COURSE DESCRIPTION CARD - SYLLABUS

Course name

Applied Thermodynamics

Course

Field of study

Construction and Exploitation of Means of Transport

Year/Semester

1/1

Area of study (specialization)

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

part-time

Requirements

compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
9	0	0
Tutorials	Projects/seminars	
9	0	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

prof. dr hab.Eng. E. Tuliszka-Sznitko,

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tel.: 61 6652111

Responsible for the course/lecturer:

Prerequisites

Student should have basic knowledge in mathematics (integration, differentiation) and in physics, also in thermodynamics (first course). Should be able to obtain information from the library and internet, should be ready to cooperate in a team.

Course objective

The purpose of the course is to deepen the student knowledge on thermodynamics and to prepare him to solve more complex problems. The purpose of the subject is also to draw attention to the issue of ecology.

Course-related learning outcomes

Knowledge

1. Student has knowledge of thermodynamics and fluid mechanics necessary to understand the thermodynamic processes occurring in working machines such as: heating devices, cooling and drying systems, pneumatic transport, energy conversion processes...

Skills

1. Student knows how to apply the acquired knowledge in the field of thermodynamics and fluid mechanics to simulate thermodynamic processes in technological systems, he knows how to use the acquired knowledge to recognize thermodynamic phenomena in a wide range of technical devices.

Social competences

1.Is ready to think and act in an entrepreneurial way.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: knowledge acquired during the lecture is verified by a 90-minute colloquium.

In tutorial class the knowledge is verified by a final test.

Programme content

Lecture: Definition of work, internal energy and enthalpy (ideal and real gas). The first law of thermodynamics (the closed and opened systems). Specific heat. Free energy and free enthalpy. Mixture of perfect gases. Spontaneous processes, irreversibility of processes, dissipation heat. The second law of thermodynamics. Analysis of basic thermodynamic processes: isothermal process, adiabatic process, isochoric process, isobaric process and reversible process, polytropic process. Efficiency of compression and expansion processes. Thermal efficiency of the gas power cycles - methods for optimizing the cycles. Supercritical fluids. Water vapor, property diagrams for phase changes processes. Vapor cycles and their thermal efficiency. The vapor-gas cycles. Theoretical and actual combustion processes. Flue gas composition. Heat of combustion. The basic processes of humid air and drying process. The thermodynamic phenomena in pneumatic systems. Heat transfer. Conduction through membranes without and with an internal heat source, natural and forced convection, radiation (basic concepts of radiation, Stefan Boltzmann's law, radiation heat exchangers).

Tutorial classes: solving practical problems (the first and second law of thermodynamics, power cycles, efficiency). Calculations of the air demand in combustion processes, exhaust composition. Calculations of adiabatic dryers

Teaching methods

Lecture: multimedia presentation illustrated with examples on the board.

In the classroom (tutorial), the practical problems are solved on the board.

Bibliography

Basic

1. Szargut, J. Termodynamika, PWN, Warszawa, 2000.

2. Demichowicz-Pigoniowa, J., Obliczenia fizykochemiczne, PWN, Warszawa, 1984.

3. Wiśniewski, S., Wiśniewski, T., Wymiana ciepła, WNT, 2002.

4. Szargut, J., Guzik, A., Górniak, H., Zadania z termodynamiki Technicznej, Wyd. Politechniki Ślaskiej, Gliwice, 2011.

5. Furmański, P., Domański, R., Wymiana ciepła, Przykłady obliczeń i zadania, Oficyna Wydawnicza Politechniki Warszawskiej, 2002.

Additional

1.Cengel, Y., Boles, M.A., Thermodynamics, an engineering approach, Mc Graw Hill, 2008.

2. Incropera, F., DeWitt, D., Fundamentals of heat and mass transfer, Wiley, 2008 3. Ghiaasiaan, M., Convective heat and mass transfer, Cambridge University Press, 2014

3. Ghiaasiaan, M., Convective heat and mass transfer, Cambridge University Press, 2014

Breakdown of average student's workload

	Hours	ECTS
Total workload	65	2,0
Classes requiring direct contact with the teacher	35	1,0
Student's own work Lecture: collecting literature, reading literature, preparing for the next lecture, preparing to final test Tutorial classes: preparing for the next class and for final test [1]	30	1,0

[1] delete or add other activities as appropriate