



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Aircraft engines

Course

Field of study

Aerospace Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

1/1

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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Prerequisites

Has analytical and conceptual thinking skills, can read simple technical diagrams. Has general knowledge about the construction of machines, in particular energy machines.

Course objective

The main aim of the subject is to learn about propulsion systems and propulsion systems used in aviation. Mastering technical vocabulary, understanding the principles of operation of individual drives and its distinctive features.

Course-related learning outcomes

Knowledge



1. has detailed knowledge related to selected issues in the field of construction of aviation propulsion systems and design of their components
2. has ordered, theoretically founded general knowledge covering key issues of aircraft engine construction
3. has ordered, theoretically founded general knowledge covering key issues in the field of fluid mechanics, theory of heat-flow, piston, electric and hybrid machines

Skills

1. knows how to use a language sufficient to understand technical texts in the field of aviation (knowledge of technical terminology)
2. has the ability to self-study using modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books
3. is able to obtain information from literature, the Internet, databases and other sources. Is able to integrate obtained information, interpret and draw conclusions from them

Social competences

1. can appropriately define priorities for the implementation of tasks specified by himself or others based on available knowledge
2. Understands the need for critical assessment of knowledge and continuous learning
3. is aware of the social role of a technical university graduate, and in particular understands the need for formulation and transmission to the public, in particular through the mass media, information and opinions on the achievements of technology and other aspects of engineering activities; endeavors to provide such information and opinions in a generally understandable way

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

written final test

Programme content

1. General characteristics of aircraft drives
2. Drives with piston engines
3. Construction of piston engines
4. Turbine drives
5. Pulse and rocket jet engines
6. Electric drives
7. Operational issues, restrictions



8. Emissions: emission reduction standards

PART-66

MODULE 16. PISTON ENGINE

16.1 Basics

Mechanical, thermal and volumetric efficiency; Operating principles - two stroke, four stroke, Otto and Diesel; Cylinder displacement and compression ratio; Engine configuration and firing order. [2]

16.2 Engine performance

Power calculation and measurement; Factors affecting engine power; Mixtures / low calories, premature ignition. [2]

16.3 Engine design

Crankcase, crankshaft, camshaft, oil pan; Auxiliary gear box; Cylinder and piston assemblies; Connecting rods, intake manifolds and exhaust manifolds; Valve mechanisms; Propeller reduction gears. [2]

16.4 Engine fuel systems

16.4.1 Carburetors

Types, construction and principles of operation; Icing and heating. [2]

16.4.2 Fuel injection systems

Types, construction and principles of operation. [2]

16.4.3 Electronic engine control

Operation of engine control and fuel metering systems, including electronic engine control (FADEC); System layout and components. [2]

16.5 Starting and ignition system

Take-off and pre-heating systems; Ignition types, construction and principles of operation; Ignition cable system, spark plug body; Low and high voltage systems. [2]

16.6 Suction system, exhaust system and cooling system

Design and operation: suction system including variable ventilation systems; Exhaust system, engine cooling system - with air and fluid. [2]

16.7 Supercharging / turbocharging

Top-up rules and goals and its impact on engine parameters; The design and operation of the supercharging and turbocharging system; System terminology; Control systems; Protection system. [2]



16.9 Lubrication systems

System operation / layout and components. [2]

16.10 Engine Indicating Systems

Engine speed; Cylinder head temperature; Coolant temperature; Oil pressure and temperature; Flue gas temperature; Fuel pressure and flow; Loading pressure. [2]

16.11 Installing the drive device

Configuration of firewalls, screens, acoustic panels, engine mount, suspension anti-vibration, cables, pipes, power supplies, connectors, cable harnesses, steering cables, rods control points, lifting points and drains. [2]

16.12 Engine monitoring and ground operations

Take-off and climb procedures; Interpretation of engine output power and parameters; Engine and component overview: criteria, tolerances and data specified by the engine manufacturer.[3]

16.13 Engine storage and maintenance

Maintenance and lack of maintenance of the engine and accessories / systems. [2]

Teaching methods

lecture

Bibliography

Basic

Boliński Benedykt, „Eksploatacja silników turbinowych”, Wydawnictwo Komunikacji i Łączności, Warszawa 1981.

Dzierżanowski Paweł, „Turbinowe silniki odrzutowe”, Wydawnictwo Komunikacji i Łączności, Warszawa 1983.

Niewiarowski K.: „Tokowe silniki spalinowe”, Wydawnictwa Komunikacji i Łączności, Warszawa 1983

A. Kowalewicz, „Tworzenie mieszanki i spalanie w silnikach o zapłonie iskrowym”, Wydawnictwa Komunikacji i Łączności, Warszawa 1984, ISDN 83- 206-0399-4

Jaźwiński J., Borgoń J., „Niezawodność eksploatacyjna i bezpieczeństwo lotów”, Wydawnictwo Komunikacji i Łączności, Warszawa 1989.

Dzierżanowski P., Łyżwiński M., Szczeciński S.: „Napędy Lotnicze. Silniki tłokowe”, Wydawnictwo Komunikacji i Łączności, Warszawa 1981



Additional

Wajand J.A., Wajand J.T.: Tłokowe silniki spalinowe średnio- i szybkoobrotowe, WNT Warszawa 2000

Breakdown of average student's workload

	Hours	ECTS
Total workload	27	1,0
Classes requiring direct contact with the teacher	17	0,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	10	0,5

¹ delete or add other activities as appropriate