



## SUBJECT DATASHEET

<b>Semester:</b>	2009/10/2
<b>Subject:</b>	Environmental Protection Technologies
<b>Code:</b>	VEMKKVB212V
<b>Responsible department:</b>	Department of Environmental Engineering
<b>Responsible department code:</b>	MKKV
<b>Responsible lecturer:</b>	dr. Árpád Kárpáti

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### Educational objectives:

Basic and special knowledge of the protection of the different phases of the environment to waste minimalization, recycling, BAT using with case studies and Hungarian industrial review.

### Detailed content of the subject:

1. Combination of atmosphere. Natural and anthropogenic pollutants. Biological, hygienic and ecological methods of fresh air. Classification of air pollutants. Emission, transmission, immission and their connection. 2. Air pollution system in Hungary. The most important pollutants /SO<sub>2</sub>, NO<sub>x</sub>, particulate materials, CO, CO<sub>2</sub>, volatile organic compounds, chlorinated carbo-hydrogenes/ 3. Legislative and technological aspects of air pollution control. Air quality end values. Technological, planning, short-time and annual air quality values. Emission values and limits. Air quality categories. Regional, technological and special emission. Active reduction alternatives of emission. 4. Secondary reduction alternatives of emission. Emission measuring of particulate material concentration. Gravitational centrifugal, electric detachment of air pollutant. Filtering, liquid dust detachment. Fraction and total detachment efficiency calculate of equipments. 5. Extraction of pollutant gases. Application of absorption, adsorption, condensation in air pollution control. Oxidational and reductional outlet gases cleaning. 6. Drinking water resources in the environment. General water management, drinking water supply and wastewater production. Water quality management. Sources of wastewaters municipal and industrial effluents and their contamination. Characteristic or control parameters of the wastewaters. 7. Introduction to wastewater treatment, theoretical considerations. Removal of suspended and dissolved contaminants. Biological transformation of the organic pollutants, BOD, N and P and separation of the suspended solid remaining (secondary sludge). 8. Physico-chemical pre-treatment, decreasing toxicity, neutralization. AOP and unit processes in wastewater treatment. 9. Bio-kinetics in wastewater treatment. Extra Phosphorus and Nitrogen removal with biotechnology. Reactor volume and recirculation design. 10. Design of the oxygen supply, and air input through the diffusers. Design of the primary and secondary clarification. Excess sludge digestion and further processing of the residue with composting. 11. Definition and types of waste. Subject, EU strategy and Hungarian regulation of waste management. Waste minimization programs. 12. The establishment and recording of the amount and composition of the generated waste. Collection and transport of wastes. Physical, physical-chemical and chemical procedures in the waste treatment. Immobilization and solidification technologies. 13. Waste incineration. Pyrolysis and plasma technologies. Vitrification, Immobilization by molten salt. Wet oxidation procedures. 14. Waste disposal by biological methods. Processes in landfill site. Environmental requirements of the establishment and operating of landfill sites. Operating, closing and after-treatment of landfill sites. 15. The fate of wastes in the nature.

### Requirements:

Successful written examination with possibility of improvement of the result during the exam period with oral exam.



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### Required and suggested references:

Sipos Z: Ipari levegőtisztaság-védelem. Műszaki könyvkiadó, Budapest. 1987 Moser M., Pálmai Gy.: A környezetvédelem alapjai. Tankönyvkiadó, Budapest. 1992. Barótfi I: Környezettechnikai kézikönyv, magánkiadvány, 1991. p 108-245 Kárpáti Árpád: Víz és szennyvíztisztítás - előadásvázlat 1995. Metcalf and Eddy Inc.: Wastewater Engineering 3rd Ed. McGraw Hill, 1991. Chovanecz,T.: Az ipari víz előkészítése, Budapest, Műszaki Könyvkiadó, 1989. Corbitt,P.A.: Standard Handbook of Environmental Engineering, McGraw Hill Books, 1990. Katona,E.(szerk.) :A vízminőség szabályozás kézikönyve, Budapest, AQUA, 1989. Illés,I.-Kelemen,L.-Öllős,G.: Ipari vízgazdálkodás, Budapest, VIZDOK, 1983. Benedek,P.: Biotechnológia a környezetvédelemben, Budapest, MK, 1990. Benedek,P.-Valló,S.: Vízisztítás-szennyvíztisztítás zsebkönyv, Budapest, MK, 1990. Öllős G: Szennyvíztisztítás, Budapest, AQUA, 1991. G. Tchobanoglous, H. Theisen, S. Vigil: "Integrated Solid Waste Management", 1993. Árvai József: "Hulladékgazdálkodási Kézikönyv", Műszaki Könyvkiadó, Budapest, 1991. H. M. Freeman: "Standard Handbook of Hazardous Waste Treatment and Disposal", McGraw-Hill Book Company, 1988.