COURSE DESCRIPTION CARD - SYLLABUS

Course name
Airframe design [S1Lot2-SLiPL>PSP]

Course

Field of study
Aviation

Year/Semester
3/6

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
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

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

Lecturers

Prerequisites

Student has basic knowledge on construction of aircraft, flight dynamics and aerodynamics. Student has the capability of performing basic of performing basic algebraic and differential computations. Student is able to independently search for and integrate information found in the literature.

Course objective

The goal of the study is to project knowledge and skills in area of aircraft design

Course-related learning outcomes

Knowledge:
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 2. has detailed knowledge related to selected issues in the field of navigation, flight mechanics and piloting techniques, use of simulators, flight principles, flight preparation, and related operational procedures 3. has extended knowledge of the strength of materials, including the theory of elasticity and plasticity, stress hypotheses, methods of calculating beams, membranes, shafts, connections and other structural elements, as well as methods of testing the strength of materials and the state of deformation and stress in structures, and also

has basic knowledge of the main areas of technical mechanics: statics, kinematics and dynamics of a material point and a rigid body 4. has basic knowledge of metallic, non-metallic and composite materials used in machine construction, and in particular about their structure, properties, methods of production, heat and thermochemical treatment and the influence of plastic processing on their strength, as well as fuels, lubricants, technical gases, refrigerants, etc. 5. has basic knowledge of the mechanisms and laws governing human behaviour and psyche

Skills:
Polish and English, integrate it properly, interpret and critically evaluate it, draw conclusions, and comprehensively justify the opinions formulated by him/her 2. is able to properly plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them 3. is able to appropriately select materials for simple aircraft structures, indicate differences between fuels used in aviation 4. is able to design means of transport with appropriate external requirements (e.g. regarding environmental protection)

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 have led to serious financial, social losses or serious loss of health or even life 3. 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:

Lecture: 90 minute exam in the exam session. Exam consists of 10 closed, single choice tasks (estimated time per task - 2 minutes) and 10 short opne calculation tasks (estimated time per task - 5 minutes) relevant to tasks presented on the lecture. Correct answer for closed tasks is worth 1 point. Open tasks are given 0-2 points with 0.5 point grading. Fully accomplished task cosists of a schematic (if needed), equations, calculations and unit calculations. Tasks are independent, answer from previous task is not required to following task. Passing the test requires 50% of points.
Project: Passing the project is based on minimum 5, maximum 7 project assignments relevant to the lectures. A project task is based on a elaborate calculations completed with specialistic software or self written scripts. Estimated time for completing a task - 13 days. Tasks shall be submitted via univerisites e-mail before given deadline. Tasks are graded from 0 - 10 points. Grading criteria are dependent on the task and comminicated during assignment. Task submitted after a deadline and/or by and to a non-univerisity e-mail are graded with 0 points. Tasks completed with use of references without pointing the reference sources (plagiarism, copycat works) are graded with 0 points. Criteria for passing a single assignment: obtaining 50% of points. Criteria for passing the class: obtaining 50% of total available point from all assignments and passing minimum of 70% of assignments.

Programme content

1. Overview of aircraft design process, statistical approach for aircraft design
2. Aerodynamic loads on flight surfaces
3. Aerodynamic loads on control surfaces
4. Aerodynamic loads on fuselage
5. Computation of shear, bending, twist loads based on aerodynamical and mass loading
6. Computation of loads in load bearing points
7. Introduction to aeroelastics

PART - 66 (THEORY - 45 hours)
MODULE 11B. PISTON AIRPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS
11.3 Airframe structures - airplanes
11.3.1 Hull (ATA 52/53/56)
Sealing structures and increasing tension;
Wing, Airplane Tail Bracket and Landing Gear Mount;
Seat assembly;
Emergency doors and exits: construction and operation;
Fixing windows and windbreak. [2]
11.3.2 Wings (ATA 57)
Building;

Storage of fuel;
Landing gear, pillar, control surface, and lift / drag devices. [2]
11.3.3 Ballasts (ATA 55)
Building;
Attachment of the control surface. [2]
11.3.4 Flight control surfaces (ATA 55/57)
Construction and fastening;
Balancing - mass and aerodynamics. [2]
11.3.5 Gondolas / Supports (ATA 54)
Gondolas / Brackets:
- Construction;
- Firewalls;
- Engine suspension. [2]

Course topics

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6. Computation of loads in load bearing points
7. Introduction to aeroelastics

Teaching methods

Blackboard based lecture, project classes in computer laboratory with practical examples of calculations presented on lecture

Bibliography

Basic:
1. Thomas C. Corke - Design of Aircraft
2. Lloyd R. Jenkinson, James F. Marchman III - Aircraft Design Projects
3. T. H. G. Megson - Aircraft Structures for Engineering Students
4. Jan Roksam - Airplane Design

Additional:
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Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
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)	63	2,50