COURSE DESCRIPTION CARD - SYLLABUS

Course name
Integrated aircraft engine design systems

Course

Field of study
Aviation

Year/Semester
3/6

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
elective

Number of hours

Lecture
15

Laboratory classes
30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

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 mathematics, especially in the field of differential calculus of many variables, vector calculus and linear algebra, in addition thermodynamics, fluid mechanics and aerodynamics, and knowledge of the subject of aircraft engine theory.

Course objective

Learn the principles of: design of aircraft components for propulsion systems, including: Analytical design of the geometry of flow engine components; Creating geometric models (CAD) tailored to the needs of CAE systems and the basics of using CAE systems to perform mass and heat flow analyzes

Course-related learning outcomes

Knowledge

1. has basic knowledge of metal, non-metal and composite materials used in machine construction, in particular about their structure, properties, methods of production, heat and thermo-chemical treatment and the influence of plastic processing on their strength, as well as fuels, lubricants, technical gases, refrigerants e.t.c.

2. has a basic knowledge of the mechanisms and laws governing human behavior and psyche

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 plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them

3. can, when formulating and solving tasks related to civil aviation, apply appropriately selected methods, including analytical, simulation or experimental methods

4. is able to properly select materials for simple aviation structures, and can indicate the differences between the fuels used in aviation

5. is able to design means of transport with appropriate external requirements (e.g. regarding environmental protection)

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. 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:

Lecture (final grade consists of three components):

1. Group complete project (analytical calculations, geometry design, CFD analysis) (65%)

2. Assessment of a small individual project (35%)

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

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

Analysis of heat and mass flow phenomena, transport equations, methods of discretization of transport equations, numerical analysis procedure, introduction to computational grid requirements,

Laboratory semester I:

Performing simple flow analyzes for compressible and compressible flows based on the ideal gas model on the provided computational grids. Creating two-dimensional structural and unstructured meshes.

PART - 66 (PRACTICE - 11.25 hours)

MODULE 16. PISTON ENGINE

16.7 Recharging / Turbocharging

System terminology;

Control systems;

Protection system. [2]

Teaching methods

1. Blackboard lecture

2. Laboratory in the computer room

3. Computational projects carried out using publicly available programming tools

Bibliography

Basic

Additional

Any adequate literature on topic

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	25	1,0
Making an individual project - performing numerical calculations and interpreting their results on a selected object (e.g. profile characteristics or determining the resistance coefficient for an object) Final project - developing an analytical model that allows you to design geometry, perform geometry and mesh in the selected software, perform analysis and describe the results, if necessary,	25	1,0

	Hours	ECTS
redesign geometry and repeat the procedure [1]		

[1] delete or add other activities as appropriate