



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Design of aircraft

### 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

III/6

Profile of study

general academic

Course offered in

english

Requirements

elective

### Number of hours

Lecture

30

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

30

### Number of credit points

5

### Lecturers

Responsible for the course/lecturer:

Dr inż Jędrzej Mosiężny

Responsible for the course/lecturer:

Jędrzej.mosiezny@put.poznan.pl

### Prerequisites

Has basic knowledge on construction of aircraft, flight dynamics and aerodynamics. Has the capability of performing basic of performing basic algebraic and differential computations

### Course objective

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

### 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 detailed knowledge related to selected issues in the field of navigation, flight mechanics and piloting techniques, the use of simulators, flight rules, its preparation, and related operating procedures



3. has extended knowledge in the field of material strength, including the theory of elasticity and plasticity, stress hypotheses, methods of calculating beams, membranes, shafts, joints and other structural elements, as well as methods of testing the strength of materials and the state of deformation and stress in structures, and has basic knowledge of the main departments of technical mechanics: statics, kinematics and dynamics of a material point and a rigid body
4. has basic knowledge of metal, non-metal and composite materials used in machine construction, in particular about their structure, properties, methods of production, heat and thermo-chemical treatment and the influence of plastic processing on their strength, as well as fuels, lubricants, technical gases, refrigerants e.t.c.
5. has a basic knowledge of the mechanisms and laws governing human behavior and psyche

#### 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 plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them
3. is able to properly select materials for simple aviation structures, and can indicate the differences between the fuels used in aviation
4. is able to design means of transport with appropriate external requirements (e.g. regarding environmental protection)

#### 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. 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 open 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 consists 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]

## 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

Any adequate literature on topic



### Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	62	2,5
Practical Activities <sup>1</sup>	63	2,5

<sup>1</sup> delete or add other activities as appropriate