STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Flight Simulation Training Devices	**1010601141010627749**

Field of study	Profile of study (general academic, practical)	Year /Semester
Aerospace Engineering	**general academic**	**2 / 4**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Aircraft Transport	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours	No. of credits
Lecture: **1** Classes: **-** Laboratory: **1** Project/seminars: **-**	**3**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
other	**university-wide**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of safety in transport, basic knowledge of air transport
2	**Skills**	ability to solve research problems using scientific methods the ability to find causal relationships based on your knowledge.
3	**Social competencies**	the ability to precisely formulate questions; ability to determine priorities important in solving tasks set before him; ability to formulate a research problem and seek its solution, independence in solving problems, ability to cooperate in a group

Assumptions and objectives of the course:

1. Familiarizing students with the classification of flight simulation training devices
2. Presentation of the construction of devices and their components
3. Familiarizing students with the principles of software development for simulators
4. Discussing the basics of human physiology important from the point of view of the use of simulators
5. An approximation of the possibility of using simulators for conducting scientific research, training new skills as well as learning behaviors in atypical situations.

Study outcomes and reference to the educational results for a field of study

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 ground-based electronic communication systems - [[K1_W09]]
2. Has a structured, theoretically founded general knowledge covering key issues in the field of flight safety and hazard risk assessment - [[K1_W12]]
3. He has detailed knowledge related to selected issues in the field of human capabilities and limitations while operating the aircraft in flight, as well as the capabilities and limitations of the air ambulance system - [[K1_W15]]

Skills:

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

Social competencies:

1. Student is able to interact and work in a group, taking on different roles - [[K1_K03]]
2. Is able to properly define the priorities for the implementation of a task set by himself or others - [[K1_K04]]

Assessment methods of study outcomes

LECTURE: Assessment of knowledge and skills on a written or oral exam based on an 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 classes.

Course description

LECTURE:

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

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

3. Legal regulations for aviation training devices and flight crew licensing (CS-FSTD (A) - Certifacation Specifications for Aeroplane Flight Simulation Training Devices, CS-FSTD (H) - Certification of Flight 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, simulators, mission simulators). Review of existing solutions (air, car, anti-crisis)

5. Construction of devices and components of simulators. Simulator motion systems: division and construction, principles of construction and control basics. Visualization systems: image presentation systems, image generation systems, helmet systems. Image generators. Real-time computer graphics. Computer database of terrain and 3D objects. Imitators of instruments and on-board indicators. Imitation aircraft flight control system.

6. Simulator sickness. Factors conducive to the occurrence of the disease, methods of diagnosing it. Causes and symptoms of simulaton sickness. Analysis of the design of simulators used for research purposes at the Poznan University of Technology.

7. Summary of the messages received - passing the material

LABORATORY:

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. Division of flight simulation devices.

3. Simulation possibilities - presentation and discussion of the scope and purposefulness of simulation of selected factors (change of atmospheric conditions, simulation of component failures, change of the propulsion system, simulation of the geographical location of the aerodrome - infrastructure, altitude, etc.).

4. Studies of the dynamics of a mobile platform using various executive elements (comparison of various construction solutions of simulator traffic platforms).

5. Impact of using the simulator on the level of concentration. Study of cognitive abilities. The analysis of the senses perception is studied using simple devices of psychophysical analysis of the pilot.

6. Simulator disease - a discussion of the phenomenon and the reasons for its occurrence. Studies of symptoms of the disease using the SSQ questionnaire (called Simulator Sickness Questionaire).

7. Examination

Basic bibliography:

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 bibliography:

1. Podręcznik zarządzania bezpieczeństwem, Doc 9859 ICAO Organizacja Międzynarodowego Lotnictwa Cywilnego, wydanie pierwsze 2006

2. Makarowski R., Smolicz T., Czynnik ludzki 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

Result of average student's workload

Activity	Time (working hours)
1. Participation in the lecture	2
2. Fixing the content of the lecture	15
3. Consultations related to the lecture	10
4. Preparation for passing the lecture	2
5. Participation in the course (lecture)	10
6. Preparation for laboratory exercises	2
7. Participation in laboratory exercises	10
8. Strengthening the content of exercises, making reports	15
9. Consultations	15
10. Participation in the pass	5

Student’s workload

Source of workload	hours	ECTS
Total workload	88	3
Contact hours	41	2
Practical activities	30	1