

I. Tantárgyleírás**1. Alapadatok***1.1 Tantárgy neve***DESIGN AND OPERATION OF DRINKING WATER AND WASTEWATER TREATMENT TECHNOLOGIES***1.2 Azonosító (tantárgykód)***BMEEOVKMSFIN03-00***1.3 Tantárgy jellege*

Kontaktórák tanegység

1.4 Óraszámok

Típus	Óraszám / (nap)
Előadás (elmélet)	1
Gyakorlat	1

1.5 Tanulmányi teljesítményértékelés (minőségi értékelés) típusa

Vizsga

1.6 Kreditszám

4

1.7 Tárgyfelelős

név	Dr. Laky Dóra
beosztás	Egyetemi docens
email	laky.dora@emk.bme.hu

1.8 Tantárgyat gondozó oktatási szervezeti egység

Vízi Közmű és Környezetmérnöki Tanszék

1.9 A tantárgy weblapjaepito.bme.hu<https://edu.epito.bme.hu/course/view.php?id=5044>*1.10 Az oktatás nyelve*

magyar

1.11 Tantárgy típusa

Kötelező az Infrastruktúra-építőmérnök (MSc) szak Víz- és vízi környezetmérnöki specializációján

*1.12 Előkövetelmények**1.13 Tantárgyleírás érvényessége*

2025. szeptember 1.

2. Céltűzések és tanulási eredmények

2.1 Céltűzések

The aim of the course is to present the complex processes occurring in drinking water and wastewater treatment technologies and to provide practical knowledge in the fields of design and operation. During the semester, practical sessions on operation and design will also be held. Students will gain insight into technological processes suitable for drinking water treatment, particularly for deep water sources, with a special focus on the removal of iron, manganese, arsenic, and ammonium ions. The course also covers regulatory changes and their impact on the design and operation of water treatment technologies. Various wastewater treatment technologies will be explored for large, medium, and small wastewater treatment plants. Topics include activated sludge processes, biofilm-based methods, case studies, sludge treatment, biogas utilization, and the energy balance of wastewater treatment plants.

2.2 Tanulási eredmények

A tantárgy sikeres teljesítése után a hallgató

A. Tudás

1.Understands the key considerations and solutions involved in designing drinking water treatment plants for raw water originated from deep aquifers, considering the actual changes in drinking water regulations. 2.Has practical knowledge about the operation and maintenance of drinking water treatment facilities that utilize specific technologies. 3.Possesses a solid understanding of the fundamental design principles associated with wastewater treatment plants employing particular treatment methods. 4.Is familiar with the operational aspects and management practices required for wastewater treatment plants using specialized technologies. 5.Has knowledge about the treatment processes applied in large-scale wastewater treatment facilities. 6. Has knowledge about the treatment processes applied in medium-sized wastewater treatment plants. 7.Has knowledge about the treatment processes applied in small-scale wastewater treatment facilities. 8.Is aware of the various sludge management options available within wastewater treatment plants, along with the fundamental principles and conditions necessary for biogas utilization. 9.Comprehends the foundational concepts of energy balance in wastewater treatment plants.

B. Képesség

1.Develops and assembles complex technological schemes for drinking water treatment systems. 2.Can design appropriate treatment process chains based on the size and capacity of a wastewater treatment plant. 3.Identifies major design flaws in wastewater treatment plants utilizing specific technologies and is capable of proposing solutions. 4.Recognizes critical design errors in drinking water treatment plants employing given technologies and can recommend corrective measures. 5.Understands the key operational issues associated with drinking water treatment facilities using specific technologies and can suggest improvements. 6.Evaluates common operational challenges in wastewater treatment plants that utilize particular technologies and is able to propose solutions.

C. Attitűd

1. Engages in collaboration with instructors and peers to expand their knowledge base. 2. Actively seeks to deepen their understanding by continuously acquiring new information, including consulting online resources beyond mandatory course materials. 3. Strives for clarity and precision in verbal communication, while maintaining a structured, high-quality approach to written documentation that aligns with engineering industry standards.

