



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Aircraft maintenance and the theory of helicopters and rockets

Course

Field of study

Aviation and Astronautics

Area of study (specialization)

Aircraft engines and airframes

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3 / 6

Profile of study

general academic

Course offered in

polish

Requirements

elective

Number of hours

Lecture

45

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

30

Number of credit points

7

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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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. Basic knowledge on aircrafts, helicopters and rockets.

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. Being capable of performing basic engineering calculations



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. Is competent to ask proper questions.

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;

- student gains knowledge on design and construction of aircraft, rockets and helicopters

Course-related learning outcomes

Knowledge

1. has detailed knowledge related to selected issues in the field of construction of manned and unmanned aircraft, including on-board equipment and their main components

2. has detailed knowledge related to selected issues in the field of construction of aircraft propulsion systems and design of their components

3. has detailed knowledge related to selected issues in the field of ground handling of aircraft and propulsion systems, taking into account logistics aspects

4. has basic knowledge about the life cycle of devices, facilities and technical systems, as well as how to describe them technically

5. has basic knowledge in the field of the main departments of technical mechanics: statics of kinematics and material point dynamics and rigid body and strength of materials, including the basics of elasticity and plasticity theory, strain hypotheses, methods of calculating beams, membranes, shafts, joints and other simple structural elements, as well as methods for testing the strength of materials and the state of deformation and stress in structures

6. has basic knowledge of electrical drives in machines, including three-phase current, DC and AC motors, frequency and voltage converters, and power electronics. as well as about automation systems, microcontrollers, control algorithms, automatics and industrial robots, electronic navigation systems used in machines as well as wired and wireless communication systems in local computer networks used in machines



7. has structured, theoretically founded knowledge of engineering graphics and machine construction: technical drawing, object projection, basic principles of engineering graphics, the use of CAD (Computer Aided Design) in machine design

Skills

1. Is able to think and act in a creative and entrepreneurial way
2. Is aware of the validity of the proposed operating rules and understands the effects of engineering activities, including its impact on flight safety
3. is able to assess material, environmental costs and work expenditure on the implementation of aviation modules and on-board equipment
4. is able to create a system diagram, select elements and perform basic calculations of the electrical and electronic systems of aircraft machines or devices
5. knows how to use verbal communication with one additional foreign language at the everyday language level, is able to describe the issues of the studied field of study in this language, is able to prepare technical descriptive and drawing documentation of an engineering, transport and / or logistics task

Social competences

1. Is able to think and act in a creative and entrepreneurial way
2. Is aware of the validity of the proposed operating rules and understands the effects of engineering activities, including its impact on flight safety

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

- Written test
- Project assignment

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.
- Trend and cost analysis, mission profile, initial weight assignment, engine type assignments, airframe load analysis, 0-D rocket engine calculations, basics of helicopter flight dynamics

Teaching methods

Lectures / project

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
6. Andreson, Jr. ? Introduction to Flight, McGraw-Hill, 2004
7. Raymer, Aircraft Design
8. Mattingly J.D. ? Elements of propulsion: Gas Turbine and Rockets, AIAA

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 | 175 | 7,0 |
| Classes requiring direct contact with the teacher | 75 | 3,0 |
| Student's own work (literature studies, preparation for tutorials, preparation for tests) ¹ | 100 | 5,0 |

¹ delete or add other activities as appropriate