COURSE DESCRIPTION CARD - SYLLABUS

Course name
Applied Thermodynamics

Course

Field of study
Industrial and Renewable Energy
Area of study (specialization)

Level of study
Second-cycle studies
Form of study
part-time

Year/Semester
1/1
Profile of study
general academic
Course offered in
Polish
Requirements
compulsory

Number of hours

Lecture
9
Laboratory classes
0
Other (e.g. online)
0
Tutorials
9
Projects/seminars
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 a knowledge which allows him/her to analyze, design and optimize the thermodynamic processes.

2. Student has a knowledge of new energy-saving technology in the field of thermodynamics.

Skills

1.The student knows how to find a source of knowledge which enables him to analyze and solve the considered problem.

2. The student knows how to formulate the hypotheses concerning the studied problem.

3. The student knows how to use the results of experimental studies carried out in the power plants to optimize them. Student has a knowledge which allows him/her to analyze, design and optimize the thermodynamic processes.

Social competences

1. Student is able to critically assess the received information in the field of thermodynamics.

2. Student is prepared to operate effectively in the field of thermodynamics.

3. Student knows his/her role in society and is ready to work effectively in the field of thermodynamics to fulfill expectations.

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: The I and II law of thermodynamics. The free enthalpy and free internal energy. The Maxwell's thermodynamic equations. The theoretical and actual combustion processes. The behavior of gas mixtures. The basic consideration in the analysis of power cycles. The vapor and combined power cycles (energy balance, efficiency, losses). The binary vapor cycles. The basic processes of humid air. The heat exchange: Conduction (in materials with an internal heat source). The free convection (laminar free convection, the effect of turbulence, empirical correlations). The combined free and forced convection. Boiling and condensation (the boiling curve). The force boiling convection, two face flow. Radiation (processes and properties, radiation exchange between surfaces).

Tutorial class: the simple flow cases are solved on the board.

Teaching methods

Lecture: multimedia presentation illustrated with examples on the board. In the classroom the practical problems are solved on the board (the student is required to have a calculator).

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	60	2,0
Classes requiring direct contact with the teacher	30	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