



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Principles of Flight

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### Course

Field of study

Year/Semester

Aerospace Engineering

1/2

Area of study (specialization)

Profile of study

Level of study

general academic

First-cycle studies

Course offered in

Form of study

polish

full-time

Requirements

compulsory

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### Number of hours

Lecture

Laboratory classes

Other (e.g. online)

15

Tutorials

Projects/seminars

15

### Number of credit points

2

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### Lecturers

Responsible for the course/lecturer:

Responsible for the course/lecturer:

Adam Wójcik

dr hab. inż. Agnieszka Wróblewska, prof.PP

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### Prerequisites

The student starting this subject should have basic knowledge of aircraft control. He should also have the ability to apply the scientific method in solving problems and be ready to cooperate within a team.

### Course objective

To acquaint the student with the operation of airplane control systems.

### Course-related learning outcomes

Knowledge

1. has detailed knowledge related to selected issues in the field of navigation of flight mechanics and piloting techniques, and the use of flight simulators.



2. has detailed knowledge related to selected issues in the field of flight rules, its preparation, as well as related operational procedures.

3. has basic knowledge necessary to understand profile subjects and specialist knowledge about construction, methods of construction, manufacture, operation, aircraft control, safety systems, economic, social and environmental impact in the field of aviation engineering for selected specialties:

1. Piloting of aircraft

2. Aero engines and airframes.

#### Skills

1. is able to communicate using various techniques in a professional environment and other environments using the formal record of construction, technical drawing, concepts and definitions of the scope of the studied field of study.

2. is able to use formulas and tables, technical and economic calculations using a spreadsheet and running a simple relational database.

3. can obtain information from literature, the Internet, databases and other sources. Is able to integrate obtained information, interpret and draw conclusions from them.

#### Social competences

1. is aware of the importance of maintaining the principles of professional ethics.

2. is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment, and the associated responsibility for the decisions taken.

3. understand the need for critical assessment of knowledge and continuous education.

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

##### Lecture:

- assessment of knowledge and skills demonstrated on the written test - 1.5 hour

##### Exercises:

- knowledge acquired during the exercises is verified by two 45-minute colloquia carried out during 3 and 7 classes

#### Programme content

##### Lecture:



Subsonic aerodynamics: basic, laws and definitions. Basics of airflow. Aerodynamic forces on aerofoils. Shape of an aerofoil section. Wing shape. The lift coefficient (CL) - angle of attack ( $\alpha$ ) graph. General use of coefficients. Three-dimensional airflow around an aeroplane.

Exercises:

Two-dimensional airflow around an aerofoil: streamline pattern, stagnation point, pressure distribution, centre of pressure (CP) and aerodynamic centre (AC), drag and wake, the lift coefficient (CL) - angle of attack ( $\alpha$ ) graph. Streamline pattern. Stagnation point. Pressure distribution.

PART - 66 (THEORY - 22.5 hours)

## MODULE 11B. PISTON AIRPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS

### 11.1 Theory of Flight

#### 11.1.1. Airplane aerodynamics and flight control

Operation and effect of trim tabs, balance and weight (leading) tabs, control tabs, spring tabs, mass balance, control surface inclination, [2]

aerodynamic control panels.

## Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.
2. Exercises: examples given on the board and performance of tasks given by the teacher - practical exercises.

## Bibliography

Basic

1. "Principles of Flight" (JAR Ref 080). JAA ATPL Training. Germany 2004
2. „Podstawy Aerodynamiki i Mechaniki Lotu”. Abłamowicz A.. Nowakowski W., Wydawnictwo Komunikacji i Łączności, Warszawa 1980
3. „Praktyczna aerodynamika i mechanika lotu samolotu odrzutowego, w tym wysokomanewrowego”, Milkiewicz A.. Wydawnictwo ITWL, Warszawa 2009
4. „Podstawy eksploatacji statków powietrznych”, Lewitowicz J., Wydawnictwo Instytutu Technicznego Wojsk Lotniczych, Warszawa 2001



Additional

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	49	2,0
Classes requiring direct contact with the teacher	36	1,4
Student's own work (literature studies, preparation for exercises, preparation for colloquium, preparation for passing) <sup>1</sup>	13	0,6

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