COURSE DESCRIPTION CARD - SYLLABUS

Course name
Uses of gaseous fuels

Course

Field of study
Industrial and Renewable Energy
Area of study (specialization)
Gas technology and renewable ene
Level of study
Second-cycle studies
Form of study
part-time

Year/Semester
1/2
Profile of study
general academic
Course offered in
polish
Requirements
compulsory

Number of hours

Lecture
18
Tutorials

Laboratory classes
9
Projects/seminars
9

Other (e.g. online)

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
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Faculty of Transpot Engineering

ul. Piotrowo 3 60-965 Poznań

Responsible for the course/lecturer:
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Wydział Inżynierii Środowiska i Energetyki

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Prerequisites

Basic has knowledge in the field of mechanics, thermodynamics and fluid mechanics and knowledge

about construction of energetic machines. Student should also have skills required to solve engineering problems with scientifically valid methodologies. Can effectively acquire the information from various sources including datasheets, literature and Internet.

Course objective

To acquaint students with the basic theoretical and practical aspects related to the used of gaseous fuels in industry, household applications.

Course-related learning outcomes

Knowledge

Has expanded knowledge necessary to understand of use of gaseous fuels in energetic devices in steel, glass, ceramic industry

Knows the basic processes occurring in the life cycle of devices powered by natural gas such as: furnace, heaters, glass bath, gas flare

Has expanded knowledge about the development directions of technologies based on renewable gaseous fuels such as pyrolysis, gasification and them use in heat production.

Skills

Is able to notice systemic and non-technical aspects, including ethical ones when formulating and solving engineering tasks in the field of Industrial Energy

Is able to use the experience gained in the environment of professionally engaged in engineering activities related to the aspects of increase of environmental quality in field of gaseous fuels use.

Is able to communicate on topics related to industrial energy with diverse audiences

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 ready to critically assess knowledge and received content

He is ready to fulfil social obligations, inspire and organize activities for the social environment -

Is ready to perform responsible professional roles, taking into account changing social needs, including: developing the profession's achievements, maintaining the ethos of the profession, compliance with and development of the principles of professional ethics and actions to comply with these principles.

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: Production of HC from crude oil, Gasification of residual crude oils, Numeric calculation of combustion process, Numerical code: Ansys, Chemkin, Cantera, GERG, Stanjan, Special equipments powered by natural gas, Fuel cells, ORC system, Natural gas in chemical industry, chemical fertilizers, glass industry, incineration process of toxic compounds, household application of natural gas, flameless combustion, oxy-fuel application, industrial furnace, heat tubes,

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

Additional

Hiroshi T., Gupta A.: High Temperature Air Combustion

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

A. Lefebvre: Gas Turbine Combustion

R. Stone: introduction to Internal Combustion Engines, Third edition

Joachim G. Wunning: Handbook of Burner Technology for Industrial Furnaces

Breakdown of average student's workload

	Hours	ECTS
Total workload	120	4,0
Classes requiring direct contact with the teacher	39	1,3
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]	81	2,7

[1] delete or add other activities as appropriate