



COURSE DATASHEET

Semester:	2016/17/1
Course:	Special water and wastewater treatment requirements of different industrial areas
Code:	NKMKKVT217I
Responsible department:	
Department code:	MKNK
Responsible instructor:	dr. Árpád Kárpáti

Course objectives:

The special methods in water and wastewater treatment processes of different industries and public services will be discussed detailed.

Course content:

Unit 1. (3 lecture hours with 45 minute length / hour) (Kárpáti Á. – 3 hours)

Water collection from ground layers near the surface, deep layers and surface waters: wells, galleries, bank filtration and their construction. Basics of geodesy. Sampling of the soil with drilling and evaluation of the samples. Collection of water from surface water. Drinking water production from surface water. Coarse filtration, coagulation, flocculation, clarification with sedimentation, sand filtration, AC filtration and safety chlorination. Visit of a water treatment plants producing drinking water from different raw waters (deep layer, and surface water).

Unit 2. (3 hours as above, Kárpáti Á. - 1,5 hour, Gáspárné – 1.5 hour)

Water supply systems for settlements: reservoirs, water distribution and its control. Drinking water quality control: raw water sources and drinking water quality at the user. Accreditation of the laboratories of Water Works (Gáspárné, head of the laboratory in Water works of Nagykanizsa)

Unit 3 (3 hours) (Kárpáti Árpád – 2 hours, Fazekas B. - 1 hour)

Water consumption of the population and some special industrial branches. Contamination of the drinking water during its use. Ground water protection from illegal discharges. Water protection from leakage of the canalization. Municipal sewage collection – building and operation of such systems. Operation of free flow and pressure systems. Sewage collection and purification in urban areas. Treated water disposal to the soil at lowly populated areas.

Change of the sewage in the channels of the highly populated areas, big towns: digestion, smell, erosion, nitrate addition. Dilution of the sewage with groundwater, nitrate infiltration.



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Regular control of the sewage pipes, necessary improvements with digging and without it. Decrease of the contaminant load of the municipal sewage collection system and the publicly owned treatment plant. Efficiency of physical and chemical pre-treatment – coagulation, flocculation flotation-. Design, construction and operation of industrial pre-treatment plants to fulfil the local sewage discharge limits of the canalization system.

Subject No. 12. - 7 credits

IEE (Institute of Environmental Engineering –University of Pannonia)

Unit 1. (3 lecture hours with 45 minute length / hour) (Papócsi Gy. - 2 hours, Németh A. – 1 hour)

Production of high purity waters. Two stage RO systems with membrane degasification, electro-deionization and polishing with mixed bed ion-exchange.

Water treatment for the pharmaceutical industry: unit operations and combined technologies, required for production of PW and HPW. Water treatment chemicals used in pharmaceutical industry, their properties a safety requirement. Operating of such treatment units and technologies.

Ultra pure water and high purity (<mikroSiemens) water production.

Water treatment technology of the Hungarian Atomic Energy Power Station at Paks.

Unit 2. (3 lecture hours as above) (Lakner G. -2 hours, Rajnai T. – 1 hour)

Production of drinking water from sea water. Use of the membrane filters in industrial applications, operation control and maintenance. Ultra-filtration in separation of sewage sludge in industrial wastewater treatment and POTWs.

Contribution of industrial experts of General Electronics and Torray Mid Europe – Mideg Miklós and Király Uzor.

Unit 3. (3 lecture hours as above) (Borsos K. – 1 hour, Lakner G. 1 hour, - Nagyné Dunai B. – 1hour)



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Course content:

Water treatment for the energy production industries (energy sector).
Water quality requirement for the blowers (low, mid and high-pressure), water softening, removal of dissolved inorganic and organic materials with RO membranes, removal of carbon dioxide and oxygen. Chemical treatment for minimization of scaling and corrosion.
Closed and opened water cooling cycles, optimization of water consumption, minimization of chemical and biological deposits on the surfaces. Choosing the proper chemicals and their doses.
Treatment of waters and wastewaters for producing irrigation waters, and fish pond waters.
Site visit of construction of water treatment units at Hidrofilt Co.

