COURSE DESCRIPTION CARD - SYLLABUS

Course name
Integrated aircraft engine design systems

Course

Field of study	Year/Semester
Aerospace Engineering	3/6
Area of study (specialization)	Profile of study
Aircraft engines and airframes	general academic
Level of study	Course offered in
First-cycle studies	english
Form of study	Requirements
full-time	elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	15	
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 detailed knowledge related to the methodologies currently used to support the engineering work of CAE systems in relation to the analysis and design of aviation components for propulsion systems.

2. Has ordered, theoretically founded general knowledge covering key issues in the field of thermodynamics, aerodynamics and gas dynamics, which allows determining the physicality of results obtained using CAE systems.

3. Has ordered, theoretically founded knowledge in the field of applied mathematics that allows selection of discretization schemes and numerical methods used for the analyzed problem.

Skills

1. Is able to obtain information from literature, the Internet, databases and other sources. In particular from English-language sources and software documentation.

2. is able to carry out elementary technical calculations in the field of fluid mechanics and thermodynamics, such as heat and mass balances, pressure losses in flows around technical flying objects and their modules, select parameters of fans, compressors and turbines for flow systems, and also calculate thermodynamic waveforms in heat machines.

3. is able to conduct computer simulations of flow phenomena associated with the work of components of aviation forces, interpret their results and draw conclusions.

Social competences

1. Is able to properly set priorities for the implementation of the task specified by himself or other based on available knowledge.

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.

3. Is able to inspire and organize the learning process of other people.

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	90	2,0
Classes requiring direct contact with the teacher	40	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,	50	1,0

	Hours	ECTS
redesign geometry and repeat the procedure [1]		

[1] delete or add other activities as appropriate