COURSE DESCRIPTION CARD - SYLLABUS

Course name
Theory of aircraft engines

Course

Field of study
Aerospace Engineering

Year/Semester
3/5

Area of study (specialization)
Aircraft engines and airframes

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
english

Form of study
full-time

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:
dr inż. Bartosz Ziegler

bartosz.ziegler@put.poznan.pl

Responsible for the course/lecturer:

Prerequisites

The student should have basic knowledge and skills in thermodynamics (the concepts of enthalpy, entropy, heat, perfect gas model, basic gas conversions), fluid mechanics (forces exerted by a fluid on a flow channel, flow classification, isentropic flows, viscous phenomena and their impact on the field flow) and aerodynamics (wing and profile aerodynamics, criterion numbers, boundary layer theory, turbulence), and knowledge from the Theory of aircraft engines of the previous semester

Course objective

Expand knowledge of the flow aircraft engines from the previous semester, the mechanics and thermodynamics of their components as well as the principles of cooperation of flow components.

Course-related learning outcomes

Knowledge

1. Has detailed knowledge related to the principle of operation and dynamics of flow jet propulsion systems, in particular turbine jet engines.

2. Has ordered and theoretically founded knowledge about the impact of individual thermodynamic cycle parameters and engine design parameters on its performance parameters and efficiency components

3. Has basic knowledge about the impact of engine design parameters, and how to use it on the device life cycle

Skills

1. Is able to obtain information from literature, the Internet, databases and other sources, in particular English. Is able to integrate obtained information with his knowledge, interpret and draw conclusions from them

2. Is able to create a quantitative description of the principle of operation and physical components of a flow aircraft engine or its component

3. Is able to use formulas, technical graph tables and create such based on known models of physical changes

Social competences

1. Is able to obtain information from literature, the Internet, databases and other sources, in particular English. Is able to integrate obtained information with his knowledge, interpret and draw conclusions from them

2. Is able to create a quantitative description of the principle of operation and physical components of a flow aircraft engine or its component

3. Is able to use formulas, technical graph tables and create such based on known models of physical changes

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture (final grade consists of three components):

1. Written pass / final exam (65%)

2. Grade from a small mid-term group project (20%)

3. Assessment of individual homework (15%)

exercises:

1. Written assessment of computational problems (100%)

To pass the course, it is required to obtain not less than 60% of component points.

The 60% -100% range curve is determined individually in each semester.

Programme content

Lecture semester II:

Gas inlet aerodynamics; Compressors (mechanics of flat and rotating palisades, stage operation, stage compression, dimensionless parameters of stage compression); Combustion chambers - chamber energy balance, basics of intraventricular process; Turbines (mechanics of flat and rotating palisades, stage work, stage expansion, dimensionless parameters); boosters; Discharge nozzles; Conditions for cooperation of flow-engine components; Map of engine controls; Mechanics of work of propeller propulsion systems

Classes semester II:

Calculation of supersonic inlet geometry; calculating the kinematics and dynamics of compressor and turbine palisades as well as the resulting unit work of the degree, spring, work coefficients and Lieblein accumulation factor; Energy and mass balance of the combustion chamber, pressure drop in the combustion chamber, calculation of the efficiency of afterburners and variable cross-sections of the adjustable nozzle; Determination of work parameters and propeller design based on one-dimensional theories

PART - 66 (THEORY - 22.5 hours)

MODULE 16. PISTON ENGINE

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 Preservation

Preservation and depreservation for the engine and accessories / systems. [2]

Teaching methods

Blackboard based lecture, project classes in computer laboratory with practical examples of calculations presented on lecture

Bibliography

Basic

1. Dzierżanowski P. „Turbinowe silniki odrzutowe”, Wydawnictwa Komunikacji i Łączności (own copy is not obligatory. The lecture covers the content sufficiently)

Additional

Any adequate literature on topic

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	33	1,1
Preservation of lecture messages, preparation of homework, group mid-term project, preparation for written tests [1]	57	1,9

[1] delete or add other activities as appropriate