STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Atmosphere Protection Engineering		**1010101241010131348**
Field of study	Profile of study (general academic, practical)	Year /Semester
Environmental Engineering First-cycle Studies	**(brak)**	**2 / 4**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
First-cycle studies	**full-time**	
No. of hours		No. of credits
Lecture: **20** Classes: **-** Laboratory: **15** Project/seminars: **15**		**5**
Status of the course in the study program (Basic, major, other)	(university-wide, from another field)	
(brak)	**(brak)**	
Education areas and fields of science and art		ECTS distribution (number and %)
technical sciences		**5 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

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.

Assumptions and objectives of the course:

Transfer of basic knowledge and skills in reducing the formation and emission of air pollutants from technological processes; basic knowledge of the processes spread of pollutants emitted from the high and low sources; presentation of the basic methods of measuring emissions and computational - assessment of the level of pollutant concentrations in the air.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. The student has knowledge of the modern approach to protect the air. - [-[K_W01, K_W05, K_W08]]
2. Student and understand the mechanism of air pollution from fuel combustion. - [-[K_W04, K_W07]]
3. The student knows and understands the basic technology, primary and secondary reduction of particulate and gaseous pollutants. - [-[K_W06, K_W07]
4. The student knows the design principles of the reduction of air pollution for selected technologies. - [-[K_W06, K_W07]]
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. - [-[K_W07]]
6. The student has knowledge of the reference mathematical model of dispersion of pollutants in ambient air. - [-[K_W07]]
7. The student has insight in the current legislation, Polish and EU emission standards and immission. - [-[K_W08]]

Skills:

1. The student is able to present the place and importance of technical activities in the area of air protection. - [-[K_U01, K_U03, K_U04, K_U10]]
2. He can calculate unos and emissions of air pollutants from the basic technological processes. - [-[K_U11, K_U14]]
3. He can discuss a draft of the dust removal and desulfurization for medium power sources. - [-[K_U12, K_U13, K_U14]]
4. He can perform a quantitative analysis of the dust - [-[K_U08]]
5. Can measure the concentration of dust and gas pollutants in the pipes. - [-[K_U08, K_U09]]
6. He can determine the impact of topographical and meteorological elevation and spread of air pollution from both the high and low pollution sources. - [- [K_U11]]

Social competencies:

1. Student realizes that the protection of atmospheric air is a complex issue, whose effective resolution requires the cooperation of specialists from different disciplines - [K_K02, K_K05, K_K07] - [-[K_K02, K_K05, K_K07]]
2. Student recognizes the need for systematic deepening and broadening of its powers. - [-[K_K01]]
3. Student learns teamwork - [-[K_K03]]

Assessment methods of study outcomes

-Lecture:

written exam ? duration 70 min. ; Individual possible discussion after the results of the written work; Evaluation of written work? based on the obtained points of individual tasks; Bonus activity during lectures; taking into account assessments of the exercises in the final assessment

-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.

Course description

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.

Basic bibliography:

1. Bagieński Z.: System ochrony powietrza, zagadnienia wybrane, cz.I; PFP; 2003
2. Konieczyński J.: Oczyszczanie gazów odlotowych; Wydz. Politechniki Śląskiej, Gliwice 1993
3. Warych Jerzy.: Oczyszczanie przemysłowych gazów odlotowych, WNT, Warszawa 2000
4. Kabsch P.: Odpylanie i odpylacze; WNT, Warszawa 1992
5. Markiewicz M.T.: Podstawy modelowania rozprzestrzeniania się zanieczyszczeń w powietrzu atmosferycznym; Wyd. Politechniki Warszawskiej, Warszawa 2005
6. Cheremisinoff P.,N. (Editor): Encyclopedia of Environmental Control Technology, Vol 2, Air Pollution Control; Gulf Publishing Company; 1998
7. Alloway B.J., D.C. Ayres: Chemiczne podstawy zanieczyszczenia środowiska; PWN Warszawa 1999

Additional bibliography:

1. Kośmider J., Mazur-Chrzanowska B., Odory, PWN, Warszawa 2002
2. Tomeczek J., Gradoń B., Rozpondek M., Redukcja emisji zanieczyszczeń z procesów konwersji paliw i odpadów, Wyd. Politechniki Śląskiej,2009
3. Zieliński S. : Skażenie chemiczne w środowisku ; Wyd. Politechniki Wrocławskiej; 2000
4. Alloway B.J., D.C. Ayres: Chemiczne podstawy zanieczyszczenia środowiska; PWN Warszawa 1999

Result of average student's workload	
Activity	**Time (working hours)**
1. Participation in lectures	45
2. Participation in the exercises projects	15
3. Implementation of projects (at home)	20
4. Participation in laboratory exercises	15
5. Preparation for laboratory exercises	15
6. consultations	10
7. Preparation for credit projects and laboratories	10

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	140	5
Contact hours	90	3
Practical activities	50	2