COURSE DESCRIPTION CARD - SYLLABUS

Course name

Industrial Gas Technologies

Course

Field of study

Power Engineering

Year/Semester

4/7

Area of study (specialization)

Industrial thermal power engineering

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

30

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

15

Number of credit points

6

Lecturers

Responsible for the course/lecturer:

dr inż. Rafał Ślefarski

email: rafa.slefarski@put.poznan.pl

tel. 616652218

Faculty of Transpot Engineering

ul. Piotrowo 3 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Basic knowledge in the field of thermodynamics and fluid mechanics and knowledge about construction of energetic machines fired by gaseous fuels . Student should also have skills required for calculation of basic physico-chemical parameters of gaseous fuels such as: adiabatic flame temperature, laminar flame speed, energy balance of gas fired units.

Course objective

To acquaint students with modern technologies connected to use of gaseous fuels in heat energy production, electricity production and in domestic sector.

Course-related learning outcomes

Knowledge

Has advanced knowledge of thermodynamics and fluid mechanics, including those necessary to understand the basic phenomena in the devices and machines powered by natural gas.

Knows the basic concepts of energy management. Has structured knowledge about the role and structure of gas energy, about the volume of gas fuel resources and how to use them.

Student has extended knowledge necessary to understand non-technical conditions of engineering activities; knows and understands the basic principles of occupational health and safety in force in the energy sector.

Has extended knowledge about principles of operation and design of energetic machines.

Skills

Is able to solve problems in fields of designing process of energetic systems, and understands the importance and impact of non-technical aspects of mechanical engineering activities and its impact on the environment and responsibility for own decisions.

Is able to use his knowledge to search for the correct sources and interpret found information to solve both standard and non-standard engineering problems related to the use of gaseous fuels.

Is able to present and analyze thermal cycles of steam, gas and gas-steam power plants.

Is able to use a foreign language at B2 + level Manual of the Language Training System and specialized terminology related to the design and operation of energy systems powered by gas fuels.

Social competences

Is aware of and understands the importance and impact of non-technical aspects of mechanical engineering activities and its impact on the environment Is able to obtain information from the literature, internet, databases and other sources. Can integrate the information to interpret and learn from them, create and justify opinions.

Is aware of the importance of acting in a professional manner, observing the rules of professional ethics and requirements of others, care for the heritage and traditions of the profession, as well as respect for diversity

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Knowledge acquired during the lecture is verified during the final test carried. Each test consists of 5 questions (open). Passing threshold: 50% of points. Final issues on the basis of which questions are prepared will be sent to students by e-mail using the university e-mail system.

Skills acquired as part of the laboratory classes will be verified basis on the final test, consisting of 10 tasks differently scored depending on their level of difficulty. Passing threshold: 50% of points.

Project: the skills acquired during the design class will be assessed on the basis of the solution to the engineering problem presented by the student during the last class presentation.

Programme content

Lecture: conventional and unconventional resources of natural gases, pre-treatment processes of gaseous fuels, LNG production, transportation and storage process of natural gas, combustion processes of gaseous fuels, gas burners, gas furnace and semi-adiabatic combustion chambers, gas boilers, gas engines, gas turbines, methods of reduction of toxic compounds created during combustion process.

Laboratory: analysis of the process of combustion of gaseous fuels in a diffusion burner, performance of the energy balance of an industrial furnace, assessment of the operation of a gas boiler, determination of the efficiency of the condensing boiler, assessment of the impact of the plotting parameters on the emission of toxic compounds during the combustion of gaseous fuels, determination of the properties of gaseous fuels

Project: solution of an engineering task in the field of gaseous fuel use

Teaching methods

Lecture: multimedia presentation, illustrated with examples on the board

Laboratory: multimedia presentation and performance of tasks given by the teacher - practical exercises.

Project: multimedia presentation illustrated with examples given on a blackboard and performance of tasks given by the teacher - practical exercises

Bibliography

Basic

Dobski, T.: Combustion Gases in Modern Technologies, 2scd Ed., Wydawnictwo Politechniki Poznańskiej,

Jarosiński J.: Techniki czystego spalania, WNT,

Molenda J.: Gaz ziemny. Paliwo i surowiec, WNT, Warszawa

Vademecum Gazownika, praca zbiorowa

Additional

Sloan E.D.; Koh C.A.: Clathrate Hydrates of Natural Gases, CRC Press, 2007

Skorek J. Kalina J.: Gazowe układy kogeneracyjne

Miller A.: Turbiny gazowe i układy parowo-gazowe

K. Niewiarowski: Tłokowe silniki spalinowe, WKiŁ, 1983

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	60	2,4
Student's own work (literature studies, preparation for laboratories, development of laboratories, preparation for passing and exam, preparation of the project, participation in consultations) [1]	90	3,6

[1] delete or add other activities as appropriate