Unit 4. (3 lecture hours as above) (Galambos Ildikó – 2 hours, Németh I. – 1 hour)

Water quality request of some food processing branches, soft drink from point of view of hardness and sterility.
Soft water production for scanning industry, wine production, milk processing etc.
dr. Galambos Ildikó (Corvinus Egyetem)
Water treatment for drinking water supply – removal of Fe, Mn, NH₄-N, As - . Arising problems in practice – getting below 10 micrograms As/litre limit value with advanced AS removal. Safety chlorination. Németh István (Hidrofilt)

Unit 5. (3 hours as above) (Etler Ottó. - 1 hour, Tóth László – 0,5 hour, Lakner Gábor -1,5 hour)

Quality control of drinking waters and industrial waters, accredited sampling and measurements.
Ion exchange resins, qualification of ion exchange resins and membranes in laboratory.
dr. Etler Ottó (Hidrofilt Kft. akkredited laboratory of Hidrofilt Co.)
Examining the different joinings – Thermoplasts and non-thermoplasts.
Tóth László (Glynwed Kft.)
Treatment of raw waters for galvanization, RO treatment of expired treating liquids galvanization basins.
Cyanide and heavy metal and organic material removal and possibility of reuse of such treated waters int these technologies. Industrial example and site visit of treating the liquid residue of galvanization in Zalaegerszeg.
Ground water remediation and examble of polluted site remediation in the Simontornya.
Removal of ammonium, heavy metals and dissolved minerals from groundwater. Lakner Gábor (Hidrofilt)



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Unit 6 (3 hours) (Kárpáti Á. – 2 hours, Gulyás G. - 1 hour)

Intensive anaerobic treatment (digestion) of the organic materials of concentrated industrial effluents (UASB and EGSB).

Biogas yield of the anaerobic digestion, and biogas utilization for electric energy production.

Removal of soil contamination, soil remediation, advanced oxidation methods for the soil water.

Pre-treatment of wastewaters of pharmaceutical plants. Nitrification rate in such concentrated wastewaters to fulfil the discharge limit to the municipal sewage collection system.

Combined physico-chemical and biological treatment of oil emulsion containing wastewaters. Adaptation of the AS to pretreated emulsions. Industrial example – Linde Hungary- Répcelak).

Unit 7 (3 hours) (Kárpáti Á. – 3 hours)

Leachate and its treatment from solid waste deposition sites.

Disposal of different industrial sludge.

Water requirement for flue gas washing from solids, and HCl and treating the wash-water.

Treatment of concentrated industrial liquid wastes from food processing plants. Dosage of N and P.

Irrigation with purified food processing effluents, and reuse of sludge on agricultural areas.

Requirements, evaluation and grading:

Students must write two papers in a semester, one paper during the semester and one at the end of it. The final mark is the weighed mean value (rounded) of the two marks received for the two papers. The mark of the second (at the end of the semester) paper is multiplied by two. The mark of the second paper is strictly required to be at least 2, and the mean value of the two papers must be better than 2.00.

Required and recommended readings:

Barótfi, I. (2003) Környezettechnika. Mezőgazdasági Kiadó, Budapest

Benedek, P. (1990) Biotechnológia a környezetvédelemben. MK, Budapest, p. 283.



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Required and recommended readings:

- Benedek, P. – Valló, S. (1982) Vízisztítás – Szennyvíztisztítás zsebkönyv. Műszaki Könyvkiadó, Budapest
- Czakó, L.; Miháltz P. (1993) Trendek és szemléletváltás a szennyvíztisztításban. Magyar Kémikusok Lapja, XLVIII, (10-11) 453-462.
- Dulovics, D. (2007) A szennyvíztisztítás biológiája. 279-326. Szilágyi, F. (Szek.) Alkalmazott hidrobiológia. Magyar Víziközmű Szövetség, Budapest, pp 624
- Förstner, U. (1993) Környezetvédelmi technika. Springer – Verlag, Budapest
- Kárpáti, Á. (2007) A komposztálás biológiája fejezet 393-406. Alkalmazott hidrobiológia Szerk.: Szilágyi, F. – Orbán V., Magyar Víziközmű Szövetség, Budapest, 2007. pp 624.
- Kárpáti, Á.-Juhász, E. (2004) Szennyvíziszap hasznosítás és áttételes hatásai. MASZESZ Hírcsatorna (november-december) 3-17.