



# WELL-FIELD AND GROUNDWATER RESOURCES PROTECTION

Hydrogeology Engineer MSc mesterszak

2022/23 I. félév

Semester 2022/23/1

TANTÁRGYI KOMMUNIKÁCIÓS DOSSZIÉ

**Miskolci Egyetem**  
**Műszaki Földtudományi Kar**  
**Környezetgazdálkodási Intézet**

## **Tartalomjegyzék**

1. Tantárgyleírás, tárgyjegyző, óraszám, kreditérték
2. Tantárgytematika (óraóra lebontva)
3. Vizsga tételsor
4. Egyéb követelmények

## 1. Tantárgyleírás, tárgyjegyző, óraszám, kreditérték

<p><b>Course Title:</b> Wellfield and groundwater resources protection (Optional subject group (2))</p> <p><b>Instructor:</b> Kolencsikné Dr. Tóth Andrea, associate professor</p>	<p><b>Code:</b> MFKHT730032</p> <p><b>Responsible department/institute:</b> Institute of Environmental Management</p> <p>Type of course: Optional</p>
<p><b>Position in curriculum (which semester):</b> 3</p>	<p><b>Pre-requisites (if any):</b> -</p>
<p><b>No. of contact hours per week (lecture + seminar):</b> 1+2</p>	<p><b>Type of Assessment (examination/ practical mark / other):</b> practice mark</p>
<p><b>Credits:</b> 3</p>	<p><b>Course:</b> full time</p>
<p><b>Course Description:</b></p> <p>For the beginning students get information on features and hydrological-hydrogeological background of the hungarian drinking water supplying and legislation rules of groundwater management. Next, this topic shall present how should this groundwater management be connected with EU legislation, namely with 2000/60 EU Framework Directive and 2006/118 EU Groundwater Directive. In addition how should we harmonise the national rules to EU requirements. Main goal to give adequate explanation on the definition of aquifer vulnerability, how to make different management ways in vulnerable porous, karstic and bank filtered media. This topic should provide a methodology for contamination transport modelling with travelling time of the different contamination matters, to make case studies about testing of theoretical/potential contamination spreadings. Finally, to give information on remediation of contaminated zones, and programme of measures.</p> <p>The short curriculum of the subject:</p> <p>Presentation of 2000/60 EU Water Framework Directive and 2006/118 EU Groundwater Directive; preliminary and surveilling works of wellfield and groundwater resources protection (previous research outputs, groundwater monitoring information); qualification of vulnerability of different groundwater and shallow-groundwater aquifers; surveilling and classification of point and diffuse contamination sources, land uses, different ways of prevention; get fit the transport model; to define the travelling time; risk assessment analysis of remediation and restriction of source uses; well protection, well-field protection, groundwater resources protection; calculation and delineation of vulnerable zones; maintenance and monitoring of vulnerable zones, vulnerable transboundary groundwater issues; practices.</p>	
<p>Competencies to evolve:</p> <p>Knowledge:</p> <p>T1 – It includes knowledge of hydrogeology, water resource management, water quality protection, water treatment, production and waterworks operation</p> <p>T2 – Extensive knowledge of hydrogeological assessment and monitoring techniques related to watershed approach and considers ecological water demands.</p> <p>T7 – Have knowledge of a wide range of problem-solving techniques for research or academic work.</p> <p>Ability:</p> <p>K1 – Ability to understand the laws and relationships related to the location, movement and quality of groundwater, to apply and put into practice the knowledge acquired, and to use problem-solving techniques.</p> <p>K5 – Ability to apply design, knowledge and technologies related to water supply and water treatment at a high level.</p> <p>K6 – Prepared to tackle complex water resource management, water conservation and aquifer protection challenges.</p> <p>K10 – Prepared to effectively apply relevant national and European professional, environmental and conservation legislation</p> <p>K11 – Ability to implement an ecological approach in line with the EU Water Framework Directive</p> <p>K12 – Ability to work in compliance with EU legislation, to cooperate with foreign partners to solve the tasks required by the EU Water Framework Directive</p> <p>Attitude:</p> <p>A5 – It is committed to lifelong learning, diversity and values</p>	

Autonomy and responsibility:

F3 – Takes decisions independently and in consultation with other disciplines (mainly legal, economic, energy and environmental), for which it takes responsibility.

F5 – Committed to sustainable natural resource management practices.

**Assessment and grading:**

Students will be assessed with using the following elements.

