts related to the probability and reliability of aircraft structures, probability of operation in an airworthy state. Technical operation of aircraft. Technical maintenance of aircraft in practice. The influence of various factors on the wear of the aircraft airframe. Non-destructive testing of aircraft structures.

Teaching methods

Lecture

Bibliography

Basic:
1. K. Kaw, Mechanics of Composite Materials, second edition, Taylor & Francis Group, LL, 2006;
2. M. Chun-Yung Niu, Airframe structural design. Practical Design Information and Data on Aircraft Structures, Conmilit Prcss Ltd., 1988;
3. A. Abłamowicz, W. Nowakowski, Podstawy aerodynamiki i mechaniki lotu, Wydawnictwa komunikacji i łączności, Warszawa 1980;
4. T. H. G. Megson, Aircraft Structures for engineering students (fourth edition), Elsevier Ltd., 2007;
5. E. ÜNAY, Load analysis of an aircraft using simplified aerodynamic and structural models, February 2015;
6. M. Bijak-Żochowski, Mechanika materiałów i konstrukcji, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2006;
7. W. Błażewicz, Budowa samolotów - obciążenia, Wydawnictwo Politechniki Warszawskiej, Warszawa 1979;
8. M. Skowron, Budowa samolotów - obciążenia. Zbiór zadań, Wydawnictwo Politechniki Warszawskiej, Warszawa 1979;
9. C. Galiński, Wybrane zagadnienia projektowania samolotów, Biblioteka Instytutu Lotnictwa, Warszawa 2016;
10. R.P.L. Nijssen, Composite materials an introduction, Inholland University of Applied Sciences, 2015;
11. M. N. Szulżenko, A.S. Mostowoj, Konstrukcja samolotów, Wydawnictwa komunikacji i łączności, Warszawa 1980;
12. Danilecki S., Projektowanie samolotów, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2000;
13. Błaszczyk J., Konstrukcja samolotów, cz.I., Obciążenia zewnętrzne, WAT, Warszawa 1984;
14. Olejnik A., Budowa statków powietrznych, WAT 1984;
15. Cichosz E., Konstrukcja i praca płatowca, WAT, Warszawa 1986;
16. Rozporządzenie Ministra Infrastruktury z dnia 15 lipca 2003 w sprawie klasyfikacji statków powietrznych Dz.U. 2003 nr 139 poz. 1333;
17. Cheda W, Malski M., Płatowce (wydanie drugie poszerzone), WKiŁ, Warszawa 1981;
18. Cymerkiewicz R. , Budowa samolotów, WKiŁ, Warszawa 1981;
19. J. Lamparski Konstrukcje powłokowe w lotnictwie, Sekcja Mechaniki i Konstrukcji KILiW PAN, Kraków 1974;
20. B. Jancalewicz Podstawy konstrukcji lotniczych z kompozytów polimerowych, Wydawnictwo Politechniki Warszawskiej, Warszawa 2000;
21. P. Elsztein, A. Mańkowski, J. Świdźiński, B. Arct, 100 słów o lotnictwie, Wydawnictwo MON, Warszawa 1958;
22. T. Sołtyk, Amatorskie konstruowanie samolotów, Wydawnictwa Naukowe Instytutu Lotnictwa, Warszawa 2012;
23. R. Aleksandrowicz, J. Rościszewski, Mechanika lotu - zbiór zadań z rozwązaniami, PWN, Warszawa 1955;
24. J. P. Filding, Aircraft design, Cambridge University Press 1999;
25. A. Milikiewicz, Praktyczna aerodynamika i mechanika lotu samolotu odrzutowego w tym wysokomanewrowego, Wydawnictwo ITWL, Warszawa 2011;

26. M. Dębski, D. Dębski, Wybrane zagadnienia wytrzymałości zmęczeniowej konstrukcji lotniczych, Wydawnictwa Naukowe Instytutu Lotnictwa, Warszawa 2014;
27. C. Galiński, Wybrane aspekty projektowania samolotów, Wydawnictwa Naukowe Instytutu Lotnictwa, Warszawa 2016;
28. M. L. Szulżenko, A. M. Mostowoj, Konstrukcja samolotów, Wydawnictwa komunikacji i łączności, Warszawa 1980;
29. M. Skowron, Budowa samolotów - obciążenia, Wydawnictwo Politechniki Warszawskiej, Warszawa 1979.

Additional:
1. A. Milikiewicz, Praktyczna aerodynamika i mechanika lotu samolotu odrzutowego w tym wysokomanewrowego, Wydawnictwo ITWL, Warszawa 2011;
2. M. Dębski, D. Dębski, Wybrane zagadnienia wytrzymałości zmęczeniowej konstrukcji lotniczych, Wydawnictwa Naukowe Instytutu Lotnictwa, Warszawa 2014;
3. A. Abłamowicz, W. Nowakowski, Podstawy aerodynamiki i mechaniki lotu, Wydawnictwa komunikacji i łączności, Warszawa 1980;
4. M. Bijak-Żochowski, Mechanika materiałów i konstrukcji, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2006;
5. R.P.L. Nijssen, Composite materials an introduction, Inholland University of Applied Sciences, 2015;
6. P. Elsztein, A. Mańkowski, J. Świdźiński, B. Arct, 100 słów o lotnictwie, Wydawnictwo MON, Warszawa 1958;
7. T. Sołtyk, Amatorskie konstruowanie samolotów, Wydawnictwa Naukowe Instytutu Lotnictwa, Warszawa 2012;
8. R. Aleksandrowicz, J. Rościszewski, Mechanika lotu - zbiór zadań z rozwązaniami, PWN, Warszawa 1955.

Breakdown of average student's workload

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