# Syllabuses

## MS in Hydrogeology Engineering

<table>
<thead>
<tr>
<th>Subject</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer science for engineers</td>
<td>GEMAK713M</td>
</tr>
<tr>
<td>Numerical Methods and Optimization</td>
<td>GEMAK712M</td>
</tr>
<tr>
<td>Environmental Geology</td>
<td>MFFAT710008</td>
</tr>
<tr>
<td>Geodesy, spatial informatics</td>
<td>MFGGT710002</td>
</tr>
<tr>
<td>Mineralogy – geochemistry</td>
<td>MFFAT710005</td>
</tr>
<tr>
<td>Soil mechanics</td>
<td>MFKHT710008</td>
</tr>
<tr>
<td>Gradual research seminar</td>
<td>MFFAT710006</td>
</tr>
<tr>
<td>Fluid mechanics</td>
<td>MFKGT710005</td>
</tr>
<tr>
<td>Hydrogeology</td>
<td>MFKHT710017</td>
</tr>
<tr>
<td>Groundwater prospect, water res. management</td>
<td>MFKHT720021</td>
</tr>
<tr>
<td>Applied and engineering hydrology</td>
<td>MFKHT720022</td>
</tr>
<tr>
<td>Water quality protection</td>
<td>MFKHT720023</td>
</tr>
<tr>
<td>Geophysics of exploration for water</td>
<td>MFGFT720024</td>
</tr>
<tr>
<td>Geotechnical engineering</td>
<td>MFKHT720025</td>
</tr>
<tr>
<td>Water chemistry</td>
<td>AKKEM6005</td>
</tr>
<tr>
<td>Hydrogeology of Hungary</td>
<td>MFKHT720026</td>
</tr>
<tr>
<td>Waterworks, water supply</td>
<td>MFKHT720027</td>
</tr>
<tr>
<td>GW flow and contaminant transport mod.</td>
<td>MFKHT720028</td>
</tr>
<tr>
<td>Quality Management</td>
<td>GTVVE7002MA</td>
</tr>
<tr>
<td>Geothermics</td>
<td>MFKHT730021</td>
</tr>
<tr>
<td>Watermining</td>
<td>MFKHT730021</td>
</tr>
<tr>
<td>Hydrogeological interpretation</td>
<td>MFKHT730024</td>
</tr>
<tr>
<td>Drilling, Deep Drilling</td>
<td>MFKOT730029</td>
</tr>
<tr>
<td>Water and waste water purification</td>
<td>MFETT73001A</td>
</tr>
<tr>
<td>Environmental Risk Asses. and Remediation</td>
<td>MFKHT730026</td>
</tr>
<tr>
<td>Environmental Geotechnics</td>
<td>MFKHT730030</td>
</tr>
<tr>
<td>Optional: Surface for windows hands-on training.</td>
<td>MFKHT73005</td>
</tr>
<tr>
<td>Numerical methods in geotechnics</td>
<td>MFKHT730022</td>
</tr>
<tr>
<td>Optional: Remote sensing</td>
<td>MFFTT730032</td>
</tr>
<tr>
<td>Optional: Wellfield and gw resources prot.</td>
<td>MFKHT730033</td>
</tr>
<tr>
<td>Safety tech. and labour safety</td>
<td>MFKOT740010</td>
</tr>
<tr>
<td>Strategic Management</td>
<td>GVVE7041MA</td>
</tr>
</tbody>
</table>

---

Miskolc, 2019. február 01.

Dr. Szűcs Péter
szakfelélos
**Course Title:** Computer science for engineers  
**Instructor:** Dr. Józsefné Mészáros, honorary associate professor  
**Code:** GEMAK713MA  
**Responsible department/institute:** Department of Applied Mathematics  
**Position in curriculum (which semester):** 1  
**Pre-requisites (if any):** -  
**No. of contact hours per week (lecture + seminar):** 0+2  
**Type of Assessment (examination/practical mark/other):** practice mark  
**Credits:** 2  
**Course:** full time

**Course Description:**
Extend the application of the computer as engineering training aids for numerical and symbolic computation.

Programming and using of MATLAB environment (desktop): operation with matrices, elements of linear algebra, plot of one, two or three dimensional functions, printing, control statements, handle graphics and user interface.

The short curriculum of the subject:


**Assessment and responsibility:**

**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) |

**Compulsory or recommended literature resources:**

**Text books:**

**Other references:**
Course Title: Numerical Methods and Optimization

Instructor: Dr. Józsefné Mészáros, honorary associate professor

Code: GEMAK712MA

Responsible department/institute: Department of Applied Mathematics

Type of course: Compulsory

Position in curriculum (which semester): 1

No. of contact hours per week (lecture + seminar): 1+1

Pre-requisites (if any): -

Type of Assessment (examination/practical mark/other): practice mark

Credits: 2

Course: full time

Course Description:

Acquired store of learning:

Study goals: Upon completing the course, students shall understand the relation between engineering and mathematics; comprehend important concept of solution methods using both analytical and numerical techniques when the problems can be formulated using differential equations, system of linear equations and system of nonlinear equations. In addition, students shall be able to apply the optimization techniques to various engineering problems.

Course content


Compencies to evolve:

Knowledge: T5, T7
Ability: K15
Attitude: A9

Assessment and grading:

During the semester the following tasks should be completed: one test and a computerized homework.

Grading Limits:

> 80%: excellent,
70-79%: good,
60-69%: medium,
50-59%: satisfactory,
< 50%: unsatisfactory.

Compulsory or recommended literature resources:

### Course Title: Environmental Geology

### Instructor: Dr. Viktor Mádai, associate professor

### Code: MFFTT10008

### Responsible department/institute: Department of Applied Mathematics

### Type of course: Compulsory

<table>
<thead>
<tr>
<th>Position in curriculum (which semester):</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites (if any):</td>
<td>-</td>
</tr>
<tr>
<td>No. of contact hours per week (lecture + seminar):</td>
<td>2+1</td>
</tr>
<tr>
<td>Type of Assessment (examination/ practical mark / other):</td>
<td>examination</td>
</tr>
<tr>
<td>Credits:</td>
<td>4</td>
</tr>
<tr>
<td>Course:</td>
<td>full time</td>
</tr>
</tbody>
</table>

### Course Description: Acquired store of learning:

The main objective of the course is to make the students familiar with the effects of geological medium on the state and changes of the environment, and prepare them for revealing the geological background of environmental problems as well as mitigating or minimizing these problems.

