



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Principles of Flight

### Course

Field of study

Aerospace Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/3-4

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

### Number of hours

Lecture

60

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

Maciej Smólski

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Responsible for the course/lecturer:

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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

#### Programme content

Lecture:

semester 3:

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. Two-



dimensional airflow around an aerofoil. The lift coefficient (CL) and drag. Three-dimensional airflow around an aeroplane. Ground effect.

semester 4:

The relationship between lift coefficient and speed in steady, straight, and level flight. High-speed aerodynamics: speed, shock waves, effects of exceeding the critical Mach number (MCRIT), means to influence critical Mach number (MCRIT). The stall, the spin. Static and dynamic stability. Control. Operating limitations. Propellers. Flight mechanics

### Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.

### 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	75	3,0
Classes requiring direct contact with the teacher	65	2,6
Student's own work (literature studies, preparation for exercises, preparation for colloquium, preparation for passing) <sup>1</sup>	10	0,4

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