COURSE DESCRIPTION CARD - SYLLABUS

Course name

Aerodynamics

Course

Field of study

Aviation

Year/Semester

1/2

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

15

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

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Faculty of Environmental Engineering and Energy

Piotrowo 3 st., 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Student should have knowledge of mathematics and physics presented in the studies. He should be able to apply the scientific method in solving problems, carrying out experiments and reasoning, knows the limits of his own knowledge and skills, formulate questions precisely, understand the need for further education.

Course objective

Teaching the basic laws and relationships in the field of aerodynamics and dynamics of aircraft movement and the ability to physically interpret phenomena, as well as familiarizing with the basic equations describing aerodynamic parameters in the flow of solids.

Course-related learning outcomes

Knowledge

1. has extended and in-depth knowledge of mathematics including algebra, analysis, theory of differential equations, probability, analytical geometry as well as physics covering the basics of classical mechanics, optics, electricity and magnetism, solid state physics, thermodynamics, useful for formulating and solving complex technical tasks related to engineering aeronautical and modeling

2. 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

3. has ordered, theoretically founded general knowledge covering key issues in the field of technical thermodynamics, fluid mechanics, in particular aerodynamics

Skills

1. can solve tasks using basic knowledge of aerodynamics, flight mechanics and flow around a body

2. can use the mathematics (differential and integral calculus) to describe simple engineering problems

Social competences

1. 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

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam from the lecture

Written exam from tutorials

Exam from laboratories based on reports

Programme content

Division of aerodynamic forces, definition of lift and drag, Bernoulli equation. Reynolds number, critical parameters and accumulation of gas, classification of gas flows, change of gas parameters in the flow through a conduit with variable cross-section, wave phenomena in the flow around key parts of external aircraft. normal and oblique shock wave, aviation profile families, aerodynamic characteristics, aerodynamic systems.

PART-66

MODULE 8. BASICS OF AERODYNAMICS

8.1 Atmospheric physics

Application of the International Standard Atmosphere (ISA) for aerodynamics. [2]

8.2 Aerodynamics

Air flow around the body; Boundary layer, stratified flow, turbulent, undisturbed, relative air flow, stream deflection, vorticity, stagnation; Terms: aviation profile, chord, medium aerodynamic chord, profile resistance, resistance induced, pressure center, angle of attack, negative and positive buckling, volatility, wing shape and elongation; Thrust, weight, resultant aerodynamic; Generation of lift and resistance: angle of attack, lift, resistance, polar, stall; Pollution of the airfoil along with ice, snow, frost. [2]

MODULE 11B. AERODYNAMICS, STRUCTURES AND PISTON PLANE SYSTEMS

11.1 Theory of flight

11.1.1. Aircraft aerodynamics and flight control

Action and result: - tilt control: ailerons and air brakes; - height adjustment: headsets, integral tail, variable range ballasts and ducks; - yaw adjustment, rudder stops; Adjustment with the use of airplanes, butterfly tail; Lifting devices, gill slits, gills, flaps, flap hooks; Resistance devices, spoilers, air brakes, speed brakes; Aerodynamic comb lobe effects, fault leading edges; Boundary layer adjustment, vortex generators, stall wedges or leading devices boundary; Operation and effect of balancing flaps, relief and weighting (leading) flaps, flaps steering, spring flaps, mass balance, control surface inclination, aerodynamic adjustment panels. [2]

11.1.2. High-speed flights - not applicable - - [-]

Teaching methods

1. Lecture: multimedia presentation

2. Tutorials: completing the tasks given by the teacher

3. Laboratories: performing measurements and calculations at the testing equipment

Bibliography

Basic

1. Sobieraj W., Aerodynamika, WAT, Warszawa 2014

2. Prosnak W.J., Równania klasycznej Mechaniki płynów, PWN, Warszawa 2006

3. Anderson J.D. Jr., Fundamentals of Aerodynamics, Fifth edition, McGraw-Hill, 2011

Additional

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Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	47	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam) [1]	53	2,0

[1] delete or add other activities as appropriate