### Course content

System approach in geology, changes in the four main systems of the Earth. The objects, methods and legal background of environmental geology. Environmental minerals, their characteristics and role in causing and mitigating of environmental problems. Geological hazards (volcanism, earthquakes, mass movements). The role of geological medium in the anthropogenic contamination and pollution (processes of environmental geochemistry, interactions between soil, rocks and contamination, geological conditions effecting on the spreading of contamination). Geological and geochemical concerns of the effects of mining on the environment. Geological background of the radioactive waste disposal. Geology in nature protection. Geological tasks in the environmental assessment.


### Compatencies to evolve:

- **Knowledge:** T1
- **Ability:** K1, K2
- **Attitude:**
- **Autonomy and responsibility:** -

### Assessment and grading:

Handing in the half year task in an exceptable format and level in time (last week of the semester), writing two tests at least on the minimum level of 51%. Failed tests are rewritable on the last week of the semester. Attendance of lectures and seminars are compulsory. Missing more than three occasions from lectures or seminars cause deny of signature.

### Grading Limits:

Evaluation of the knowledge happens in 100% by the result of the exam. Reaching the 80% of the minimum questions, which is a compulsory constrain to start the oral or written exam.

- Oral exam: 0 - 50%: 1, 50 – 60%: 2, 60 – 70%: 3, 70 – 90%: 4, 90 – 100%: 5

### Compulsory or recommended literature resources:

- **Edgar, Spencer;Reichard, J S;Reichard, J:** *Environmental Geology*, McGraw-Hill, 2009,
- **Keller, E A:** *Introduction to Environmental Geology*, Prentice Hall, 2011,
- **Erickson, J.:** *Environmental Geology: Facing the Challenges of Our Changing Earth (Living Earth)* Amazon com,2002
- **Foley,Duncan:** *Investigations in environmental geology*, Prentice Hall, Upper Saddle River N.J, 2009,
- **Holland, H D.:** *Treatise on geochemistry*, Elsevier, New York NY, 2003
- **Keith,S.:** *Environmental hazards*, Routledge,, Abingdon, Oxon ;;New York ;, 2008,
- **Knödel,Klaus:** *Environmental geology : handbook of field methods and case studies*, Springer, Berlin ;;New York, 2007,
| **Course Title:** Geodesy, spatial informatics | **Code:** MFGGT710002 |
| **Instructor:** Dr. Gábor Bartha professor emeritus | **Responsible department/institute:** Institute of Geophysics and Geoinformatics |
| **Position in curriculum (which semester):** 1 | **Type of course:** Compulsory |
| **Pre-requisites (if any):** - | |
| **No. of contact hours per week (lecture + seminar):** 2+1 | **Type of Assessment (examination/ practical mark / other):** exam |
| **Credits:** 4 | **Course:** full time |
| **Program:** Hydrogeological Engineering MSc |

**Course description:**
The students will acquire the principles of modern geomatics, its measuring methods and the application of IT in the subject. They will be prepared to apply the modern measuring techniques, the remote data-acquiring methods and use them to solve practical problems. They will learn the application fields of geo-informatics and GIS programs. The students will be competent in the application of modern geodetic technology and geo-informatics in their field. The students enable to process their professional data and organize them into geo-information databases.

The short curriculum of the subject:


**Assessment and grading:**
Students will be assessed with using the following elements.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>15%</td>
</tr>
<tr>
<td>Short quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Midterm exam</td>
<td>40%</td>
</tr>
<tr>
<td>Final exam</td>
<td>35%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Grading scale:**

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>85 -100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>70 – 84%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>55 - 69%</td>
<td>3 satisfactory</td>
</tr>
<tr>
<td>40 - 54%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 39%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**
- Quest: Geodesy Tutorial;
- Vanicek, P.: Geodesy;
- Burkard, R. K.: Geodesy for the Layman;
- Gábor Bartha: Geoinformation Master Course, University of Miskolc, 2014.
- István Havasi - Gábor Bartha: Introduction to GIS, Introduction to Geoinformatics (pp. 10.5)
(Gábor Bartha), Satellite Global Positioning Systems (pp. 67) (István Havasi). angol nyelvű digitális tankönyv: http://digitalisegyetem.uni-miskolc.hu, Miskolci Egyetem. TÁMOP 4.1.2.-08/1/A-2009-0033 projekt, 2011;
<table>
<thead>
<tr>
<th>Course Title: Mineralogy and geochemistry</th>
<th>Code: MFFAT710005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsible Instructor: Sándor Szakáll,</td>
<td>Responsible department/institute: Department</td>
</tr>
<tr>
<td>associate professor</td>
<td>of Geology and Mineral Resources</td>
</tr>
<tr>
<td></td>
<td>Type of course: Compulsory</td>
</tr>
<tr>
<td>Position in curriculum (which semester): 1st</td>
<td>Pre-requisites (if any): -</td>
</tr>
<tr>
<td>No. of contact hours per week (lecture + seminar): 2+1</td>
<td>Type of Assessment (examination/ practical mark / other): exam</td>
</tr>
<tr>
<td>Credits: 4</td>
<td>Course: full time</td>
</tr>
</tbody>
</table>

**Course Description:** Students will get the knowledge of the principals of the distribution of chemical element in the Earth. They will also know the most important thermodynamic processes concerning solid materials, the geochemical classification of elements, the geochemical aspects of the genesis of the most important minerals and mineral assemblages. The geochemistry of isotopes, which explores the chemical evolution of the Earth will also be introduced, as well as the geochemical characteristics of water, organic matter, magmatic, sedimentary and metamorphic rocks by which we can describe the mineral-and rock-forming processes in the crust and mantle.

**Competencies to evolve:**
Knowledge: T7
Ability: K1, K2
Attitude: A1, A2, A9
Autonomy and responsibility: F2, F5


**Assessment and grading:**
The final grade will consist of two part. During the semester two midterm tests are written. The average of them will be the 50% of the final grade. The rest 50% is for the final exam. The total (100%) of them is graded as:
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:**
Course Title: Soil mechanics

Instructor: Dr. Tamás Madarász, associate professor

Code: MFKHT710008

Responsible department/institute: Department of Hydrogeology and Engineering Geology

Type of course: Compulsory

Position in curriculum (which semester): 1

Pre-requisites (if any): -

No. of contact hours per week (lecture + seminar): 2+1

Type of Assessment (examination/practical mark/other): exam

Credits: 4

Course: full time

Course Description:
The students will be familiar with the basic concepts of soil mechanics. They will learn about the determination soil parameters, soil classification. After a short review the students will study the main topics of applied soil mechanics, in the interest of being able to manage interactions between buildings/objects and subsoil, to solve, handle or expertise occurring problems (construction, building, damages).

