COURSE DESCRIPTION CARD - SYLLABUS

Course name
Flight mechanics [S1Lot2-SLiPL>ML]

Course

Field of study
Aviation

Year/Semester
3/5

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
elective

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
15

Number of credit points

4,00

Coordinators

dr inż. Łukasz Brodzik
lukasz.brodzik@put.poznan.pl

Lecturers

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 understands the need to expand their competencies and has the willingness to cooperate in a team.

Course objective

Teaching the basic laws and relationships in the field of aircraft flight mechanics, as well as getting acquainted with basic equilibrium equations of airframes in various flight states. Learning basic laws and relationships regarding stability and controllability in the field of flight mechanics aircraft, as well as familiarization with the basic equilibrium equations of helicopters in various flight states.

Course-related learning outcomes

Knowledge:
of differential equations, probability, analytical geometry as well as physics including the basics of classical mechanics, optics, electricity and magnetism, solid state physics, thermodynamics, useful for formulating and solving complex technical tasks related to aeronautical engineering and modeling 2. has structured and

theoretically based general knowledge of key issues of technology and detailed knowledge of selected issues related to air transport, knows 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-educate using modern teaching tools, such as remote lectures, Internet sites and databases, teaching programs, e-books

Skills:
Polish and English, using appropriate integrate, interpret and critically evaluate them, draw conclusions, and comprehensively justify the opinions he/she formulates 2. is able to properly use information and communication techniques that are applied 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. is able to formulate and solve tasks related to civil aviation, apply appropriately selected methods, including analytical, simulation or experimental methods 5. is able to solve tasks using air traffic problems and design a runway in accordance with applicable ICAO requirements 6. the student is able to use theoretical probability distributions. The student is able to analyze and interpret statistical data. The student is able to use methods and tools of mathematical statistics in engineering practice 7. is able to prepare a short scientific paper, observing basic editorial principles. Is able to select appropriate methods for the research being conducted and is able to conduct a basic analysis of the results. 8. is able to organize, cooperate and work in a group, assuming different roles in it and is able to appropriately define priorities for the implementation of a task defined by himself or others 9. is able to plan and implement the process of his 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:
2. is aware of the importance of knowledge in solving engineering problems and knows examples and understands the causes of malfunctioning engineering projects that led to serious financial, social losses or serious loss of health or even life 3. is aware of the social role of a graduate of a technical university, in particular understands the need to formulate and communicate to the public, in an appropriate form, information and opinions concerning engineering activities, technical achievements, as well as the achievements and traditions of the engineering profession 4. correctly identifies and resolves dilemmas related to the performance of the profession aerospace engineer

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written assessment of the lecture
Assessment based on the project

Programme content

Classification of flying objects and aircraft drives, propeller operation in constant and variable conditions, necessary and available power, characteristic speeds, steady horizontal and climbing flights, straight and curved, flight range and duration, aircraft ceiling, aircraft take-off and landing, aircraft flight limitations in terms of aerodynamics and durability, similarity criteria, selected dangerous situations in flight. Static and dynamic stability and ship steerability air, the phenomenon of stable and unstable corkscrew, selected issues of aerobatics, basic concepts related to helicopters, classification of helicopters, basics of aerodynamics main rotor, horizontal movement with descent and ascent of the helicopter, take-off and landing of the helicopter
PART - 66 (THEORY - 30 hrs)
MODULE 8. FUNDAMENTALS OF AERODYNAMICS
8.3 Flight theory
Relationship between lift, weight, thrust and drag;
gliding flight;

Course topics

The lecture program consists of the following parts: introduction to flight mechanics, steady level flight, steady flight with climb, steady flight with descent, take-off and landing, summary of knowledge, polar speeds, barograms and maximum ceiling, range determination using the partial fuel mass method,

determination necessary thrust, introduction to stability, longitudinal stability, corkscrew, diving, important aerobatic figures, loop, basic knowledge about helicopters
The exercise program consists of the following parts: steady level flight, flight range and duration, steady flight with climb and descent, turn, take-off and landing.
The design lesson program consists of the following parts: calculation of aircraft parameters, i.e. the distribution of the drag coefficient at zero lift, the necessary thrust curve and other selected characteristics of the aircraft.

Teaching methods

1. Lecture: multimedia presentation
2. Exercise: activities using a blackboard
3. Project: preparation of a written study of a selected project

Bibliography

Basic:
1. Krzyżanowski A., Helicopter flight mechanics, Military University of Technology, Warsaw 2010
2. Fiszdon W., Flight mechanics part 1 and 2, PWN, Warsaw 1961
3. Hull D.G., Fundamentals of Airplane Flight Mechanics, Springer, 2007
Supplementary

Additional:
-

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	38	1,50