



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Hydraulic and pneumatic installations

Course

Field of study

Aerospace Engineering

Area of study (specialization)

Onboard systems and aircraft propulsion

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/6

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

15

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

PhD Łukasz Semkło

Responsible for the course/lecturer:

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Institute of Thermal Energy

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Prerequisites

Basic knowledge of thermodynamics and fluid mechanics, General mechanics, Fundamentals of mechanical engineering (general engineering). Predict threats to fluids transmitted pneumatically and hydraulically. Work in an interdisciplinary team. Ability to lead a team and expand team knowledge.

Course objective

Getting to know the pneumatic and hydraulic installations on the aircraft. Basics of design, principles of construction and operation of pneumatic and hydraulic installations.

Course-related learning outcomes

Knowledge

1. has knowledge in physics, covering the basics of classical mechanics, optics, electricity and



magnetism, solid state physics, thermodynamics, necessary to understand issues in the field of the theory of construction materials and materials science, theory of machines and mechanisms, theory of drives and mechatronic systems

2. has basic knowledge in the field of strength of materials, including the basics of the theory of elasticity and plasticity, strain hypotheses, methods of calculating beams, membranes, shafts, joints and other simple structural elements, as well as methods for testing material strength and the state of deformation and stress in structures

3. has structured, theoretically founded general knowledge covering key flight safety issues and risk assessment

Skills

1. knows how to use verbal communication with one additional foreign language at the everyday language level, is able to describe in this language issues from the field of study

2. can draw a diagram and a simple machine element in accordance with the principles of technical drawing

3. can apply the basic technical standards for safety

Social competences

1. can properly prioritize the implementation of tasks specified by him or others based on available knowledge

2. can think and act in an entrepreneurial manner

3. is aware of the social role of a technical university graduate, and in particular understands the need to formulate and convey to the public, in particular through the mass media, information and opinions on technological achievements and other aspects of engineering activities; endeavors to provide such information and opinions in a generally understandable way

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture and exercises - written test. Obtaining a pass from a minimum of 51% of points possible. Oral questioning is possible in order to raise the obtained grade. Laboratories - report and evaluation each time after the classes.

Programme content

Division of hydraulic systems. Basic principles of hydromechanics: hydraulic fluids, construction schemes and functioning of hydraulic installations. Liquids used in hydraulic systems - classifications, fluid parameters, viscosity, fluid resistance; compressibility of the liquid. Hydraulic installations: main, backup and emergency installations; - use, indicators, warning systems; - auxiliary installations. On-board hydraulic system - components and their symbols. Hydraulic machines: pumps and motors, timing elements, accumulators, filters, safety systems, characteristic parameters of hydraulic machines: pumps



and motors. Energy losses in elements of hydraulic systems. Bernoulli - Venturi theory. Principles of design and construction of hydraulic installations. Reliability of components of on-board systems and installations.

Classification of pneumatic systems. Construction diagrams and functioning of pneumatic installations. Power sources for pneumatic installations. Pressure control. Distribution. Indications and warnings. Interaction of pneumatic systems with other systems.

Teaching methods

Informative (conventional) lecture (information transfer in a structured way)

Seminar lecture ("external dialogue" between the lecturer and the student; students participate in solving the problem) - the continuation of the lecture may be a seminar

The exercise method (subject exercises, practice exercises) - in the form of auditorium exercises (application of acquired knowledge in practice - may take various forms: solving cognitive tasks or training psychomotor skills; transforming a conscious activity into a habit through repetition)

Bibliography

Basic

Hydraulika / Jarosz A., Wołoszyn J. Państw.Wydawn.Roln.i Leśne, 1966.

Napędy i sterowania pneumatyczne - Elementy pneumatyczne - Wyznaczanie parametrów przepływowych PN-M-73763 / Polski Komitet Normalizacji, Miar i Jakości. 1992.

Podstawy pneumatyki / H. Meixner, R. Kobler. wydawnictwo Festo.

Pneumatyka : elementy i układy / Łukasz N. Węsierski. Uniwersytet Rzeszowski Katedra Mechatroniki i Automatyki, 2015

Wentylatory i pompy przepływowe / Rydlewicz Janusz. Politechnika Łódzka, 1989.

Additional

Pompy, wentylatory, dmuchawy i sprężarki wraz z sieciami / Pacholczyk Edward. Stow.Elektryków Polskich, 1980.

Breakdown of average student's workload

	Hours	ECTS
Total workload	66	2,0
Classes requiring direct contact with the teacher	51	1,5
Student's own work (literature studies, making presentations) ¹	15	0,5

¹ delete or add other activities as appropriate