The short curriculum of the subject:


Compatencies to evolve:
Knowledge: T3, T4, T7
Ability: K7, K12, K13, K15
Attitude: A2, A9
Autonomy and responsibility: F1, F2, F5, F6

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)

Compulsory or recommended literature resources:
<table>
<thead>
<tr>
<th>Course Title: Gradual research seminar</th>
<th>Code: MFFAT720007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor: Dr. Ferenc Mádai, associate professor, institute head</td>
<td>Responsible department/institute: Institute of Mineralogy and Geology</td>
</tr>
<tr>
<td></td>
<td>Type of course: Compulsory</td>
</tr>
<tr>
<td>Position in curriculum (which semester): 1</td>
<td>Pre-requisites (if any): -</td>
</tr>
<tr>
<td>No. of contact hours per week (lecture + seminar): 0+2</td>
<td>Type of Assessment (examination/ practical mark / other): practice mark</td>
</tr>
<tr>
<td>Credits: 2</td>
<td>Course: full time</td>
</tr>
</tbody>
</table>

**Acquired store of learning:**

**Study goals:** To introduce the methods of information gathering and evaluation, formal and ethic requirements of scientific communication, rules for preparation of oral and poster presentations. During the course these general requirements are actualized to the field of earth science and engineering. Examples and exercises will use English publications and text materials.


**Education method:** Completion of a 3-4 pages paper on a specified topic from petroleum geoscience. It should be a literature summary with at least one table and one figure. The paper should fulfill all formal requirements of a scientific paper. Completion of a 5-minutes presentation on the above mentioned specified topic. It should be presented for the class audience.

**Competencies to evolve:**

T1, T5, T8, T12, K1, K2, K3, K5, K6, K7, K8, K9, K10, K11, A2, A3, A4, A5, A6, A7, A8, A9, F1, F2, F3, F4, F5

**Assessment and grading:**

During the semester the following tasks should be completed: short presentation of the selected topic, outline and references (20%), elaboration of the concept map of the article (20%), submission of first draft (15%), submission of the final text (20%), ppt presentation of the topic in 10 minutes (25%).

**Grading limits:**

>80%: excellent, 70-79%: good, 60-69%: medium, 50-59%: satisfactory, <50%: unsatisfactory.

**Compulsory or recommended literature resources:**

- Chun-houh Chen, Wolfgang Härdle, Antony Unwin (eds.) Handbook of Data Visualization (Springer, 2008).
- ISO 690-2: Information and documentation - Bibliographic references.
**Course Title:** Fluid mechanics  
**Instructor:** Dr. Anikó Tóth, associate professor  
**Code:** MFKGT710005  
**Responsible department/institute:** Petroleum Engineering Department  
**Type of course:** Compulsory

<table>
<thead>
<tr>
<th>Position in curriculum (which semester):</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites (if any):</td>
<td>-</td>
</tr>
<tr>
<td>No. of contact hours per week (lecture + seminar):</td>
<td>2+1</td>
</tr>
<tr>
<td>Type of Assessment (examination/ practical mark / other):</td>
<td>exam</td>
</tr>
<tr>
<td>Credits:</td>
<td>3</td>
</tr>
<tr>
<td>Course:</td>
<td>full time</td>
</tr>
</tbody>
</table>

**Course Description:**
Basic knowledge to learn Hydrogeology, Applied Hydrology, Water supply, Hydrodynamical modelling etc. The most important elements of fluid mechanics are fitted into the frame of the transport theory. Fundamentals of fluid mechanics and the flow through porous media will be learned at the level of direct engineering applications.

The short curriculum of the subject:

**Compatencies to evolve:**
Knowledge: T4, T5  
Ability: K1, K2, K9, K13  
Attitude: A9  
Autonomy and responsibility: F6

**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:**

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 -100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**
- Currie, Iain G., Currie I. G.: Fundamental mechanics of fluids, Mechanical engineering, 2002
<table>
<thead>
<tr>
<th><strong>Course Title:</strong> Hydrogeology</th>
<th><strong>Code:</strong> MFKHT710017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Instructor:</strong> Dr. Péter Szűcs, full professor</td>
<td><strong>Responsible department/institute:</strong> Institute of Environmental Management</td>
</tr>
<tr>
<td><strong>Type of course:</strong> Compulsory</td>
<td><strong>Position in curriculum (which semester):</strong> 1</td>
</tr>
<tr>
<td><strong>Pre-requisites (if any):</strong> -</td>
<td><strong>No. of contact hours per week (lecture + seminar):</strong> 2+2</td>
</tr>
<tr>
<td><strong>Type of Assessment (examination/practical mark/other):</strong> exam</td>
<td><strong>Course:</strong> full time</td>
</tr>
</tbody>
</table>

**Course Description:**
The students will be familiar with the basic concepts of modern hydrogeology as well as field hydrogeology. The students will learn about the relationships of rocks and groundwater, and about the phenomena of groundwater flow through the pores and fractures. The students will be able to handle and solve basic problems in hydrogeology and contamination transport. The main relationships of well hydraulics concerning steady-state and transient problems are also discussed. The students will be able to calculate the discharge value, the depression curve and the velocity distribution of an operating well or a group of wells. The students will be able to carry out field pumping tests, and they will be able to interpret the obtained results effectively.

