



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Aircraft and engines maintenance

Course

Field of study

Aviation

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

2

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. has extended and in-depth knowledge of mathematics including algebra, analysis, theory of differential equations, probability, analytical geometry as well as physics covering the basics of classical mechanics, optics, electricity and magnetism, solid state physics, thermodynamics, useful for formulating and solving complex technical tasks related to engineering aeronautical and modeling
2. has ordered and theoretically founded general knowledge in the field of key technical issues and detailed knowledge of selected issues related to air transport, knows the basic techniques, methods and tools used in the process of solving tasks related to air transport, mainly of an engineering nature
3. has knowledge of the method of presenting test results in the form of tables and graphs, performing the analysis of measurement uncertainties
4. has knowledge of the method of presenting test results in the form of tables and graphs, performing the analysis of measurement uncertainties
5. has basic knowledge of environmental protection in transport, is aware of the risks associated with environmental protection and understands the specificity of the impact of mainly air transport on the environment as well as social, economic, legal and other non-technical conditions of engineering activities
6. has the ability to self-study with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books

Skills

1. is able to obtain information from various sources, including literature and databases, both in Polish and in English, integrate them properly, interpret them and make a critical evaluation, draw conclusions and exhaustively justify the opinions they formulate



2. is able to properly use information and communication techniques, applicable at various stages of the implementation of aviation projects
3. is able to properly plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them
4. can, when formulating and solving tasks related to civil aviation, apply appropriately selected methods, including analytical, simulation or experimental methods
5. is able to properly select materials for simple aviation structures, and can indicate the differences between the fuels used in aviation
6. 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 study field of study
7. is able to design elements of means of transport with the use of data on environmental protection
8. student can use theoretical probability distributions. Student is able to analyze and interpret statistical data. Student is able to use the methods and tools of mathematical statistics in engineering practice
9. can use the language of mathematics (differential and integral calculus) to describe simple engineering problems.
10. 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
11. is able to prepare a short research paper while maintaining the basic editorial rules. He can choose appropriate methods for the conducted research and is able to carry out a basic analysis of the results.
12. 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 task set by himself or others
13. 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

1. understands that in technology, knowledge and skills very quickly become obsolete
2. 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 a serious loss of health and even life



3. is aware of the social role of a technical university graduate, in particular understands the need to formulate and provide the society, in an appropriate form, with information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession

4. 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
- 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

MODULE 7A. MAINTENANCE ACTIVITIES

7.13 Steering lines

7.16 Aircraft weight and balance

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

Weighing the aircraft. [2]

7.17 Handling and storage of aircraft

Taxiing and towing aircraft and related security measures; Lifting, wedging, securing of aircraft and related measures safety; Aircraft storage methods; Procedures for filling / emptying fuel tanks; Deicing



and deicing procedures; Electrical, hydraulic and pneumatic earthing supplies; Impact of environmental conditions on the operation and functioning of the aircraft. [2]

7.19 Extraordinary events

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

b) Examination after extraordinary events such as difficult landing and flight through turbulence. [2]

7.20 Maintenance procedures

Maintenance planning; Modification procedures; Warehouse procedures; Certification / approval procedures; Connection to the operation of the aircraft; Maintenance check / quality control / quality guarantee; Additional maintenance procedures; Inspection of limited durability components. [2]

MODULE 10. REGULATIONS CONCERNING AVIATION

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 replaced by EU requirements)

a) Maintenance programs, inspection and testing of maintenance; Airworthiness directives; Service bulletins, manufacturer service information; Changes and repairs; Technical service documentation: technical service manual, repair manual construction, illustrated spare parts catalog, etc. Only for licenses A to B2: Master list of minimum equipment, list of minimum equipment, list shipping deviations; [2]

b) Continuing airworthiness; Minimum equipment requirements - test flights Only for B1 and B2 licenses: ETOPS, maintenance and shipping requirements; Operation in any weather, operation of category 2/3. [1]

MODULE 17A. PROPELLER

17.5 Icing guard for propeller

Equipment for de-icing by liquid and electrically. [2]

17.6 Propeller maintenance

Static and dynamic balancing; Demarcation of the shovel; Assessment of blade damage, erosion, corrosion, impact of damage, splitting of layers; Propeller treatment / repair systems; Propeller engine operation. [3]

17.7 Storage and maintenance of the propeller



Maintenance and lack of propeller maintenance. [2]

Teaching methods

Lectures / Dyscusion

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	50	2,0
Classes requiring direct contact with the teacher	30	1,5
Student's own work (literature studies, preparation for tutorials, preparation for tests) ¹	20	0,5

¹ delete or add other activities as appropriate