



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Flight Simulation Devices

### Course

Field of study

Aviation

Area of study (specialization)

Air Traffic Management

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

dr inż. Marta Galant-Gołębiewska

marta.galant@put.poznan.pl

Faculty of Civil and Transport Engineering

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

mgr inż. Barbara Mika

barbara.mika@put.poznan.pl

Faculty of Civil and Transport Engineering

ul. Piotrowo 3, 60-965 Poznań

### Prerequisites

Knowledge: Basic knowledge of transport safety, basic knowledge of air transport

Skills: the ability to solve research problems using scientific methods, the ability to find cause and effect relationships based on the acquired knowledge

Social competences: the ability to precisely formulate questions; the ability to define priorities important in solving the tasks set before him; the ability to formulate a research problem and search for its solution, independence in problem-solving, the ability to cooperate in a group.

### Course objective

1. To acquaint students with the classification of flight simulation devices
2. Presentation of the construction of devices and their components



3. Acquainting students with the principles of creating simulator software
4. Discussion of the basics of human physiology important from the point of view of using simulators
5. Presentation of the possibility of using simulators to conduct scientific research, train new skills and learn behavior in unusual situations.

### Course-related learning outcomes

#### Knowledge

has detailed knowledge related to selected issues in the field of manned and unmanned aircraft construction, in the field of on-board equipment, control systems, communication and recording systems, automation of individual systems, has basic knowledge of flight simulation training devices and simulation methods used to solve air transport issues [L1\_W06].

#### Skills

1. is able to obtain information from various sources, including literature and databases, both in Polish and in English, integrate them properly, interpret and critically evaluate them, draw conclusions and exhaustively justify their opinions [L\_U01]
2. can properly use information and communication techniques, applicable at various stages of the implementation of aviation projects [L\_U02]
3. can, when formulating and solving tasks related to civil aviation, apply appropriately selected methods, including analytical, simulation or experimental methods [L\_U04]

#### Social competences

1. understands that in technology, knowledge and skills very quickly become obsolete [L\_K01]
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 and social losses or to a serious loss of health and even life [L\_K02]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

LECTURE: Assessment of knowledge and skills in a written or oral exam based on the explanation of selected issues

LABORATORY: Preparation of reports on the implementation of individual laboratory exercises. Optional assessment of students' knowledge prior to the implementation of the classes.

### Programme content

LECTURE:

1. Introduction. Basic concepts. Flight simulator and training device definitions. History of flight simulators.



2. Advantages and disadvantages of flight simulation devices: impact on training efficiency, training time reduction, environmental protection, cost reduction and safety.
3. Regulatory regulations for aviation training devices and aviation personnel licensing (CS-FSTD (A) Certification Specifications for Airplane Flight Simulation Training Devices, CS-FSTD (H) Certification Specifications for Helicopter Flight Simulation Training Devices)
4. The use of flight simulation devices in the training of pilots. Characteristics of pilot training. Possibilities of using simulators at various stages of education. Other simulation devices (centrifuge, trainers, mission simulators). Review of existing solutions (aviation, automotive, anti-crisis)
5. Construction of devices and components for simulators. Simulator motion systems: division and construction, principles of construction and basics of control. Visualization systems: image presentation systems, image generation systems, helmet-mounted systems. Image generators. Real-time computer graphics. Computer databases of terrain and 3D objects. Instruments and gauges simulators. Airplane flight control system simulators.
6. Simulator sickness. Factors contributing to the occurrence of the disease, methods of its diagnosis. The causes and symptoms of the simulator disease. Analysis of the construction of simulators used for research purposes at the Poznań University of Technology.
7. Summarizing the acquired knowledge and passing the material

LAB:

1. Introduction and discussion of health and safety rules.
2. Simulation possibilities. Presentation and discussion of the scope and advisability of simulating selected factors: change of atmospheric conditions, possibilities of simulating the geographical location of the airport, infrastructure, altitude).
3. Simulation possibilities. Presentation and discussion of the scope and advisability of simulation of selected factors: simulation of component failure, change of the drive system
4. Certification of Flight Simulation Training Devices: Validation tests
5. Certification of Flight Simulation Training Devices: Functional and subjective tests
6. Simulator sickness. Discussion of the phenomenon and the reasons for its occurrence. Examination of the symptoms of the disease using the SSQ (Simulator Sickness Questionnaire).
7. Crediting

**Teaching methods**

Informative (conventional) lecture (providing information in a structured manner) - may be of a course (introductory) or monographic (specialist) character



Laboratory (experiment) method (students independently conduct experiments)

## Bibliography

### Basic

1. Bartnik R., Grenda B., Galej P., Symulatory lotu oraz symulatory kontroli ruchu lotniczego w szkoleniu lotniczym, Wyd. Akademii Obrony Narodowej, Warszawa, 2014
2. Lozia Z.: Symulatory jazdy samochodem, WKŁ, Warszawa 2008
3. Leski J., Symulacja i symulatory, Wyd. MON, Warszawa, 1971
4. Szczepański C., Symulatory lotu, Wyd. Politechniki Warszawskiej, 1990
5. Zagdański Z.: Stany awaryjne statków powietrznych, Wyd. ITWL, Warszawa, 1995
6. Kearns S., Marvin T., Hodge S.: Competency-Based Education in Aviation: Exploring Alternate Training Pathways, 2016
7. J. M. Rolfe, K. J. Staples: Flight Simulation
8. Peter A. Hancock, Dennis A. Vincenzi, John A. Wise, Mustapha Mouloua: Human Factors in Simulation and Training
9. Lewitowicz J., Kustroń K., Podstawy eksploatacji statków powietrznych, Własności i właściwości eksploatacyjne statku powietrznego, Wyd. ITWL, Warszawa, 2003

### Additional

1. Podręcznik zarządzania bezpieczeństwem, Doc 9859 ICAO Organizacja Międzynarodowego Lotnictwa Cywilnego, wydanie pierwsze 2006
2. Makarowski R., Smolicz T., Czynniki ludzkie w operacjach lotniczych, ADRIANA AVIATION, Kosowizna, 2012
3. Lewitowicz J., Kustroń K., Podstawy eksploatacji statków powietrznych, Własności i właściwości eksploatacyjne statku powietrznego, Wyd. ITWL, Warszawa, 2003
4. Lewitowicz J. (red.) Podstawy eksploatacji statków powietrznych, Badania eksploatacyjne statków powietrznych, Wyd. ITWL, Warszawa, 2007
5. Makarowski R., Ryzyko i stres w lotnictwie sportowym, Wyd. Difin, Warszawa, 2010



### Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	30	1,5
Student's own work (literature studies, preparation for classes, preparation for tests,) <sup>1</sup>	70	2,5

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