The short curriculum of the subject:

**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:**

- 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:**
Course Title: Groundwater prospecting, water resources management
Instructor: Andrea Tóth Dr. Kolenciskné, assistant lecturer
Code: MFKHT720021
Responsible department/institute: Institute of 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+1
Type of Assessment (examination/ practical mark / other): exam
Credits: 4
Course: full time

Course Description:
The course gives an overview of the different GW occurrences, and of properties of aquifers. The students gain a basic knowledge about the principles and main problems of GW management. The students will be familiar with the different methods used in GW prospecting. They will learn the pros and cons, applicability limits of them. The course gives a practical summary and evaluation of the field and laboratory tests, surface (geophysical methods, remote sensing) and direct (CPT, drilling, well instruction) methods of GW exploration. The students will get the fundamentals to be able to plan a complex GW prospecting project, and the protection of GW resources.
The short curriculum of the subject:

Compatencies to evolve:
Knowledge: T1, T2, T4, T7, T8
Ability: K1, K2, K3, K6, K10, K11, K12, K13, K14, K15
Attitude: A1, A2, A3, A4, A5, A6, A8, A9
Autonomy and responsibility: F1, F2, F3, F4, F5, F6

Assessment and grading:
Students will be assessed with using the following elements.
During the semester for the signature:
Attendance: 15 %
Short quizzes 10 %
Practical work 75 %
Final exam 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:
Course Title: Applied and engineering hydrology
Instructor: András Szöllősi-Nagy, full professor

Course: full time
Grading scale:

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 -100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

Position in curriculum (which semester): 2
Pre-requisites (if any): -
No. of contact hours per week (lecture + seminar): 1+1
Type of course: Compulsory

Credits: 2
Type of Assessment (examination/ practical mark / other): practice mark

Course Description:
To introduce the measurement methods and principles of hydraulic characteristics of surface and subsurface waters; to familiarize the students with its newest tools and the modern processing methods of the measurement data. Tools, methods and organizations of prevention of water damage. To prepare student how to solve basic hydraulic measurement problems.

The short curriculum of the subject:

Compatencies to evolve:
Knowledge: T1, T2, T3, T5, T7
Ability: K1, K2, K3, K6, K9, K10, K11, K12, K13, K14, K15
Attitude: A1, A3, A4
Autonomy and responsibility: F1, F5, F6

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 %


Code: MFKHT720022
Responsible department/institute: Institute of Environmental Management
Compulsory or recommended literature resources:

- Chow, V., Maidment, D., Mays, L.: Applied hydrology, 1988
**Course Title:** Water quality protection  
**Instructor:** Dr. Péter Szűcs, full professor  
**Code:** MFKHT720023  
**Responsible department/institute:** Institute of Environmental Management  
**Type of course:** Compulsory  

<table>
<thead>
<tr>
<th>Position in curriculum (which semester)</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites (if any):</td>
<td>-</td>
</tr>
<tr>
<td>No. of contact hours per week (lecture + seminar):</td>
<td>1+1</td>
</tr>
<tr>
<td>Credits:</td>
<td>3</td>
</tr>
</tbody>
</table>

**Course Description:**
The students will be familiar with the basic concepts, tasks and purposes of water quality protection. The students will also learn about the contamination transport processes in surface water as well as in groundwater. The students will be prepared to assess and solve different water quality and contamination problems. The students will learn about the different tasks given by the European Water Framework in order to achieve the good status of water resources.

The short curriculum of the subject:

**Compatencies to evolve:**
- Knowledge: T1, T2, T4, T6, T7, T8
- Ability: K1, K2, K3, K6, K9, K10, K11, K12, K13, K14, K15
- Attitude: A1, A2, A3, A4, A5, A6, A7, A8, A9
- Autonomy and responsibility: F1, F2, F3, F4, F5, F6

**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)

**Compulsory or recommended literature resources:**
Course Title: Geophysics of exploration for water
Instructors: Péter Tamás Vass Dr., associate professor.
Norbert Péter Szabó Dr., associate professor
Code: MFGFT720024
Responsible department/institute: Department of Geophysics
Type of course: Compulsory
Position in curriculum (which semester): 2
Pre-requisites (if any): -
No. of contact hours per week (lecture + seminar): 2+2
Type of Assessment (examination/practical mark/other): examination
Credits: 5
Course: full time
Program: Hydrogeological Engineering MSc

Course Description:
Students will be provided with geophysical skills applied in the exploration for water. The subject reviews the relation and system of physical, geophysical, hydrogeological and geometrical parameters determined by different geophysical methods. In the seminars students can acquire the basic processing, interpretation and management methods of geophysical data sets and come to know how to use some relevant softwares.

The short curriculum of the subject:


Compatencies to evolve:
Knowledge: T4, T5
Ability: K1, K3, K5, K8, K9, K10, K12
Attitude: A1, A5, A6, A7, A8, A9
Autonomy and responsibility: F1, F2, F3, F4, F5, F6

Assessment and grading:
Condition for obtaining the signature: the presence in at least 60 % of the lessons.
The determination of the examination grade is entirely based on the result of examination.
Grading scale (% value → grade): 0 – 49 % → 1 (fail), 50 – 64 % → 2 (pass), 65 – 79 % → 3 (satisfactory), 80 – 89 % → 4 (good), 90 – 100 % → 5 (excellent).

Compulsory or recommended literature resources:
- Edited by P. Vass: course slides converted in pdf format: http://geofizika.unimiskolc.hu/education.html
Course Title: Geotechnical engineering

Instructor: Dr. Tamás Madarász, associate professor

Code: MFKHT720025

Responsible department/institute: Department of Hydrogeology and Engineering Geology

Type of course: Compulsory

Position in curriculum (which semester): 2

Pre-requisites (if any): MFKHT710008

No. of contact hours per week (lecture + seminar): 2+1

Type of Assessment (examination/ practical mark / other): exam

Credits: 4

Course: full time

Course Description:
The students will be familiar with the basic concepts of geotechnical engineering, with the principles of designing and with the construction methods of different buildings and objects.

The short curriculum of the subject:

Practical work: self-made solutions of simple case-study problems

Competencies to evolve:
Knowledge: T3, T6, T7, T8
Ability: K2, K4, K7, K8, K10, K12, K13, K14, K15
Attitude: A1, A2, A3, A4, A5, A6, A7, A8, A9
Autonomy and responsibility: F1, F2, F3, F4, F5, F6

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)

Compulsory or recommended literature resources:
<table>
<thead>
<tr>
<th>Course Title:</th>
<th>Water chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor:</td>
<td>Dr. János Lakatos, associate professor</td>
</tr>
<tr>
<td>Code:</td>
<td>AKKEM6005</td>
</tr>
<tr>
<td>Responsible department/institute:</td>
<td>Department of Chemistry</td>
</tr>
<tr>
<td>Type of course:</td>
<td>Compulsory</td>
</tr>
</tbody>
</table>

| Position in curriculum (which semester): | 2 |
| Pre-requisites (if any): | - |
| No. of contact hours per week (lecture + seminar): | 1+1 |
| Type of Assessment (examination/ practical mark / other): | practice mark |
| Credits: | 2 |
| Course: | full time |

**Course Description:**
The students will be familiar with the structure and chemical properties and reactivity of the water molecule, and will learn about the main principle of the equilibrium between a water molecule and its components within an aquatic system.

