COURSE DESCRIPTION CARD - SYLLABUS

Course name
Integrated aircraft engine design systems

Course

Field of study
Aviation and Astronautics

Year/Semester
III/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
elective

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

6

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 structured knowledge about the types of loads on aircraft engines and aircraft airframes and how to analyze them

2. Has specialist knowledge about the construction and methods of constructing machines for aviation purposes

Skills

1. Is able to communicate in English the basic aspects of CAE related topics

2. Is able to carry out elementary technical calculations in the field of fluid mechanics, gas dynamics, thermodynamics enabling the creation of initial geometry for numerical calculations as well as determining the appropriate types and values of boundary conditions

3. can create a system diagram, select elements and perform basic calculations of the electrical and electronic systems of aircraft machinery or equipment

Social competences

1. Is able to think and act in a creative and entrepreneurial way

2. Is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment and the associated responsibility for decisions made

3. Is aware of the responsibility for their own work and readiness to comply with the principles of teamwork and taking responsibility for jointly implemented tasks

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

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

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.

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	150	6,0
Classes requiring direct contact with the teacher	70	2,8
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, redesign geometry and repeat the procedure [1]	80	3,2

[1] delete or add other activities as appropriate