COURSE DESCRIPTION CARD - SYLLABUS

Course name
Industrial gas technologies [N1Energ2>TG]

Course

Field of study
Power Engineering

Year/Semester
5/9

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
20

Laboratory classes
10

Other
0

Tutorials
0

Projects/seminars
10

Number of credit points

5,00

Coordinators

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Lecturers

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 and 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 theoretically enhanced knowledge including mechanics, thermodynamics, fluid mechanics, , including the knowledge necessary to understand complex methods and technologies for the prouction, storage and delivery of gaseous fuels, including non-normative fuels such as hydrogen, biogas and syngas.
He has a well-established and theoretically enhanced knowledge of the importance of gaseous fuels in the energy industry, the structure of gas fuel generation and supply on a national scale and the size of

the resource, the ways in which it can be used, taking into account the transmission structure of the national energy system, and the factors affecting energy demand from a regional and national perspective.

Skills:
Is able, when formulating and solving tasks in the field of energy systems and systems, including production processes, to use analytical, simulation and experimental methods to estimate demand of gas fuel and energy security on a national scale, recognizing the environmental, economic and legal aspects of the solutions used

Social competences:
Is aware of the importance and understands the non-technical aspects and consequences of the activities of a power engineer, including its impact on the environment and the associated responsibility for decision-making; is ready to fulfill social obligations, as well as to promote pro-environmental attitudes in society and in the industry environment.
Is aware of the importance of behaving in a professional manner, adhering to the principles of professional ethics and promoting the standards of ethical and responsible conducting of research and implementation activities in the energy industry; is aware of the care for the achievements and traditions of the profession, as well as respect for diversity of views and cultures.

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: 51% of points.
Laboratory: 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: 51% 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

The resources of both conventional and unconventional gas fuels, as well as alternative gaseous fuels such as hydrogen, ammonia, and biogas, along with gas combustion technologies, including low-emission systems in industrial furnaces and boilers. Processes for gas purification and drying, the use of gases for chemical production, synthetic gas synthesis technologies, and methods for neutralizing gaseous chemical compounds.

Course topics

Lecture: conventional and unconventional gas fuel resources, gaseous alternative fuels (hydrogen, ammonia, biogas), division of combustion processes, division and construction of gas burners, modern gas turbine systems, low-emission combustion technologies for gaseous fuels in industrial furnace and boiler chambers, gas purification and drying technologies, use of gaseous fuels for the production of chemical compounds, synthetic gases, methods of neutralising selected gaseous chemical compounds,
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,
Speight G. Synthesis Gas Production and Properties, Wiley 2020
Molenda J.: Gaz ziemny. Paliwo i surowiec, WNT, Warszawa
Seader J., Ernest J., Separation Process Principles: With Applications Using Process Simulators, Wiley

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
Ślefarski R.,Jójka J., Czyżewski P. , Gołębiewski M., Jankowski R., Markowski J., Magdziarz M.
Experimental and Numerical-Driven Prediction of Automotive Shredder Residue Pyrolysis Pathways toward Gaseous Products Energies - 2021, vol. 14, no. 6, s. 1779-1-1779-15

Breakdown of average student's workload

	Hours	ECTS
Total workload	142	5,00
Classes requiring direct contact with the teacher	42	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	100	3,50