**The short curriculum of the subject:**

**Comaptencies to evolve:**
Knowledge: T1, T2, T6, T7, T8
Ability: K1, K6, K9, K10, K11, K12, K15
Attitude: A2, A5
Autonomy and responsibility: F2, F5, F6

**Assessment and grading:**
Students will be assessed using the following elements.
Attendance: 15%
Short quizzes: 10%
Midterm exam: 40%
Final exam: 35%
Total: 100%

**Grading scale:**

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 - 100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**
- Orbán Vera: Vízkémia, PMMF, Baja, 1980.
**Course Title:** Regional hydrogeology  
**Instructor:** Dr. Enikő Darabos, assistant lecturer  
**Code:** MFKHT720026  
**Responsible department/institute:** Institute of Environmental Management  
**Type of course:** Compulsory  
**Position in curriculum (which semester):** 2  
**No. of contact hours per week (lecture + seminar):** 2+0  
**Credits:** 2  
**Course:** full time

**Course Description:**
To familiarize students with the hydrogeological structure of Hungary. A detailed overview of being a hydrological basin country. To prepare students how to solve basic hydrology-based design problems. The short curriculum of the subject:
- Water supplies of Hungary, major outlines of water supply management.
- Regional tectonics parts of Hungary. The hydrological division of Hungary and the basis of division; their comparisons.
- Water bodies. Utilization and its possibilities, quantity and areas of different water types (shallow ground water, bank-filtered water, deep ground water, water of fissure rocks, karst water. Thermal water reserves in porous and karstic rocks. Mineral and medicinal waters. Matters of regional water production. Water supply protection.
- Competencies to evolve:
  - Knowledge: T1, T2, T6, T7
  - Ability: K8, K10
  - Attitude: A4
- Autonomy and responsibility: F3, F5, F6

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

Course Title: Waterworks, water supply

Instructor: Dr. Tamás Madarász PhD, associate professor
Gábor Nyiri, PhD student

Code: MFKHT720027

Responsible department/institute: Institute of Environmental Management

Type of course: Compulsory

Position in curriculum (which semester): 2

Pre-requisites (if any): -

No. of contact hours per week (lecture + seminar): 1+1

Type of Assessment (examination/ practical mark / other): exam

Credits: 3

Course: full time

Course Description:
The students will be familiar with the basic elements of modern waterworks and water supply. Based on a sample network design, the students will be able to design the necessary parts of a working waterworks plant as well as pipe system of the water distribution system.

The short curriculum of the subject:
The estimation and calculation of the water demand. Water demand for the fireflow. The measurement of the water loss in the supply system. Requirements concerning the water quality. Pumps, pipes, water towers and their hydraulics. The principal assignments of this subject are the design and management calculations of a water distribution network. The class shall be guided through the protocol of designing a simple water distribution network. Minor separate assignments may be given to the class.

The individual project progress shall be discussed on during the class meetings. The principle assignment submission deadline is the last course meeting. Written submissions (drawings, reports, etc) are to emphasize clarity and legibility.

Competencies to evolve:
Knowledge: T1, T2, T4, T5, T8
Ability: K1, K4, K5, K6, K8, K10, K11, K13, K14, K15
Attitude: A1, A2, A3, A4, A5, A6, A7, A8, A9
Autonomy and responsibility: F1, F2, F3, F4, F5, F6

Assessment and grading:
Students will be assessed with using the following elements.

Attendance: 10 %
Assignment reports: 50 %
Final exam: 40 %
Total: 100 %

Grading scale:

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 - 100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

Compulsory or recommended literature resources:
- HAESTAD Methods Advanced water distribution modeling and management
  http://systemssolution.net/cadtechno/0%20SAMPLE/SPECs%20&%20DETAILS/BOOKS%20MECHANICAL/PLUMBING/WATER%20DISTRIBUTION%20MODELING.pdf
**Course Title:** Groundwater flow and contaminant transport modeling  
**Instructor:** Dr. Balázs Kovács, honorary associate professor  
**Code:** MFKHT720028  
**Responsible department/institute:** Institute of Environmental Management  
**Type of course:** Compulsory  
**Position in curriculum (which semester):** 2  
**Pre-requisites (if any):** MFKHT710017  
**No. of contact hours per week (lecture + seminar):** 2+2  
**Type of Assessment (examination/ practical mark / other):** exam  
**Credits:** 5  
**Course:** full time  

**Course Description:**  
The students will be familiar with the theoretical and practical aspects of the numerical methods widely used in the modern hydrogeology. The students will be able to use a worldwide known numerical environment. Using this environment the students will possess an ability to solve simple problems in the field of hydrodynamics and contaminant transport, and will learn that basic knowledge based on which getting more experiences they will be later able to solve also more complex simulation problems.  
The short curriculum of the subject:  
**Compatencies to evolve:**  
Knowledge: T1, T2, T4, T5, T7  
Ability: K1, K2, K3, K4, K5, K6, K7, K8, K13, K15  
Attitude: A8  
Autonomy and responsibility:F1, F5, F6  

**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:  
\[
\begin{array}{|c|c|}
\hline
\text{% value} & \text{Grade} \\
\hline
90 -100% & 5 (excellent) \\
80 – 89% & 4 (good) \\
70 - 79% & 3 (satisfactory) \\
60 - 69% & 2 (pass) \\
0 - 59% & 1 (failed) \\
\hline
\end{array}
\]

**Compulsory or recommended literature resources:**  
**Course Title:** Quality Management  
**Instructor:** Dr. László Berényi, associate professor  
**Code:** GTVVE7002MA  
**Responsible department/institute:** Institute of Management Science  
**Position in curriculum (which semester):** 3  
**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 objective of the course is to prepare students to perform professional tasks on a higher level by applying the approach of quality management, including managing or participating related projects. The student will learn about principles, concept and terminology of quality management, quality-related corporate activities, requirements of the ISO 9001 standard and the specialities of project quality management.

Lectures:
1. week: Terminology of quality management (principles, 5 approaches, 9 influencing factors), history of quality management.
4. week: ISO 9001 requirement: Management system.
7. week: Total Quality Management. Lean approach in quality management.
8. week: Enhancing quality management, integrated management systems.
9. week: Quality tools: 7 old&new tools, finding the root cause, 8D
10. week: Quality tools: FMEA, QFD
12. week: Project quality management: planning.

