

## **Specialisation in Infrastructural Engineering IV.**

### **final exam questions**

#### **(Department of Sanitary and Environmental Engineering)**

##### **Public works II (BMEEOVKAI41)**

1. Water supply systems. Water demands and quality requirements. System design, subsystems, pressure zones.
2. Water distribution system design, sizing, and planning.
3. Stormwater systems. Rainwater quality. The principles of flow control, methods. Sizing the stormwater and sewer network. Gravity drain design, dimensioning and planning of systems.
4. Sewer systems. Determination of wastewater loads and wastewater quality. Sewer network - wastewater treatment plant - receiving connection.
5. Design and dimensioning of drainage systems with gravity and pressurized and vacuum flow and planning.

##### **Water Quality Management (BMEEOVKAI44)**

1. Types of pollutants and trends of water-related pollution problems. Review of the EU water quality legislation (WFD and its daughter directives).
2. Basics of water quality modelling. Oxygen balance of rivers: sources and sinks. Simple river oxygen model to calculate the impact of organic matter discharge on the river oxygen concentration.
3. Mixing of pollutants in rivers. Transport processes (advection, dispersion), analytical solutions of the transport equation for calculating pollution wave and transversal mixing (graphical examples).

##### **Drinking Water and Wastewater Treatment (BMEEOVKA-H1)**

1. Typical pollutants of subsurface water sources. Describe the different stages of conventional drinking water treatment from subsurface water sources (removal of dissolved gases, iron, manganese, arsenic and ammonium ions from raw water). Draw typical treatment schemes and explain the role of each treatment unit.
2. Typical pollutants of surface water sources. Describe the different stages of conventional drinking water treatment from surface water sources. Draw a typical treatment scheme and explain the role of each treatment unit.
3. Sketch an activated sludge type wastewater treatment plant layout (biological treatment) for pre-denitrification and post-denitrification. Explain the ongoing bacterial processes and functionality (eg. Nitrate recirculation, WAS, RAS, carbon source, etc). What are the pros and cons?
4. Why is hydrolysis in wastewater treatment a crucial biochemical process? What are the differences between heterotrophic and autotrophic cultures? What are PAOs, explain the conditions for phosphorous removal (reactor types necessary to occur, limiting factors).

##### **Environmental Impact Assessment (BMEEOVKA-H3)**

1. Definition of Environmental Impact Assessment, international law (NEPA, EC directives, etc.). Basic terminology (e.g. mitigation, scoping, resources, impact areas etc.) and principles (e.g. precaution).
2. The structure of the EIA process. Screening, scoping, alternatives. Environmental baseline. Impact identification methods.
3. The IPPC process, terminology, and legislation. Definitions of BATs, BAT-Conclusions. The preparation process, the structure and content of BREFs documents.