



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Aircraft and engines maintenance

### 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

Other (e.g. online)

Tutorials

15

Projects/seminars

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

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Faculty of Transport Engineering

ul. Piotrowo 3; 60-965 Poznań

Responsible for the course/lecturer:

### Prerequisites

1 Knowledge: Basic mathematical information in the field of statistics and probability in calculating the reliability parameters and measures and indicators of the airframe and aircraft engine engineering

2 Skills: Student is able to adopt and plan an appropriate model of the operating process and create computer support tools for the operation of the airframe and aircraft engine using

a spreadsheet or relational database

3 Competence: Student is aware of the level of his knowledge and skills and understands the need for further training - raising professional and personal competences



### Course objective

-learn students the principles of engines and aircraft servicing on the basis of service processes and operating models;

-understand the basic issues regarding reliability, readiness, operational vulnerability, durability, lifetime and properties and operational properties of airframe and aircraft engines;

-acquire the methods of testing the operational reliability of airframes and aircraft engines, adopt an appropriate model of the operation process and suggest the appropriate extension or modification of service processes depending on the needs;

- plan and supervise the operation process of the selected aircraft structure taking into account relevant quality standards

to ensure a high level of flight safety;

### Course-related learning outcomes

#### Knowledge

1. knows the operation process of aviation technology based on the example of civil and military maintenance organizations. Has detailed knowledge related to selected issues in the field of construction and operation of aircraft propulsion systems and the design of their components. -

2. has detailed knowledge of the basic concepts of technical objects operation. Based on the acquired knowledge, he is able to supervise and plan the process of using the resources of the aircraft fleet. -

3. knows the service documentation systems used in civil and military aviation. Has a basic knowledge of the processes connected with the life cycle of technical objects and systems, as well as their technical description in the field of aviation engineering. -

#### Skills

1. knows how to use technical documentation. Is able to develop recommendations and guidelines for the operation of aircraft systems, both preventive and typically maintenance. Is able to use English in certain level of experience to enabling understanding of technical texts in the field of aviation (knowledge of technical terminology) -

2. is able to organize and plan the process of designing and maintenance of aircraft on-board systems in the selected aviation specialty.

3. is able to obtain information on current PART guidelines and introduce them into the aviation technical operation process. Knows system of granting authorizations for technical personnel in accordance with European Union regulations. Is able to integrate obtained information, interpret and draw conclusions from it. -

#### Social competences

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



2. is able to properly determine the priorities of the service process in the selected aviation organization for the implementation of the task specified by itself or other based on the available knowledge and guidelines from the civil aviation organization -

3. is able to motivate and inspire technical staff to constantly improve their qualifications and knowledge related to aircraft systems -

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

- Written test
- Verbal test

### Programme content

- Basic concepts of operation of airframes and aircraft engines.
- Reliability theory, characteristics and reliability models.
- Characteristics of selected models of operation of airframe structures and aircraft engines.
- Forecasting reliability in the aircraft operation process.
- Basic models of failures and damage.
- Readiness, suitability, durability and lifetime of the technical facility with regard to aircraft constructions.
- Operational vulnerability as a property of airframes and aircraft engines.
- Computer operating support systems.

PART - 66 (THEORY - 22.5 hours)

#### MODULE 7A. MAINTENANCE ACTIVITIES

##### 7.16 Aircraft Weight and Balance

- a) Calculation of center of gravity / restrictions: use of referenced documents. [2]
- b) Preparation of the aircraft for weighing;

Weighing the aircraft. [2]

##### 7.17 Aircraft Handling and Storage

Taxiing and towing of aircraft and related security measures;

Aircraft lifting, wedging, securing and related safety precautions;

Aircraft storage methods;



Procedures for filling / draining fuel tanks;

De-icing and anti-icing procedures;

Electrical, hydraulic and pneumatic grounding supplies;

Influence of environmental conditions on aircraft maintenance and operation. [2]

7.19 Extraordinary events

a) Lightning strike test and HIRF penetration. [2]

(b) Investigation after exceptional occurrences such as difficult landing and flight through turbulence. [2]

7.20 Maintenance procedures

Maintenance planning;

Modification procedures;

Warehouse procedures;

Certification / Release Procedures;

Link to operation of the aircraft;

Maintenance examination / quality control / quality guarantee;

Additional maintenance procedures;

Inspection of life-limited components. [2]

MODULE 10. AVIATION REGULATIONS

10.6 Continuing airworthiness

Detailed understanding of Part-21 regulations on continuing airworthiness.

