COURSE DESCRIPTION CARD - SYLLABUS

Course name
Applied Thermodynamics [S1Energ1>TT2]

Course

Field of study
Power Engineering

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Student should have basic knowledge in mathematics (integration, differentiation), in physics and also in thermodynamics. 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. Also to acquaint him with the measure methods.

Course-related learning outcomes

Knowledge:
1.student has basic knowledge in the field of solid mechanics, thermodynamics, fluid mechanics (including knowledge necessary to understand the basic physical phenomena occurring in thermal engineering systems).
2.student has knowledge on the thermal effects of chemical reactions.
3.student has knowledge on the conversion of primary energy into work and heat, has the basic
4.student is aware of the influence of energy conversion on the natural environment.

Skills:
1.student is able to obtain information from literature and is able to use it to solve the considered problem.
2.student can work individually and in a team in the field of thermodynamics (particularly in laboratory); student knows how to solve task (knows how to estimate the time needed to complete the task; is able to develop and implement a work schedule ensuring meeting deadlines.

Social competences:
.1.student understands the need and knows the possibilities of continuous raising his professional qualifications in thermodynamics; the student is ready to critically assess his knowledge.
2.student understands the non-technical aspects of the activities of an energy engineer, including the impact of this activity on the environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture: Knowledge acquired during the lecture is verified by a 90-minute colloquium. The test consists of 15 questions. A list of 30 questions, of which 15 are selected for the test, is sent by e-mail to all students 2 weeks in advance.
Laboratory classes: Student writes a short 10 minutes test at the beginning of each laboratory class.

Programme content

Lecture: 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). The equation of thermal conductivity and its solutions. The thermodynamics of wet steam. Supercritical fluids. Maxwell thermodynamic equations and their application. Combined gas-vapor power cycles, binary vapor cycles. The energy balances. Heat pumps.
Laboratory classes: measurement of basic thermodynamic parameters such as pressure, temperature, humidity, measurements in the field of thermal conductivity, heat transfer, heat exchangers.

Teaching methods

Lecture: multimedia presentation illustrated with examples on the board.
Laboratory classes: the measurements are performed using equipment existing in IEC.

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	105	4,00
Classes requiring direct contact with the teacher	65	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	2,00