Attendance:	15 %
Short quizzes	0 %
Planning task	40 %
Final exam	35 %
Total	100%

Grading scale:

% value	Grade
90 -100%	5 (excellent)
80 – 89%	4 (good)
70 - 79%	3 (satisfactory)
60 - 69%	2 (pass)
0 - 59%	1 (failed)

**Compulsory or recommended literature resources:**

- H. P. Patra, Shyamal Kumar Adhikari, Subrata Kuar: Groundwater Prospecting and Management. Springer Hydrogeology, 2016.
- Tomasz Nalecz: Groundwater Management in the East of the European Union: Transboundary Strategies for Sustainable Use and Protection of Resources. Springer, 2010
- James A. Tindall, James R. Kunkel, Dean E. Anderson: Unsaturated zone hydrology for scientists and engineers , Prentice Hall, Upper Saddle River, New Jersey 07458, 1999
- Vulnerability and risk mapping for the protection of carbonate (karst) aquifers, Final report (edited by Francois Zwahlen), EU Commission Directorate-General for Research COST Action 620, Office for Official Publications of the European Communities, Luxembourg, 2004
- Contaminated Land and the Water Environment, Report of the National Rivers Authority, NRA London, 1994

## 2. TANTÁRGYTEMATIKA

Hidrogeology.  
Tantárgytematika (ÜTEMTERV)  
Aktuális tanév őszi félév  
Hidrogeológus mérnök mesterszak MSc, 3. félév, választható tárgy

Week	Date	Topics
1.	11. Oct	Presentation of 2000/60 EU Water Framework Directive and 2006/118 EU Groundwater Directive, Preliminary and surveilling works of wellfield and groundwater resources protection (previous research outputs, groundwater monitoring information), Qualification of vulnerability of different groundwater and shallow-groundwater aquifers
2.	25. Oct	Surveilling and classification of point and diffuse contamination sources, land uses, different ways of prevention; get fit the transport model, Risk assessment analysis of remediation and restriction of source uses; well protection, well-field protection, groundwater resources protection.
3.	15. Nov	Calculation and delineation of vulnerable zones; maintenance and monitoring of vulnerable zones, vulnerable transboundary groundwater issues; practices
4.	06. Dec	TEST
5.	13. Dec	Retake of TEST

### 3) VIZSGA TÉTELSOR

1. Why we need for water management and river basin management? What does it mean freshwater magnitude, status, types and management area?
2. What are the elements of the Maintaining Phase of groundwater protection programme (from continuous monitoring to Water Safety Plan)?
3. Enumerate at least four objectives among key aims from the EU 2000/60 Water Framework Directive (WFD). If we are speaking on environmental objectives of the WFD what does it mean good status and they concern on what?
4. What are the elements of the Protecting Phase of groundwater protection programme (from legal registration of protection zones to build up operational monitoring network)?
5. What are the main featured elements of good ecological status in case of surface waters? What is the difference between surface and groundwater featuring in status assessment?
6. What is the role of conceptual models in groundwater protection programme? Outline the conceptual model of regional and local groundwater flows in great basins and hilly areas shortly.
7. Why we need for transnational coordination in Danube level or international river basin? Describe the river basin management cycle and their elements.
8. What are the components of the Diagnostic Phase 2 of groundwater protection programme (from modelling to Protection Plan)?
9. What are the main activities in the flow chart of river basin management process and describe them shortly. Why important the monitoring activity?
10. What are the components of the Diagnostic Phase 1 of groundwater protection programme (from documentation sourcing to contamination survey)?
11. Definitions for designation of water bodies (water body, artificial, heavily modified, transitional, coastal bodies). Take difference between surface and groundwater bodies.
12. What are the phases of groundwater protection programme and who are responsible bodies of different phases?
13. Definition of river basin and sub-basin. Enumerate characterisation aspects/types of groundwater bodies.
14. What are restrictions in case of different groundwater protection zones? What is the zone where new activities are not allowed? Where is restricted use of priority substances (pesticides, biocides) and hazardous ones (toxics)?
15. Outline the conceptual model of regional and local groundwater flows in great basins (by József Tóth) with chemical-, temperature- and pressure-change features.
16. Do you know an approaching solution for protection zone calculation in case if not available either hydrogeological studies or aquifer modelling?
17. What is water status assessment based on? Describe the DPSIR method by elements.
18. How should you calculate and define re/source protection zones (aspects, models theoretically only)?
19. Describe water contamination sources. What is the difference between point and diffuse contamination and how can we manage them?
20. Explain sensitivity and vulnerability of an aquifer. What is difference between them?
21. What does it mean “one out all out” principle in status assessment of surface water bodies? What are the element groups to be assessed?
22. Which water bodies using for drinking water do you have to identify according to Article 7 of WFD?

23. What does it mean “one out all out” principle in status assessment of groundwater bodies? Enumerate some quantity and chemical quality elements to be assessed.
24. Which EU Directives are dealing with groundwater? What are the targeted areas of these directives?

#### **4. EGYÉB KÖVETELMÉNYEK**

A vizsga írása közben a mobiltelefon használata tilos!