Compencies to evolve:
Knowledge: T7
Ability: K2, K10, K12,
Attitude: A4, A7
Autonomy and responsibility: F3, F4

**Assessment and grading:**
40%: successful midterm test; 20%: presentation about a chosen quality management tool; 40%: oral exam

Grading scale:

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80-89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70-79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60-69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0-59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**

**Compulsory literature**

**Recommended literature**
<table>
<thead>
<tr>
<th><strong>Course Title:</strong> Legal and economic studies with regard to mining and geology</th>
<th><strong>Code:</strong> MFFTT730027</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Instructor:</strong> Dr. Mádai Ferenc, associate professor</td>
<td><strong>Responsible department/institute:</strong> Institute of Mineralogy and Geology</td>
</tr>
<tr>
<td><strong>Position in curriculum (which semester):</strong> 3</td>
<td><strong>Type of course:</strong> Compulsory</td>
</tr>
<tr>
<td><strong>No. of contact hours per week (lecture + seminar):</strong> 2+0</td>
<td><strong>Pre-requisites (if any):</strong> -</td>
</tr>
<tr>
<td><strong>Type of Assessment (examination/ practical mark / other):</strong> exam</td>
<td><strong>Course:</strong> full time</td>
</tr>
<tr>
<td><strong>Credits:</strong> 2</td>
<td><strong>Course Description:</strong> The main objective is to provide an in-depth and practical knowledge of the supranational and national legislation and regulatory framework with regard to mining and geology. The short curriculum of the subject: 1. Essential legal terms and definitions 2. Specific Community legislation of the European Union (the „acquis”) 3. International conventions and standards 4. The Hungarian national mining and geology legislation 5. Other Hungarian acts on the environment, energy, water, etc. 6. Other national quasi-legislation (orders of MBFH) and the licensing framework</td>
</tr>
<tr>
<td><strong>Assessment and grading:</strong> Students will be assessed with using the following elements.</td>
<td></td>
</tr>
<tr>
<td>Attendance: 15 %</td>
<td></td>
</tr>
<tr>
<td>Short quizzes: 10 %</td>
<td></td>
</tr>
<tr>
<td>Midterm exam: 40 %</td>
<td></td>
</tr>
<tr>
<td>Final exam: 35 %</td>
<td></td>
</tr>
<tr>
<td>Total: 100 %</td>
<td></td>
</tr>
<tr>
<td>Grading scale:</td>
<td></td>
</tr>
<tr>
<td>% value</td>
<td>Grade</td>
</tr>
<tr>
<td>90 -100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
<tr>
<td><strong>Compulsory or recommended literature resources:</strong></td>
<td></td>
</tr>
<tr>
<td>Wagner H. et al. 2006: Minerals planning policies and supply practices in Europe – European Commission Directorate, General Enterprise, University of Leoben</td>
<td></td>
</tr>
<tr>
<td>Course Title:</td>
<td>Geothermics</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Instructor:</td>
<td>Dr. Anikó Tóth, associate professor</td>
</tr>
<tr>
<td>Code:</td>
<td>MFKGT730021</td>
</tr>
<tr>
<td>Responsible department/institute:</td>
<td>Natural Gas Engineering Department</td>
</tr>
<tr>
<td>Type of course:</td>
<td>Compulsory</td>
</tr>
</tbody>
</table>

| Position in curriculum (which semester): | 3 |
| Pre-requisites (if any): | - |
| No. of contact hours per week (lecture + seminar): | 1+1 |
| Type of Assessment (examination/ practical mark / other): | exam |
| Course: | full time |

### Course Description:

Students study the production and utilization technologies of geothermal energy, based on the applied fluid mechanics and heat transfer. They can get the ability to elaborate geothermal projects, feasibility studies. They will became to organize and lead implementations of different geothermal energy production and utilization systems.

The short curriculum of the subject:


Electricity production and direct uses. Lindal diagram. Environmental impacts.

### Competencies to evolve:

Knowledge: T4, T5, T7
Ability: K1, K2, K5, K6, K13
Attitude: A2, A9
Autonomy and responsibility: F2, F5

### 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:**

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 - 100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

### Compulsory or recommended literature resources:

<table>
<thead>
<tr>
<th><strong>Course Title:</strong> Watermining</th>
<th><strong>Code:</strong> MFKHT740021</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Instructor:</strong> Dr. László Lénárt, associate professor</td>
<td><strong>Responsible department/institute:</strong> Institute of Environmental Management</td>
</tr>
<tr>
<td><strong>Type of course:</strong> Compulsory</td>
<td></td>
</tr>
<tr>
<td><strong>Position in curriculum (which semester):</strong> 3</td>
<td><strong>Pre-requisites (if any):</strong> -</td>
</tr>
<tr>
<td><strong>No. of contact hours per week (lecture + seminar):</strong> 2+0</td>
<td><strong>Type of Assessment (examination/ practical mark / other):</strong> exam</td>
</tr>
<tr>
<td><strong>Credits:</strong> 3</td>
<td><strong>Course:</strong> full time</td>
</tr>
</tbody>
</table>

**Course Description:**
The students shall be acquainted with the design, drilling, construction and operation of groundwater wells. The curriculum discusses other type of water production installations. The students will be competent in designing a drilled groundwater well and preparing the documentation for the technical and legal permission of the well. Production techniques, operation and maintenance of groundwater wells close the curriculum.

**The short curriculum of the subject:**
Selection of drilling technique and its main aspects, influencing factors in drilling operations, Classification of groundwater wells, applied well designs, types and classification of well screens, design and requirements of well screens, materials of well screens, screen installation techniques, installation of groundwater well, measurements in operating wells, well maintenance and repair, Well design project.


**Competencies to evolve:**
Knowledge: T1, T2, T4, T7, T8
Ability: K1, K4, K5, K7, K8, K9, K10, K12, K14
Attitude: A7, A9
Autonomy and responsibility: F2, F5

**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:**

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 -100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**

- Achmed N., Taylor S. W., Sheng Z.: Hydraulics of wells: design, construction, testing, and maintenance of water well systems, American Socity of Civil Engineers, 2014
- F. G. Driscoll: Groundwater and Wells I. II. III., Johnson Division, St. Paul Mn, 1990, USA
**Course Title:** Hydrogeological interpretation  
**Instructor:** Dr. Tamás Madarász, associate professor  
**Code:** MFKHT730024  
**Responsible department/institute:** Institute of Environmental Management  
**Type of course:** Compulsory  
**Position in curriculum (which semester):** 3  
**Pre-requisites (if any):** MFKHT710017  
**No. of contact hours per week (lecture + seminar):** 1+1  
**Type of Assessment (examination/ practical mark / other):** practice mark  
**Credits:** 2  
**Course:** full time

**Course Description:**
The students will be familiar with the basic concepts, tasks and purposes of complex hydrogeological interpretation. The students will also learn about the main properties of measured hydrological and hydrogeological data sets and about geostatistical as well as optimization calculations. The students will be prepared to process and analyze multidimensional hydrogeological data sets on order to make effective interpretation.

