



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Flight simulation training devices

Course

Field of study

Aerospace Engineering

Area of study (specialization)

Air transport

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/4

Profile of study

general academic

Course offered in

polish

Requirements

elective

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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Prerequisites

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

Skills: the ability to solve research problems with the use of 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 important priorities in solving the tasks set for him; ability to formulate a research problem and search for its solution, independence in problem-solving, ability to cooperate in a group

Course objective

1. Presentation of the classification of flight simulation devices to students
2. Presentation of the construction of devices and their components
3. Introducing students to 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

1. Has a structured, theoretically founded general knowledge covering key issues in the field of on-board equipment, as well as on-board and terrestrial electronic communication systems [[K1A_W09]]
2. has ordered, theoretically founded general knowledge covering key flight safety issues and risk assessment - [[K1A_W12]]
3. Has detailed knowledge related to selected issues in the field of human capabilities and limitations during the operation of the aircraft in flight, as well as the possibilities and limitations of the air ambulance system [[K1A_W15]]

Skills

1. Can analyze objects and technical solutions, can search in catalogs and on manufacturers' websites, ready components of machines and devices, including means and devices for transport and storage, assess their suitability for use in own technical and organizational projects [[K1A_U09]]
2. Can plan and carry out a research experiment using measuring equipment, computer simulations, can perform measurements such as temperature measurements with liquid, thermistor, thermocouple thermometers, velocity and flow rate using turbine, laser and ultrasonic flow meters, interpret the results and draw conclusions [[K1A_U11]]



Social competences

1. Can interact and work in a group, assuming different roles in it - [[K1A_K03]]
2. Is able to properly define priorities for the implementation of a task set by himself or others- [[K1A_K04]]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

LECTURE: Assessment of knowledge and skills on 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 before starting 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 Aeroplane Flight Simulation Training Devices, CS-FSTD (H) Certification Specifications for Helicopter Flight Simulation Training Devices)
4. Use of flight simulation devices in pilot training. Characteristics of pilot training. Possibilities of using simulators at different 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 disease. 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. Discussion of the construction of advanced flight simulation and car driving devices. Motion, sound and visualization systems. Classification of flight simulation devices.
3. Simulation possibilities. Presentation and discussion of the scope and advisability of simulating selected factors (change of weather conditions, simulation of component failure, change of the drive system, possibilities of simulating the geographical location of the airport, infrastructure, altitude).
4. Research on the dynamics of a mobile platform using various actuators (comparison of various design solutions of the simulator motion platform).
5. The impact of using the simulator on the level of concentration. Examination of cognitive abilities. Analysis of the perception of the senses tested with simple devices for analyzing the psychophysical state of the pilot.
6. Simulator disease. Discussion of the phenomenon and its causes. Study of disease symptoms using the SSQ (Simulator Sickness Questionnaire).
7. Final test

Teaching methods

Informative (conventional) lecture (providing information in a structured way) - 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	125	5,0
Classes requiring direct contact with the teacher	80	3,0
Student's own work (literature studies, preparation for laboratory classes, preparation for the exam, reports preparation) ¹	45	2,0

¹ delete or add other activities as appropriate