UNIVERSITY OF MISKOLC
FACULTY OF
EARTH AND ENVIRONMENTAL
SCIENCE AND ENGINEERING

REGIONAL HYDROGEOLOGY
(HYDROGEOLOGY OF HUNGARY)

Hydrogeology Engineer MSc mesterszak

2023/24 II. félév

TANTÁRGYI KOMMUNIKÁCIÓS DOSSZIÉ

Miskolci Egyetem
Műszaki Föld- és Környezettudományi Kar
Víz- és környezetgazdálkodási Intézet

Tartalomjegyzék

1. Tantárgyleírás, tárgyjegyző, óraszám, kreditérték

Course Title: Regional hydrogeology **Instructor:** Dr. Attila Kovács, Senior Researcher	**Code:**MFKHT720026 **Responsible department/institute:** Institute of Water Resources and Environmental Management
	Type of course: Compulsory
Position in curriculum (which semester): 2	**Pre-requisites (if any):-**
No. of contact hours per week (lecture + seminar): 2+0	**Type of Assessment (examination/ practical mark / other):** exam
Credits:2	**Course:** full time

Course Description:

The course is focused on case studies of hydrogeological investigations from around the world. The primary goal is to introduce the students to real-life applications and to demonstrate practical quantitative hydrogeological investigation techniques. The students also get introduced to the large – scale geological and hydrogeological conditions in different environments from Hungary through New Zealand to Australia. The course will discuss various fields of quantitative hydrogeology including mining, climate change, contaminant hyrogeology, fractured rock and karst hydrogeology, geothermal energy and so on.

Compatencies to evolve:
Knowledge:
T1 – It includes knowledge of hydrogeology, water resource management, water quality protection, water treatment, production and waterworks operat
T2 – Extensive knowledge of hydrogeological assessment and monitoring techniques related to watershed approach and considers ecological water demands.
T6 – Knows basic requirements of environmental protection, quality control, consumer protection, product liability, equal access approach, occupational health and safety, technical and economic legislation and engineering ethics.
T7 – Have knowledge of a wide range of problem-solving techniques for research or academic work.
Ability:
K8 – Able to solve mining and pit dewatering problems at a high level
K10 – Prepared to effectively apply relevant national and European professional, environmental and conservation legislation
Attitude:
A4 – Deep commitment and professional solidarity
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.
F6 – He/she is responsible claims in expert oppinions, professional judgements and for the work carried out under his/her supervision.

Assessment and grading:

Students will be assessed with using the following elements.

Attendance:	15 %
Short quizzes	10 %
Midterm exam	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)

- C.W., Fetter Jr.: Applied hydrogeology; Mitsch, W. J., Gosselink, J. G.: Wetlands
- J. M. Sharp: Fractured Rock Hydrogeology; B. B. S. Singhal – R. P. Gupta: Applied Hydrogeology of Fractured Rocks; S. Eslamian: Handbook of Engineering Hydrology - Fundamentals and Applications
- Freeze, R. A., Cherry, J. A.: Groundwater, Prentice Hall, 1979; Fetter Jr., C. W.: Applied Hydrogeology (4th Edition), Pearson, 2014; Kreitler, C. W.: Hydrogeology of sedimentary basins. Journal of Hydrology, 1989, 106, 29-53; Hubbert, M. K.: The Theory of Ground-water Motion. The Journal of Geology, 1940, 48, 785-944; Tóth, J.: A Theory of Groundwater Motion in Small Drainage Basins in Central Alberta, Canada. Journal of Geophysical Research, 1962, 67, 4375-4387; Tóth, J.: A theoretical analysis of groundwater flow in small drainage basins. Journal of Geophysical Research, 1963, 68, 4795-4812)
- M. Karamouz – A. Moridi – S. Nazif: Urban Water engineering and management, CRC Press; E. Vázquez-Sune – X. Sanchez-Vila – J. Carrera: Introductory review of specific factors influencing urban groundwater, an emerging branch of hydrogeology, with reference to Barcelona, Spain, Hydrogeology Journal, 2005 13, pp. 522-533)

2. TANTÁRGYTEMATIKA

Hydrogeology of Hungary.
Tantárgytematika (ÜTEMTERV)
Aktuális tanév tavaszi félév
Hidrogeológus mérnök MSc mesterszak 2. félév, törzsanyagos tárgy

Hét	Előadás
1.	**Introduction of course material, syllabus, requirements and deadlines** Bases of groundwater modelling concepts and methods (teacher: PhD Attila Kovács)
2.	Quantitative assessment of climate impact on shallow groundwater conditions in Hungary (teacher: PhD Attila Kovács)
3.	Reactivation of karst springs after regional mine dewatering in the Transdanubian Mountains, Hungary (teacher: PhD Attila Kovács)
4.	Coal mining on the edge of the Great Artesian Basin, Australia (teacher: PhD Attila Kovács)
5.	Numerical modelling of a high-temperature geothermal reservoir, New Zealand (teacher: PhD Attila Kovács)
6.	Modelling seepage from a tailings storage facility Queensland, Australia (teacher: PhD Attila Kovács)
7.	Modelling multiphase LNAPL migration, Hungary (teacher: PhD Attila Kovács)
8.	Risk assessment and nuclide transport modelling related to nuclear waste disposal, Hungary (teacher: PhD Attila Kovács)
9.	Modelling karst hydrodynamics, Switzerland (teacher: PhD Attila Kovács)
10.	Break
11.	
12.	Test
13.	Replacement option to every tests

3) MINTA ZÁRTHELYI

Regional Hydrogeology

Exam 1.

1. What are the mechanisms of fresh water discharge of coastal aquifers? (3 points)
2. What is the difference between passive and active encroachment? (you can draw) (2 points)
3. What are the elements of water budget in case of a wetland? (sign the inflow with ‚+' and the outflow with ‚-') (3 points)
4. Name at least 3 processes which affect the "original" permeability of rocks/sediments! (6 points)
5. Indicate whether the following features characterize the recharge or discharge areas: (6 points)
    i. topographically higher zones
    ii. topographically lower zones
    iii. upward gradient and flow
    iv. downward gradient and flow
    v. shallow water table
    vi. deep unsaturated zone
    vii. convergent flow
    viii. divergent flow
    ix. relatively fresh water
    x. relatively saline water
    xi. recent water
    xii. older water

6. Please arrange the following pollutants into groups! (2 points)
   Pollutants: Pharmaceuticals; Endocrine disrupting chemicals; Gasoline constituents; Personal care products (PPCP); Chlorinated solvents; Polycyclic aromatic hydrocarbons (PAH)
   Groups: Micropollutants; Macropollutants

7. In creating a flow and solute transport model for an urban environment, what are the considerations which must be taken into account? (3 points)
8. Drainage basin terms (4 points)
    i. Transpiration
    ii. Throughflow
    iii. Percolation
    iv. Surface runoff
9. What affects the shape of a hydrograph? (5 points)
10. The calculation of exchange flow rate between river and GW based on Darcy's law! (3 points)
11. What can cause that a gaining river becomes losing one? (3 points)

12. How rocks can be classified from geological aspects? List the different types and describe some sentences. (3 p)
13. What is the difference between primary and secondary porosity? (2 p)

Time available: 60 minutes, maximum points: 45
(0-27=1; 28-31=2; 32-36=3 37-40=4; 41-45=5)