COURSE DESCRIPTION CARD - SYLLABUS

Course name

Technical thermodynamics

Course

Field of study

Aviation

Year/Semester

2/3

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

full-time

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:

dr hab. inż. Agnieszka Wróblewska, prof.PP

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tel. 61 665 2201

Responsible for the course/lecturer:

Prerequisites

The student starting this subject should have basic knowledge of the basics of thermodynamics and processes of energy flow and conversion in thermo-flow machines and devices. He should also have the ability to effectively self-study in a field related to the chosen field of study and be willing to cooperate within a team.

Course objective

Acquainting with basic thermodynamic processes, thermodynamic transformations and energy conservation equations. Getting to know the methods of description of various thermodynamic factors and thermodynamic cycles implementing the assumed processes of thermal and mechanical energy conversion in order to modernize or rebuild technological systems in the field of thermal energy. Practical mastery of the ability to describe the implementation of thermal processes.

Course-related learning outcomes

Knowledge

1. has ordered and theoretically founded general knowledge in the field of key technical issues and detailed knowledge of selected issues related to air transport, knows the basic techniques, methods and tools used in the process of solving tasks related to air transport, mainly of an engineering nature

2. has ordered, theoretically founded general knowledge covering key issues in the field of technical thermodynamics, fluid mechanics, in particular aerodynamics

Skills

1. is able to properly plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them

2. can solve tasks using basic knowledge of aerodynamics, flight mechanics and flow around a body

Social competences

1. is aware of the social role of a technical university graduate, in particular understands the need to formulate and provide the society, in an appropriate form, with information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

- assessment of knowledge and skills demonstrated on the written test - 1.5 hour exam

exercises:

The knowledge acquired as part of the exercises is verified by two 45-minute colloquia carried out during 3 and 7 classes

Laboratories:

- checking the preparation (knowledge) for laboratory classes,

- rewarding practical knowledge acquired during previous laboratory exercises,

- assessment of knowledge and skills related to the performance of measurements and their development in the form of a report.

Programme content

Lecture:

Introduction - basic relationships, thermodynamic factor model. First law of thermodynamics. Perfect gases. Basic relationships for open systems. The second law of thermodynamics. Circulation and

transformation efficiency. Typical transformations of perfect gas. Real gases. Basics of combustion processes description. Engine circuits. Left-hand cycles. Steam power cycle. Fundamentals of heat flow.

exercises:

The issues presented in the lecture are solved in the form of tasks.

Laboratories:

1. Temperature measurement and calibration.

2. Thermometry. Temperature measurements with resistance and thermoelectric thermometers.

3. Pressure measurement and calibration.

4. Energy balance. First law of thermodynamics.

5. Measurement of heat flux.

6. Perfect gas. The process of expansion in perfect gases.

7. Testing the TA60 absorption aggregate.

PART - 66 (THEORY - 33.75 hours, 11.25 hours)

MODULE 2. PHYSICS

2.3 Thermodynamics

a) Temperature: thermometers and temperature scales: Celsius, Fahrenheit and Kelvin; definition

warm; [2]

b) Heat capacity, specific heat;

Heat transfer: convection, radiation and conductivity;

Volumetric expansion;

First and second laws of thermodynamics;

Gases: the laws of ideal gases; specific heat in constant volume and constant pressure, work

made by expanding gas;

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.

2. Exercises: examples given on the board and performance of tasks given by the teacher - practical exercises.

3. Laboratories: Practical classes on the didactic positions.

Bibliography

Basic

1. Kalinowski E.:Termodynamika, Wyd. P. Wr. 1994

2. Szargut J.: Termodynamika techniczna, Wyd. P. Śl. 1997

3. Szargut J. I inni: Zadania z termodynamiki technicznej, P. Śl. 1995

4. Wiśniewski St.: Termodynamika techniczna, WNT 1995

5. Tuliszka E. Red.: Termodynamika techniczna. Zbiór zadań, Nr 889, Wyd. P.P. 1980

6. Kestin J.: Course in Thermodynamics, New York, Hemisphere 1979

Additional

1. Tuliszka E.: Teoria maszyn cieplnych, Nr 511, Wyd. P.P. 1974

2. M.J. Morano, H.N.Shapiro: Fundamentals of Engineering Thermodynamics, John Wiley & Sons, New York, 1998

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	45	1,5
Student's own work (literature studies, preparation for laboratory classes / exercises, preparation for tests / exam / passing laboratory classes, preparation of laboratory reports) [1]	5	0,5

[1] delete or add other activities as appropriate