COURSE DESCRIPTION CARD - SYLLABUS

Course name
Technical thermodynamics

Course

Field of study
Aviation

Year/Semester
2/4

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

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

1

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Agnieszka Wróblewska, prof.PP

Wydział Inżynierii Środowiska i Energetyki

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Responsible for the course/lecturer:
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tel. 61 665 2209

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. the student has knowledge of aviation safety and management. The student knows the concept of the human factor and methods of assessing human reliability, has detailed knowledge related to selected issues in the field of human capabilities and limitations during aircraft operation in flight, its impact on health and the ability to perform air operations, as well as the possibility of improving physical condition

2. has the ability to self-study with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books

Skills

1. is able to obtain information from various sources, including literature and databases, both in Polish and in English, integrate them properly, interpret them and make a critical evaluation, draw conclusions and exhaustively justify the opinions they formulate

2. is able to properly use information and communication techniques, applicable at various stages of the implementation of aviation projects

3. can see legal aspects in the process of formulating and solving tasks in air transport, in particular, use the aspects of European and national aviation law regulations

4. can assess - at least in a basic scope - various aspects of the risk associated with a logistics undertaking in air transport

5. is able to organize, cooperate and work in a group, assuming various roles in it, and is able to properly define priorities for the implementation of a task set by himself or others

6. is able to plan and implement the process of own permanent learning and knows the possibilities of further education (2nd and 3rd degree studies, postgraduate studies, courses and exams conducted by universities, companies and professional organizations)

Social competences

1. is able to think and act in an entrepreneurial way, incl. finding commercial applications for the created system, bearing in mind not only the business benefits, but also the social benefits of the activity

2. 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

3. correctly identifies and resolves dilemmas related to the profession of an aerospace engineer

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	25	1,0
Classes requiring direct contact with the teacher	15	0,5
Student's own work (literature studies, preparation for laboratory classes / exercises, preparation for tests / exam / passing laboratory classes, preparation of laboratory reports) [1]	10	0,5

[1] delete or add other activities as appropriate