COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of fluid mechanics [S1Lot2>PMP]

Course

Field of study
Aviation

Year/Semester
2/3

Area of study (specialization)
Aircraft Engines and Airframes

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Knowledge of mathematics and physics within the scope of the study program. The student is able to describe basic physical phenomena and perform calculations related to them. The student is able to determine priorities important in solving tasks assigned to him. The student demonstrates independence in solving problems, acquiring and improving acquired knowledge and skills.

Course objective

To familiarize students with the theoretical foundations and applications of fluid mechanics.

Course-related learning outcomes

Knowledge:
1. has ordered and theoretically founded general knowledge in the field of key technical issues and detailed knowledge of selected issues related to air transport, knows the basic techniques, methods and tools used in
the process of solving tasks related to air transport, mainly of an engineering nature
2. has ordered, theoretically founded general knowledge covering key issues in the field of technical thermodynamics, fluid mechanics, in particular aerodynamics

Skills:
1. is able to properly plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them
2. can solve tasks using basic knowledge of aerodynamics, flight mechanics and flow around a body

Social competences:
1. is aware of the social role of a technical university graduate, in particular understands the need to formulate
and provide the society, in an appropriate form, with information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: exam
Exercises: tests

Programme content

Subject of fluid mechanics. Model of a continuous medium. Some concepts and theorems of fluid kinematics. Streamline. Stream surface. Path of a fluid element. Acceleration of a fluid element. Substantial, convective and local derivative. Circulation. Principle of conservation of mass. Forces acting on a fluid. General properties of the motion of non-viscous and non-heat-conducting fluids. Fluid statics. Determination of equipotential surfaces and pressure distribution. Fluid pressure on the walls of solids. Floating and stability of floating bodies.

Course topics

1.Introduction to Fluid Mechanics: Continuous Medium and Fluid Kinematics:
Overview of the concept of a continuous medium.
Basic principles of fluid kinematics, including key terms and definitions.
Streamlines, Stream Surfaces, and Fluid Element Path
2.Defining and visualizing streamlines and stream surfaces.
Understanding the path of a fluid element and its implications.
Acceleration and Derivatives of Fluid Elements
3.Analyzing the acceleration of a fluid element.
Explanation of substantial, convective, and local derivatives in fluid dynamics.
Circulation and Vorticity in Fluid Flow
4. Bernouli equation and its use
5.Derivation and explanation of the continuity equation.
Application of the principle of conservation of mass in fluid flow scenarios.
Forces Acting on Fluids and Properties of Non-Viscous Fluids
6.Analyzing the forces that act on a fluid, including pressure, gravity, and surface tension.
General properties of non-viscous and non-heat-conducting fluids in motion.
Fluid Statics and Stability of Floating Bodies
7.Understanding fluid pressure and equipotential surfaces.
Exploring the stability of floating bodies, including the principles of buoyancy and equilibrium.

Teaching methods

1. Lecture: multimedia presentation and on the board.
2. Calculation exercises: examples analyzed on the board and performed independently by students.

Bibliography

Basic:
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Additional:

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Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	45	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	5	0,50