COURSE DESCRIPTION CARD - SYLLABUS

Course name
Environmental Engineering [S2EPiO1>OŚ]

Course

Field of study
Industrial and Renewable Energy Systems

Year/Semester
1/2

Area of study (specialization)
Thermal and Renewable Energy

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr hab. inż. Rafał Ślefarski prof. PP
rafal.slefarski@put.poznan.pl

Lecturers

Prerequisites

Student has basic knowledge of thermodynamics, mathematics and biology and knowledge about knowledge of the surrounding environment and the construction of power machines. Student should also have skills to solve engineering problems with the use of scientific methods and find relevant information in literature, on the Internet, in data bases, and in other sources.

Course objective

To acquaint students with the knowledge and analysis of the problems of environmental protection the gas fuel sector of the energy industry as well as in renewable energy industry.

Course-related learning outcomes

Knowledge:
has expanded knowledge about the development directions of energy technologies and renewable energy sources as well as new standards of environmental protection.
knows legal issues related to the design and use of energetic systems especially in field of environmental engineering technlologies.
knows the main development trends in the field of environmentally friendly energy technologies.

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 related to environment protection.
is able to critically analyze the functioning of existing technical solutions in the energy industry and evaluate these solutions in terms of environmental impact.
is able to lead a debate in the field of shaping knowledge on topics related to environmental protection.

Social competences:
is ready to recognize the importance of knowledge in solving cognitive and practical problems and to seek expert opinions in the event of difficulties in solving the problem yourself - [e2a_k1], [p7s_kk]
he is ready to fulfill social obligations, inspire and organize activities for the social environment.
he is ready to critically assess his knowledge and received content, also in terms of the impact of technology on the natural environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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.

Programme content

lecture:
The greenhouse effect and methods to prevent it
Emissions of toxic compounds from combustion processes in energetic systems
Methods of reducing toxic emissions
Legislation on toxic emissions in industry
Noise and methods for its reduction
Laboratories:
Experimental exercises illustrating the mechanisms of toxic compound formation
Measurement techniques used in the analysis of toxic compounds emission

Course topics

lecture:
Mechanisms of formation of toxic compounds (NOx, CO, HC) and pollutants (CO2, SO2, dust) during combustion of fossil fuels in power generation equipment and machinery
High- and low-emission combustion technologies in terms of reducing toxic compounds
Environmental regulations (IED, MCP, BAT)
Volatile organic compounds and methods for their neutralisation,
Primary and secondary technologies for the reduction of toxic compounds,
Evaluation of the economic and ecological efficiency of investments, Development of environmental operatio, Modern,
noise in the energy industry and its impact on humans
laboratories:
measurement methods used in air protection, dust emission measurements, calculation of toxic compound emissions
evaluation of the influence of operational parameters on the emission of toxic compounds during the combustion of gaseous fuels, evaluation of primary methods during the formation of nitrogen oxides
evaluation of noise propagation from machinery and power equipment, dust emission measurements, calculation of toxic emissions

Teaching methods

Lecture: multimedia presentation, illustrated with examples on the board

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

Bibliography

Basic
Molenda J. Steczko K. Ochrona środowiska w gazownictwie i użytkowaniu gazu
Józef Jarosiński: Techniki czystego spalania
Jerzy Merkisz, Ireneusz. Pielecha: Alternatywne paliwa i układy napędowe
Warych Jerzy: Oczyszczanie przemysłowych gazów odlotowych
Additional
John C. Mycock: Handbook of air pollution control engineering and technology
Hiroshi T., Gupta A.: High Temperature Air Combustion
Joachim G. Wunning: Handbook of Burner Technology for Industrial Furnaces

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
Classes requiring direct contact with the teacher	45	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	0,50