



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Airframes construction

### Course

Field of study

Aerospace Engineering

Area of study (specialization)

Aircraft engines and airframes

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

15

Laboratory classes

Tutorials

30

Projects/seminars

Other (e.g. online)

### Number of credit points

4

### 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 intermediate 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. Is 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 suitable 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 maintenance in 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.

## Teaching methods

Lectures

## Bibliography

Basic

1. K. Kaw, Mechanics of Composite Materials, second edition, Taylor & Francis Group, LL, 2006;
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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;
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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. Błaszczak J., Konstrukcja samolotów, cz.I., Obciążenia zewnętrzne, WAT, Warszawa 1984;



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14. Cheda W, Malski M., Płatowce (wydanie drugie poszerzone), WKiŁ, Warszawa 1981;
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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. Świdziński, B. Arct, 100 słów o lotnictwie, Wydawnictwo MON, Warszawa 1958;
7. T. Sołyk, Amatorskie konstruowanie samolotów, Wydawnictwa Naukowe Instytutu Lotnictwa, Warszawa 2012;
8. R. Aleksandrowicz, J. Rościszewski, Mechanika lotu – zbiór zadań z rozwiązaniami, PWN, Warszawa 1955.



### Breakdown of average student's workload

	Hours	ECTS
Total workload	105	4,0
Classes requiring direct contact with the teacher	55	2,0
Student's own work (literature studies, preparation for tutorials, preparation for tests) <sup>1</sup>	50	2,0

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