COURSE DESCRIPTION CARD - SYLLABUS

Course name
Airframes construction [S1Lot2-SLiPL>KP]

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
elective

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Knowledge: Basic knowledge in the field of mechanics, airframe construction, metrology, strength of materials, non-destructive testing. Skills: He can apply the scientific method in solving problems, carrying out experiments and gain conclusions Competence: He knows the limits of his knowledge and skills; can precisely formulate questions, understands the need for further education

Course objective

- Familiarize students with the problems of aircraft operation (elements of the airframe structure). Understanding the currently used operation and diagnosis systems increasing the safety of aircraft operation. Acquainting with basic aerial structures and methods of testing their strength. Familiarizing students with the principles of strength calculations for aircraft structures. To acquaint students with currently used systems supporting the design of aircraft structures.

Course-related learning outcomes

Knowledge:
has detailed knowledge related to selected issues in the field of manned and unmanned aerial vehicles, in the field of on-board equipment, control systems, communication and registration systems,

automation of individual systems
has an extensive knowledge of the strength of materials, including the theory of elasticity and plasticity, stress hypotheses, methods of calculating beams, membranes, shafts, joints and other structural elements, as well as methods of testing the strength of materials and the state of deformation and stress in structures

Skills:
can obtain information from various sources, including literature and databases, both in Polish and in English, integrate them properly, interpret and critically evaluate them, draw conclusions and exhaustively justify their opinions
is able to properly use information and communication techniques, applicable at various stages of the implementation of aviation projects
is able to properly plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them
can, when formulating and solving tasks related to civil aviation, apply appropriately selected methods, including analytical, simulation or experimental methods
is able to properly select materials for simple aviation constructions, to indicate the differences between fuels used in aviation
is able to communicate using various techniques in the professional environment and other environments using the formal notation of construction, technical drawing, concepts and definitions of the scope of the field of study studied
can design elements of means of transport using data on environmental protection
the student knows how to use theoretical probability distributions. The student is able to analyze and interpret statistical data. The student is able to use the methods and tools of mathematical statistics in engineering practice
can use the language of mathematics (differential and integral calculus) to describe simple engineering problems.
the student is able to make a comprehensive assessment of the ecological parameters of an aircraft propulsion unit based on the values of emission factors for harmful gaseous compounds and particulate matter
is able to prepare a short research paper while maintaining the basic editorial rules. He can choose the appropriate methods for the conducted research and is able to carry out a basic analysis of the results
is able to organize, cooperate and work in a group, assuming various roles in it, and is able to properly define priorities for the implementation of a specific task
is able to plan and implement the process of own permanent learning and knows the possibilities of further education (2nd and 3rd degree studies, postgraduate studies, courses and exams conducted by universities, companies and professional organizations)

Social competences:
understands that in technology, knowledge and skills very quickly become obsolete
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 serious loss of health and even life
is aware of the social role of a graduate of a technical university, in particular understands the need to formulate and convey to the society, in an appropriate form, information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession
correctly identifies and resolves dilemmas related to the profession of an aerospace engineer

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written test

Programme content

General information on the types of aircraft structures. Materials used for the production of airframe components. Concepts related to the probability and reliability of aircraft structures. The probability of working in the state of fitness. Technical operation of aircraft. Aircraft maintenancein practice. The influence of various factors on aircraft airframe wear. Non-destructive testing of aircraft structures.

Problems of assessing the technical condition of the aircraft's reliability and operational durability. Technical services for servicing and repairing airframe structures. Operational flight safety factors. Safety of aircraft against the background of aviation law and regulatory requirements.

Course topics

PART - 66 (THEORY - 33 hours)
MODULE 7A. MAINTENANCE ACTIVITIES
7.8 Riveting
Riveted joints, rivet spacing and pitch;
Tools used for riveting and dimpling;
Examination of riveted joints. [2]
7.14.2 Composites and non-metals
Making binders;
Environmental conditions;
Research methods. [2]
MODULE 11B. PISTON AIRPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS
11.2 Airframe structures - general concepts
b) Construction methods: working hull, frames, stringers, partitions, frames, doublers, struts, ligaments, beams, floor structure, reinforcement, stripping methods, protection anti-corrosion, wing, tail and engine equipment;
Structure assembly techniques: riveting, screwing, bonding;
Surface protection methods such as chromating, anodizing, painting;
Surface cleaning;

Teaching methods

Lectures

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;
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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;
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Additional:
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4. M. Bijak-Żochowski, Mechanika materiałów i konstrukcji, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2006;
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Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
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)	55	2,00