

Przedmiot: TECHNOLOGIES OF AIR AND FLUE GAS CLEANING (2W, 2C)

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The issue of cleaning of the flue gases, as well as other off-gases from various energy conversion processes, is an important problem that has to be addressed in order to ascertain sustainable development of a society and minimize the emission of unwanted process byproducts.

Particular attention is put to the removal of components that directly affect the health of human beings, as well as the living organisms in the surrounding ecosystem.

Apart from investigating the possibility to get rid of the flue gas pollutants much attention is also given to the technological safety and economics.

Plan of lectures

No.	Topics	Number of hours
1/2	Air and atmosphere. History of the development of energy conversion technologies. Brief overview on combustion, gasification, pyrolysis, chemical synthesis, and other fuel thermal treatment processes.	4
3	Description of the main pollutants from energy conversion processes and the chemistry of their formation.	2
4	Current legislation associated with air protection and flue gas emission.	2
5	Theoretical background to physicochemical processes applied for pollutant removal: absorption, adsorption, filtration, etc.	2
6/7	Setups, systems and plants for flue gas desulfurization (dry and semi-dry methods)	4
8	Setups, systems and plants for flue gas desulfurization (wet methods)	2
9	Technologies of the removal of NO _x (SNCR, SCR) and N ₂ O	2
10	The technologies for the removal/transformation of TOC, VOC, CO, CO ₂ , and other GHG	2
11	Removal of particulate matter. Cyclones, bag filters, candle barrier filters. Control of the emission of PM ₁₀ and PM _{2.5}	2
12	Control of the emission of minor and trace elements (DXN, Cl, Na, K, P, Hg, Cd, Pb, Se)	2
13	Mass and energy balance of energy conversion systems	2
14	Process endproducts. Waste management and reuse policies. Soil and water protection issues.	2
15	Economics and technological safety issues.	2

Plan of auditorium meetings

No.	Topics	Number of hours
1	Introduction to the subject	2
2/3	Calculation and discussion of the mass and energy balances of various energy conversion systems	4
4	Calculation of some chosen cases for absorption, adsorption and filtration processes	2
5/6	Emission of sulfur oxides – calculation of the required, sorbent consumption and de-SO _x efficiency for various fuels	4
7	The removal of nitrogen oxides – calculation of some chosen cases	2
8	Analysis of the possibility to get rid of CO ₂ – calculation of process efficiency, costs, etc.	2
9	Design and calculation of cyclone/multicyclone separator.	2
10	Calculation and design of an AC filter for the removal of organic compounds.	2
11	Economic and costs of the implementation of some chosen flue gas cleaning technologies	2
12/13	Calculation of some chosen cases for the protection of soil and water.	4
14	Colloquium test.	2
15	Summary, discussion and credit.	2