The short curriculum of the subject:
Measurements and data set types in hydrogeology and hydrology. Data processing to gain information. Data distribution models in groundwater science. Fitting and regression analysis. The role of histograms. Sample statistical properties, uncertainty determination. Frequently used statistical probes in water sciences. The basic concepts of optimization. Rare event determination concerning flood levels and groundwater levels. Water level curve characteristics. Sample collection strategy in environmental and water sciences. Determination of weather probability curve. Extreme precipitation events and their predictions. Complex interpretation of different types of groundwater data.

**Compaticencies to evolve:**
Knowledge: T1, T2, T4, T5, T7, T8
Ability: K2, K4, K5, K6, K9, K10, K13, K14
Attitude: A1, A4, A6, A8
Autonomy and responsibility:F1, F2, F5, F6

**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:

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 -100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**
- Dr. Csoma János, Dr. Szigyártó Zoltán: A matematikai statisztika alkalmazása a hidrológiában. VITUKI, Budapest, 1975.
**Course Title:** Drilling, Deep Drilling

**Instructor:** Dr. Imre Federer, associate professor

**Code:** MFKOT730029

**Responsible department/institute:** Petroleum Engineering Department

**Type of course:** Compulsory

**Position in curriculum (which semester):** 3

**Pre-requisites (if any):** -

**No. of contact hours per week (lecture + seminar):** 1+1

**Type of Assessment (examination/practical mark/other):** practice mark

**Credits:** 2

**Course:** full time

### Course Description:

The subject introduces the basic properties of hydrocarbon and geothermal well drilling technology and the knowledge for design and operate of drilling methods. The students will be familiar with the basic concepts of modern drilling technology as well as field engineering. The students will learn about the relationships of pressure balance in the drilled hole, about the phenomena of well planning. The students will be able to handle and solve basic problems in shallow and deep well drilling. The main relationships of mud logging, cutting transport and well testing concerning the well structure determination and well hydraulics problems are also discussed. The students will be able to measure and calculate the mud properties, the casing shoe setting depth. The students will be able to carry out the formation integrity test, and they will be able to interpret the obtained results effectively.

The short curriculum of the subject:


### Compatencies to evolve:

- **Knowledge:** T3, T7, T8
- **Ability:** K4, K5, K6, K7, K8, K9, K12, K14
- **Attitude:** A1, A3, A5
- **Autonomy and responsibility:** F1, F2, F3, F6

### Assessment and grading:

Students will be assessed with using the following elements.

<table>
<thead>
<tr>
<th>Element</th>
<th>% Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>15</td>
</tr>
<tr>
<td>Short quizzes</td>
<td>10</td>
</tr>
<tr>
<td>Midterm exam</td>
<td>40</td>
</tr>
<tr>
<td>Final exam</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

**Grading scale:**

<table>
<thead>
<tr>
<th>% Value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 -100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

### Compulsory or recommended literature resources:

| Course Title: Water and waste water treatment | Code: MFEET730028 |
| Instructor: Dr. Sándor Nagy, associate professor | Responsible department/institute: Institute of Raw Material Preparation and Environmental Processing |
| Position in curriculum (which semester): 3 | Type of course: Compulsory |
| Pre-requisites (if any): MFKHT720003 | |
| No. of contact hours per week (lecture + seminar): 1+1 | Type of Assessment (examination/ practical mark / other): practice mark |
| Credits: 2 | Course: full time |

**Course Description:**

**Acquired store of learning:**

The students will be familiar with the basic elements and concepts of modern water and waste water purification technology and processes. The students will be able to choose the right purification technology concerning environmental protection aspects.

The short curriculum of the subject:


**Compatencies to evolve:**

Knowledge: T2, T7, T8

Ability: K3, K6, K9, K10, K11, K15

Attitude: A3, A7, A8

Autonomy and responsibility: F1, F2, F3, F6

**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:**

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 -100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**

- M Henze; P Harremoes; J la C Jansen; E Arvin: Wastewater Treatment; Springer-Verlag Berlin heidelberg, 2002
- Hungarian and English textbooks, and Internet resources
• Dr. Michael R. Templeton, Prof. David Butler: Introduction to Wastewater Treatment. 2013
• Fatta-Kassinos, Despo, Dionysiou, Dionysios D., Kümmerer, Klaus (Eds.): Advanced Treatment Technologies for Urban Wastewater Reuse
**Course Title:** Environmental Risk Assessment and Remediation  
**Code:** MFKHT730026  
**Instructor:** Dr. Tamás Madarász, associate professor  
**Responsible department/institute:** Institute of Environmental Management  
**Type of course:** Compulsory  

<table>
<thead>
<tr>
<th>Position in curriculum (which semester):</th>
<th>Pre-requisites (if any):</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of contact hours per week (lecture + seminar):</th>
<th>Type of Assessment (examination/ practical mark / other):</th>
</tr>
</thead>
<tbody>
<tr>
<td>2+0</td>
<td>exam</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credits:</th>
<th>Course:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>full time</td>
</tr>
</tbody>
</table>

**Course Description:**  
The students will be familiarized with the basic concept and framework of Environmental and Human Health Risk assessment and its relationship to contaminated land remediation. The students shall be competent in reading and understanding risk assessment documentation and evaluating its correctness. They will be able to work together with other field specialists in a risk assessor team. They will get a brief introduction to remediation practices and their design and the European practice of remediation planning and monitoring.  
The short curriculum of the subject:  
Practical work: Hands-on activity of simple case-study problems  
Compencies to evolve:  
Knowledge: T3, T4, T7, T8  
Ability: K1, K2, K3, K6, K7, K10, K13, K15  
Attitude: A2, A3, A7  
Autonomy and responsibility:F1, F4, F5, F6