Detailed understanding of Part-M. [2]

10.7 Relevant National and International Requirements: (if not superseded by EU requirements)

(a) Maintenance programs, maintenance inspection and testing;

Airworthiness Directives;

Service bulletins, manufacturer service information;

Changes and repairs;

Maintenance documentation: maintenance manual, repair manual



construction, illustrated spare parts catalog, etc.

For A to B2 licenses only:

Master minimum equipment list, minimum equipment list, inventory

shipping variations; [2]

b) Continuing airworthiness;

Minimum equipment requirements - test flights

Only for B1 and B2 licenses:

ETOPS, Maintenance and Shipping Requirements;

All Weather Operation, Category 2/3 Operation. [1]

#### MODULE 17A. PROPELLER

##### 17.5 Propeller Ice Protection

Fluid and electric de-icing equipment. [2]

##### 17.6 Propeller maintenance

Static and dynamic balancing;

Mowing the path of the shovel;

Assessment of blade failure, erosion, corrosion, damage effect, layer splitting;

Propeller Treatment / Repair Systems;

Propeller motor work. [3]

##### 17.7 Propeller storage and maintenance

Propeller maintenance and depreservation [2]

#### Teaching methods

Lectures / Discussion

#### Bibliography

Basic

1. Jerzy Lewitowicz, Kamila Kustroń: Podstawy eksploatacji statków powietrznych, Tom 1 i 2

2. Zbigniew Zagdański, Stany awaryjne statków powietrznych



3. Jerzy Lewitowicz, Leszek Lorycha, Jerzy Manerowski, Problemy badań i eksploatacji techniki lotniczej, Tom 6 Wydawnictwo Instytutu Technicznego Wojsk Lotniczych , Listopad 2006

4. Szczepanik R., Tomaszek H., Zarys metody oceny niezawodności i trwałości urządzeń lotniczych z uwzględnieniem stanów granicznych, Problemy Eksploatacji 2005

5. Tomaszek H., Żurek J., Jaształ M., Prognozowanie uszkodzeń zagrażających bezpieczeństwu lotów statków powietrznych, Wydawnictwo Naukowe Instytutu Technologii Eksploatacji, Warszawa 2008

#### Additional

Supplementary literature:

1. Paweł Lindstendt, Praktyczna diagnostyka maszyn i jej teoretyczne podstawy
2. Dzierżanowski p., (i inni), Napędy lotnicze, Turbinowe silniki śmigłowe i śmigłowcowe, Wydawnictwo Komunikacji i Łączności, 1985
3. Dzierżanowski p., (i inni), Napędy lotnicze, Turbinowe silniki odrzutowe, Wydawnictwo Komunikacji i Łączności, 1983
4. Dzierżanowski p., (i inni), Napędy lotnicze, Zespoły wirnikowe silników turbinowych, Wydawnictwo Komunikacji i Łączności, 1982
5. Józef Zieleziński, Budowa płatowców, Wydawnictwo Komunikacji i Łączności, Warszawa 1974
6. Kocańda S., Szala J., Podstawy obliczeń zmęczeniowych, Wydawnictwo Naukowe PWN, 1997

#### Breakdown of average student's workload

	Hours	ECTS
Total workload	77	3
Classes requiring direct contact with the teacher	51	2,0
Student's own work (literature studies, preparation for tutorials, preparation for tests) <sup>1</sup>	26	1,0

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