D. Önállóság és felelősség

1.Applies a system-oriented approach in their thinking. Independently applies engineering principles – Takes responsibility for designing homework regarding optimizing water and wastewater treatment processes while given environmental and regulatory constraints. 2.Takes initiative in learning and preparation – Independently studies lecture materials, prepares for exams, and completes design assignments on time. 3.Engages in teamwork and discussion – Actively participates in class discussions and group work while respecting different viewpoints and contributing to collaborative problem-solving. 4.Ensures academic integrity and professional responsibility – Adheres to ethical standards in coursework, including proper citation of sources and honest reporting of results in assignments and exams.

2.3 Oktatási módszertan

Lectures with theoretical knowledge; communication in writing and speaking. Practical classes, joint discussion of technological processes.

2.4 Részletes tárgyprogram

1. Pollutants in drinking water 2. Block diagrams of drinking water purification technologies 3. Complex drinking water treatment technological schemes 4. Modification of drinking water treatment technologies in order to comply with new drinking water legislation 5. Practice work related to planning and operation of drinking water treatment plants I. 6. Practice work related to planning and operation of drinking water treatment plants II. 7. Basic knowledge of wastewater treatment 8. Block diagrams of wastewater treatment plants, activated sludge and biofilm wastewater treatment technologies 9. Sludge treatment, biogas utilization 10. Energy balance of wastewater treatment plants 11. Design process of wastewater treatment plants 12. Design and reconstruction of technological units at wastewater treatment plants – technological and flow considerations 13. Practice work related to planning and operation of wastewater treatment plants I. 14. Practice work related to planning and operation of wastewater treatment plants II.

A félév közbeni munkaszüneti napok miatt a program csak tájékoztató jellegű, a pontos időpontokat a tárgy honlapján elérhető "Részletes féléves ütemterv" tartalmazza.

2.5 Tanulástámogató anyagok

Henze M., Harremoes P., Cour Jansen J. la, Arvin E. (2002) Wastewater Treatment – Biological and Chemical Processes (Springer) Wastewater Engineering: Treatment and Resource Recovery 5th Edition by Inc. Metcalf & Eddy (Author), George Tchobanoglous (Author), H. David Stensel (Author),

2.6 Egyéb tudnivalók

Attendance at classes is mandatory. A student who misses more than 30% of the classes will not earn the course credits.

2.7 Konzultációs lehetőségek

Contact the lecturers via e-mail (Tamás Koncsos: koncsos.tamas@emk.bme.hu; Dóra Laký: laky.dora@emk.bme.hu)

Jelen TAD az alábbi félévre érvényes:

II. Tárgykövetelmények

3. A tanulmányi teljesítmény ellenőrzése és értékelése

3.1 Általános szabályok

The assessment of the learning outcomes specified in section 2.2. is based on written and oral performance evaluations conducted during the exam period. During the exam, students will prepare written answers to two questions during the preparation time—one related to drinking water treatment and one related to wastewater treatment. This is followed by an oral examination. To pass the exam, students must achieve at least a satisfactory level in both the drinking water and wastewater treatment topics.

3.2 Teljesítményértékelési módszerek

Assessment Name (Type)	Code	Assessed Learning Outcomes
Written and oral exam (summative performance assessment)	FE	A.1-A.9; B.1-B.6; C.1-C.3; D.1-D.4

A szorgalmi időszakban tartott értékelések pontos idejét, a házi feladatok ki- és beadási határidejét a "Részletes féléves ütemterv" tartalmazza, mely elérhető a tárgy honlapján.

3.3 Teljesítményértékelések részaránya a minősítésben

Code	Weight
FE	100%
Total	100%

3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége

The requirement for obtaining the signature is attendance at a minimum of 70% of the classes.

3.5 Érdemjegy megállapítása

Grade	Score (P)
excellent (5)	$90 \leq P$
good (4)	$80 \leq P < 90\%$
satisfactory (3)	$65 \leq P < 80\%$
pass (2)	$50 \leq P < 65\%$
fail (1)	$P < 50\%$

3.6 Javítás és pótlás

In the case of a failed exam, a retake is possible in accordance with the Academic and Examination Regulations (TVSZ).

3.7 A tantárgy elvégzéséhez szükséges tanulmányi munka

Activity	Hours/Semester
Participation in contact classes	$14 \cdot 2 = 28$
Time dedicated to home study	60
Preparation for the exam	32

3.8 A tárgykövetelmények érvényessége

2025. szeptember 1.

Jelen TAD az alábbi félévre érvényes: