



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Flight mechanics

Course

Field of study

Aviation

Area of study (specialization)

Aircraft engines and airframes

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/5

Profile of study

general academic

Course offered in

polish

Requirements

elective

Number of hours

Lecture

30

Laboratory classes

Other (e.g. online)

Tutorials

15

Projects/seminars

15

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

PhD inż. Łukasz Brodzik

Responsible for the course/lecturer:

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Faculty of Environmental Engineering and
Energy

Piotrowo 3 st., 60-965 Poznań

Prerequisites

Student should have knowledge of mathematics, physics and aerodynamics presented in the studies. He should be able to obtain information from the indicated sources of literature, the Internet and other sources, use formulas, tables and technical calculations. He should be able to understand the need to expand their competencies and has the willingness to cooperate in a team.

Course objective

Teaching basic laws and dependencies regarding stability and control in the field of flight mechanics of aircraft, as well as familiarizing with basic equilibrium equations of helicopters in different flight states.



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 the ability to self-study with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books

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 use information and communication techniques, applicable at various stages of the implementation of aviation projects
3. is able to properly plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them
4. can, when formulating and solving tasks related to civil aviation, apply appropriately selected methods, including analytical, simulation or experimental methods
5. can solve tasks using the rules of air traffic and design a runway in accordance with the applicable ICAO requirements
6. student can use theoretical probability distributions. Student is able to analyze and interpret statistical data. Student is able to use the methods and tools of mathematical statistics in engineering practice
7. is able to prepare a short research paper while maintaining the basic editorial rules. He can choose appropriate methods for the conducted research and is able to carry out a basic analysis of the results.
8. is able to organize, cooperate and work in a group, assuming various roles in it, and is able to properly define priorities for the implementation of a task set by himself or others
9. is able to plan and implement the process of own permanent learning and knows the possibilities of further education (2nd and 3rd degree studies, postgraduate studies, courses and exams conducted by universities, companies and professional organizations)

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. 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

4. 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:

Written exam from the lecture

Written exam from project

Programme content

Static, dynamic and controllability of aircraft, the phenomenon of stable and unstable corkscrew, selected aerobatics, basic concepts related to helicopters, helicopter classification, basics of rotor aerodynamics, horizontal movement with helicopter descending and rising, helicopter takeoff and landing

PART - 66 (THEORY - 30 hours)

MODULE 8. BASIC AERODYNAMICS

8.3 Theory of Flight

Relationship between lift, weight, thrust and drag; gliding flight; Steady state flights, performance;

rotation theory; [2] Effects of loading factors: stall, flight envelope and design constraints; Increasing lift. [2]

8.4 Flight stability and dynamics

Longitudinal, lateral and directional (active and passive) stability. [2]

Teaching methods

1. Lecture: multimedia presentation

2. Project: preparation of a written study of a selected project

Bibliography

Basic

1. Krzyżanowski A., Mechanika lotu śmigłowców, WAT, Warszawa 2010



2. Fiszdon W., Mechanika lotu cz. 1 i 2, PWN, Warszawa 1961
3. Hull D.G., Fundamentals of Airplane Flight Mechanics, Springer, 2007

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	62	2,5
Student's own work (literature studies, preparation for exam, project preparation) ¹	38	1,5

¹ delete or add other activities as appropriate