COURSE DESCRIPTION CARD - SYLLABUS

Course name

Airframes construcion

Course

Field of study	Year/Semester
Aerospace Engineering	2/3
Area of study (specialization)	Profile of study
Aircraft engines and airframes	general academic
Level of study	Course offered in
First-cycle studies	polish
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30		
Tutorials	Projects/seminars	
15		

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

Dr eng. Wojciech Prokopowicz

email: wojtek379@wp.pl

phone +48 606 638 410

Faculty of Transport Engineering

ul. Piotrowo 3; 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

1 Knowledge: Basic knowledge in the field of mechanics, airframe construction, metrology, strength of materials, non-destructive testing.

2 Skills: He can apply the scientific method in solving problems, carrying out experiments and gain conclusions

3 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

1. has detailed knowledge related to selected issues in the field of manned and unmanned aircraft structures, including applicable structural systems, materials, equipment and on-board systems. -

2. has basic knowledge of the main departments of technical mechanics: static and kinematic tests of the aircraft airframe structure and tests of aircraft structures at the depo and intermidiate level maintenance -

3. has basic knowledge in the field of strength of materials, including the basics of the elasticity and plasticity theory , effort hypotheses, methods of beams calculating, membranes, shafts, joints and other simple structural elements of the aircraft airframe, as well as methods of testing material strength and the state of deformation and stress in aircraft constructions. -

Skills

1. knows how to use technical documentation regarding to the construction of aircrafts. Is able to develop recommendations and guidelines regarding to changes in the construction of selected airframe elements. Ia able to use English in a degree sufficient to understanding of technical texts in the field of aviation constructions (knowledge of technical terminology) using the formal notation of construction, technical drawing, concepts and definitions of the studied area -

2. can create a schematic of a structural systems, select materials for aviation structures and perform basic strength calculations for a mechanical, aerodynamic system and other components of an airframe structure -

3. is able to use commercially available structural solutions in the field of aviation with particular attention to the structure of the aircrafts. He knows the criteria for the suitabile use of aviation components in own technical projects and can propose the process of their assembly, manufacture and operation.

Social competences

1. is aware of the importance of the human factor in the design and operation of aviation technology and of compliance with professional ethics -

2. is able to properly define the priorities of the process of manufacturing and maintenance of aircraft structures in a selected aviation organizations for the implementation of tasks specified by him or others based on available knowledge -

3. understands the need for continuous verification and deepening of their knowledge in the field of aircraft constructions, their production and service. -

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.

860/5000

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. T. H. G. Megson, Aircraft Structures for engineering students (fourth edition), Elsevier Ltd., 2007;

4. E. ÜNAY, Load analysis of an aircraft using simplified aerodynamic and structural models, February 2015;

5. W. Błażewicz, Budowa samolotów – obciążenia, Wydawnictwo Politechniki Warszawskiej, Warszawa 1979;

6. M. Skowron, Budowa samolotów – obciążenia. Zbiór zadań, Wydawnictwo Politechniki Warszawskiej, Warszawa 1979;

7. C. Galiński, Wybrane zagadnienia projektowania samolotów, Biblioteka Instytutu Lotnictwa, Warszawa 2016;

8. M. N. Szulżenko, A.S. Mostowoj, Konstrukcja samolotów, Wydawnictwa komunikacji i łączności, Warszawa 1980;

9. Danilecki S., Projektowanie samolotów, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2000;

10. Błaszczyk J., Konstrukcja samolotów, cz.I., Obciążenia zewnętrzne, WAT, Warszawa 1984;

11. Olejnik A., Budowa statków powietrznych, WAT 1984;

12. Cichosz E., Konstrukcja i praca płatowca, WAT, Warszawa 1986;

13. Rozporządzenie Ministra Infrastruktury z dnia 15 lipca 2003 w sprawie klasyfikacji statków powietrznych Dz.U. 2003 nr 139 poz. 1333;

14. Cheda W, Malski M., Płatowce (wydanie drugie poszerzone), WKiŁ, Warszawa 1981;

15. Cymerkiewicz R. , Budowa samolotów, WKiŁ, Warszawa 1981;

16. J. Lamparski Konstrukcje powłokowe w lotnictwie, Sekcja Mechaniki i Konstrukcji KILiW PAN, Kraków 1974;

17. B. Jancalewicz Podstawy konstrukcji lotniczych z kompozytów polimerowych, Wydawnictwo Politechniki Warszawskiej, Warszawa 2000;

18. J. P. Filding, Aircraft design, Cambridge University Press 1999.

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	82	3,0
Classes requiring direct contact with the teacher	55	2,0
Student's own work (literature studies, preparation for tutorials, preparation for tests) [1]	27	1,0

[1] delete or add other activities as appropriate