COURSE DESCRIPTION CARD - SYLLABUS

Course name

Atmosphere Protection Engineering

Course

Field of study

Environmental Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2 / 4

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

15

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

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Faculty of Environmental Engineering and Energy

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Responsible for the course/lecturer:

Prerequisites

1. Knowledge:

Basic processes and chemical reactions. Flows of compressible fluid and incompressible in pipes and open channels. Mass forces, the forces of friction. Intermolecular forces. Fundamentals of adsorption and absorption. Equation of state of gas. And second law of thermodynamics.

2. Skills:

Measurements of temperature, pressure, gas flow. Solving simple problems from fluid mechanics (gas) and thermodynamics

3. Social competencies:

Ability to work in a team. Awareness of the need for continuous replenishment of knowledge and skills.

Course objective

Transfer of basic knowledge and skills in formation and emission of air pollutants from technological processes and its monitoring and reduction.

Course-related learning outcomes

Knowledge

1. The student has knowledge of the modern approach to protect the air.

2. Student and understand the mechanism of air pollution from fuel combustion.

3. The student knows and understands the basic technology, primary and secondary reduction of particulate and gaseous pollutants.

4. The student knows the design principles of the reduction of air pollution for selected technologies.

5. The student has knowledge of the description of elevation and dispersion of air pollutants depending on the technical issue and topographic conditions and meteorological.

6. The student has knowledge of the reference mathematical model of dispersion of pollutants in ambient air.

7. The student has insight in the current legislation, Polish and EU emission standards and immission.

Skills

1. The student is able to present the place and importance of technical activities in the area of air protection.

2. He can calculate unos and emissions of air pollutants from the basic technological processes.

3. He can discuss a draft of the dust removal and desulfurization for medium power sources.

4. He can perform a quantitative analysis of the dust.

5. Can measure the concentration of dust and gas pollutants in the pipes.

6. He can determine the impact of topographical and meteorological elevation and spread of air pollution from both the high and low pollution sources.

Social competences

1. Student realizes that the protection of atmospheric air is a complex issue, whose effective resolution requires the cooperation of specialists from different disciplines.

2. Student recognizes the need for systematic deepening and broadening of its powers.

3. Student learns teamwork.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

-Lecture:

possible individual discussion after the results of the written exam; evaluation of written work based on the obtained points ; bonus activity during lectures;

-Exercises Project:

Ongoing control of the project during exercise and consultation; completion of the project on the basis of an oral defense of the work.

-Laboratory exercises:

short work of control before exercise (entrance fee); checking in progress; report of the exercises; discussion during the counting exercise.

Programme content

Model system of protection of atmospheric air.

Basic concepts (eg. Emissions, concentration, unos, efficiency flue gas cleaning), solving simple problems using these concepts and different units (eg. Ppm g / m3).

Sources of air pollution from natural and anthropogenic? short characteristics.

The conditions and mechanism of formation of air pollutants: SO2, NOx, CO, PAHs, JWA, CO2, H2O from fuel combustion in stationary sources and mobile; Primary technologies to reduce pollution. Calculation of the sling (emissions) for SO2, CO2, H2O as a result of fuel combustion.

Corrosion sulfur low temperature. Flue gas desulphurization technology-based alkaline (mainly calcium): dry, semi-dry and wet; operating principles, patterns, ranges of applications, calculate the balance.

Reduction of dust pollution: the base extraction techniques (systematics dust, physical properties of dust), cyclones, fabric, electrostatic; scopes and principles of operation, schematics,

Reduction of gaseous pollutants (secondary technologies): theoretical basis of technology based on adsorption, absorption, combustion (including catalytic); biodegradable pollutants; areas of application.

Teaching methods

1. Lecture

Depending on the subject, the lecture is conducted as an informative multimedia presentation, as a problem or conversational lecture

2. Design exercises

Consist of carrying out practical projects in small groups together with discussion of case studies. Conversational lecture.

3. Laboratory

The method of experiment - students independently, based on the materials available, conduct research and observe the course of the analyzed phenomenon, put hypotheses and analyze cause-effect relationships for better understanding. Design exercises

Bibliography

Basic

1. Kościelnik B. Dąbrowski T. Podstawy ochrony atmosfery. Wydawnictwo Uczelniane Politechniki Koszalińskiej, 2016.

2. Warych J. Oczyszczanie przemysłowych gazów odlotowych. WNT, 2000.

3. Zwoździak J., Zwoździak A., Szczurek A. Meteorologia w ochronie atmosfery. Wydawnictwo. Politechniki Wrocławskiej, 1998

4. Wielgosiński G., Zarzycki R. Technologie i procesy ochrony powietrza, PWN, 2018.

5. Rup K. Procesy przenoszenia zanieczyszczeń w środowisku naturalnym, PWN, 2017.

6. Juszczak M. Źródło ciepła małej mocy zasilane biomasą. Efektywność energetyczno-ekologiczna dla wybranych paliw Wydawnictwo Politechniki Poznańskiej, seria Rozprawy nr 533, 2016

Additional

1. Kośmider J., Mazur-Chrzanowska B., Odory.PWN, 2002.

2. Bagieński Z. System ochrony powietrza , cz.1. PFP , 2003.

3. Markiewicz M., Podstawy modelowania rozprzestrzeniania się zanieczyszczeń w powietrzu atmosferycznym. Wyd. Politechniki Warszawskiej, 2004

4. Tomeczek J., Gradoń B., Rozpondek M., Redukcja emisji zanieczyszczeń z procesów konwersji paliw i odpadów, Wyd. Politechniki Śląskiej, 2009

5. Bagieński Z.: Emisja ze źródeł stacjonarnego spalania jako wyznacznik energetycznego wskaźnika jakości powietrza, [w] Współczesne osiągnięcia w ochronie powietrza atmosferycznego, praca zbiorowa red. A. Musialik-Piotrowska, J. Rutkowski; Politechnika Wrocławska 2010, 21-30.

6. Juszczak M., K. Pałaszyńska, K. Rolirad. M. Janicki, E. Szczechowiak. Próba zastosowania w peletach z agrobiomasy dodatków podwyższających temperaturę topnienia popiołu w celu uniknięcia tworzenia się żużla w palenisku.2017. Ciepłownictwo, Ogrzewnictwo, Wentylacja, T. 48, nr 8, 320-326

7. Alloway B.J., D.C. Ayres: Chemiczne podstawy zanieczyszczenia środowiska; PWN Warszawa 1999

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests, project preparation) [1]	40	1,5

[1] delete or add other activities as appropriate