



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Flight simulation training device [S1Lot2-ORL>USL]

### Course

Field of study

Aviation

Year/Semester

2/3

Area of study (specialization)

Air Traffic Organisation

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

15

Laboratory classes

15

Other

0

Tutorials

0

Projects/seminars

0

### Number of credit points

4,00

### Coordinators

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### Lecturers

### 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

## Course topics

Lecture topics include the following topics:

1. Definitions of flight simulator and training device

The history of flight simulators

2. Advantages and disadvantages of flight simulation devices: impact on training efficiency, shortening training time, environmental protection, cost reduction and safety

3. Legal regulations regarding aviation training devices and licensing aviation personnel

4. The use of flight simulation devices in pilot education. Review of existing solutions

5. Construction of simulator devices and components

6. Simulator sickness. Factors contributing to the occurrence of the disease, methods of its diagnosis.

Causes and symptoms of simulator sickness

7. Summary of the acquired knowledge and assessment of the material

The topics of laboratory classes include the following topics:

1. Introduction and discussion of occupational health and safety rules.

2. Simulation possibilities. Presentation and discussion of the scope and purposefulness of simulation of selected factors

3. Testing of overloads occurring during simulator flights

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 causes of its occurrence. Testing the symptoms of the disease using the SSQ (Simulator Sickness Questionnaire)

## 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. Galant-Gołębiewska M., Urządzenia symulacji lotu, Wyd. Politechniki Poznańskiej, Poznań, 2023

2. Bartnik R., Grenda B., Galej P., Symulatory lotu oraz symulatory kontroli ruchu lotniczego w szkoleniu lotniczym, Wyd. Akademii Obrony Narodowej, Warszawa, 2014

3. Lozia Z.: Symulatory jazdy samochodem, WKŁ, Warszawa 2008

4. Leski J., Symulacja i symulatory, Wyd. MON, Warszawa, 1971

5. Szczepański C., Symulatory lotu, Wyd. Politechniki Warszawskiej, 1990

6. Zagdański Z.: Stany awaryjne statków powietrznych, Wyd. ITWL, Warszawa, 1995

7. Kearns S., Marvin T., Hodge S.: Competency-Based Education in Aviation: Exploring Alternate Training Pathways, 2016

8. J. M. Rolfe, K. J. Staples: Flight Simulation

9. Peter A. Hancock, Dennis A. Vincenzi, John A. Wise, Mustapha Mouloua: Human Factors in Simulation and Training

10. 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	4,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	70	3,00