**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:  
<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80-89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70-79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60-69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0-59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**  
- Vegter, J.J. (2001): A Risk-Based Land Management Approach; Land Contamination and Reclamation, Vol. 9, No. 1, Richmond, UK  
**Course Title:** Environmental Geotechnics  
**Instructor:** Dr. Andrea Tóth Kolencsikné, assistant lecturer  
**Code:** MFKHT730030  
**Responsible department/institute:** Institute of Environmental Management  
**Type of course:** Compulsory  
**Position in curriculum (which semester):** 3  
**Pre-requisites (if any):** MFKHT710008  
**No. of contact hours per week (lecture + seminar):** 1+1  
**Type of Assessment (examination/ practical mark / other):** exam  
**Credits:** 2  
**Course:** full time

**Course Description:**  
The students will be familiar with the basic concepts of environmental geotechnics.  
The short curriculum of the subject:  
Compatencies to evolve:  
Knowledge: T3, T7, T8  
Ability: K7, K10, K13, K14, K15  
Attitude: A2, A5, A7  
Autonomy and responsibility: F1, F3, F6

**Assessment and grading:**  
Students have to prepare a project work during the semester, and several calculation tasks and lab experiments.  
Students will be assessed with using the following elements:  
Attendance: 15 %  
Short quizzes: 10 %  
Project work: 40 %  
Calculation and lab tasks: 35 %  
Total: 100 %  
Requirement for the signature: >60%  
Grading scale of the final exam:  
- 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:**  
Course title: Surfer for windows hands on training
Instructor: Dr. Mikita Viktória, assistant professor
Code: MFKHT73005
Responsible department/institute: Hidrogeológiai-Mérnökögésztudományi Intézet
Type of course: optional

Position in curriculum (which semester): 6
Pre-requisites (if any): no
No. of contact hours per week (lecture + seminar): 2+1
Type of Assessment (examination/ practical mark / other): exam
Credits: 3
Course: full time

Course description
The students will be able to use the most common practical applications of the Surfer for Windows software. They will able to solve some engineering tasks related to area and volume integral problems they can edit various maps and perform data processing tasks.

The short curriculum of the object:
- The theoretical background of grid files,
- Introduction to interpolation algorithms
- Math with grid files (on 2 occasions),
- Volume calculations
- 2D mapping techniques: base maps, contour maps, post maps, vector maps (on 2 occasions)
- 2.5 D spatial mapping techniques: 3D wireframe, surface and watershed maps (on 2 occasions)
- Data transfer to Processing MODFLOW

Competencies to evolve:
Knowledge: T4, T5, T6, T7, T10, T12
Ability: K1, K2, K3, K4, K5, K13
Attitude: A1, A2
Autonomy and responsibility: F1, F3

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)

Compulsory and recommended literature resources:
**Course Title:** Wellfield and groundwater resources protection (Optional subject group (2))

**Instructor:** Dr. László Perger, invited lecturer

**Code:** MFKHT730032

**Responsible department/institute:** Institute of Environmental Management

**Position in curriculum (which semester):** 3

**Pre-requisites (if any):** -

**No. of contact hours per week (lecture + seminar):** 1+2

**Type of course:** Optional

**Type of Assessment (examination/ practical mark / other):** practice mark

**Credits:** 3

**Course:** full time

**Course Description:**
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 reckon 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.

The short curriculum of the subject:
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; rik 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.

**Competencies to evolve:**
Knowledge: T1, T2, T7
Ability: K1, K5, K6, K10, K11, K12
Attitude: A5
Autonomy and responsibility: F3, F5

**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:**

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 -100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**
• 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
• Contaminated Land and the Water Environment, Report of the National Rivers Authority, NRA London, 1994
**Course Title:** Remote sensing (Optional subject group (2))

**Instructor:** Dr. Norbert Németh, associate professor

**Code:** MFFTT730032

**Responsible department/institute:** Department of Geology and Mineral Deposits

**Position in curriculum (which semester):** 3

**No. of contact hours per week (lecture + seminar):** 1+2

**Pre-requisites (if any):**

**Type of course:** Optional

**Type of Assessment (examination/ practical mark / other):** practice mark

**Credits:** 3

**Course:** full time

**Course Description:**

**Compatencies to evolve:**
Knowledge: T7
Ability: K2, K13
Attitude: A1, A7
Autonomy and responsibility: F6

**Assessment and grading:**
*Signature requirements:* attendance on the seminars and pass grade on the midterm exam.

*Practical mark:* presentation on a choosen topic from the application of remote sensing.

Students will be assessed according to the results of the presentation.

Grading scale:

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 –100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 – 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 – 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 – 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**

**Course Title:** Safety techniques and labour safety  
**Instructor:** Dr. Tibor Szabó, associate professor  
**Code:** MFKOT740010  
**Responsible department/institute:** Petroleum Engineering Department  
**Type of course:** Compulsory  
**Position in curriculum (which semester):** 4  
**No. of contact hours per week (lecture + seminar):** 2+0  
**Pre-requisites (if any):** -  
**Type of Assessment (examination/ practical mark / other):** exam  
**Credits:** 2  
**Course:** full time

**Course Description:**  
Understand of the basic knowledges of safety techniques and labour safety.  
Topics Covered & Course Description:  
Compencies to evolve:  
Knowledge: T6, T7, T8  
Ability: K12, K13, K14, K15  
Attitude: A3, A5, A8  
Autonomy and responsibility: F1, F4

**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:  
<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 - 100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**  
Relevant laws and regulations in force.  
- A kémiai biztonság szabályozása, OTH OMMF kiadvány 2005.  
- A munkavédelmi törvény magyarázata, KJK KERSZÖV, 2005. ISBN 9632247752  
- Érvényben lévő ide vonatkozó jogszabályok és előírások.  
**Course Title:** Strategic Management  
**Instructor:** Dr. Balaton Károly, full professor  
**Code:** GTVVE7041MA  
**Responsible department/institute:** Institute of Management Science  
**Type of course:** Compulsory  
**Position in curriculum (which semester):** 4  
**Pre-requisites (if any):** GTVVE7002MA  
**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 aim of the subject is to represent the reasons of creation of corporations – as non-natural legal entities – (The Netherlands, 1820), development of corporate governance, and American, German and Japanese basic model since the minor of Hungarian practice. Through the flow of EU Co. the subject focuses on the buying foreseen tendencies of corporate governances in case of cluster, network and multiple corporational forms.

**Structure of lectures:**

**Compentencies to evolve:**
- Knowledge: T6, T7, T8
- Ability: K11, K14
- Attitude: A2, A4, A5, A8
- Autonomy and responsibility: F2, F4, F5, F6

**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:**

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 -100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**
**Compulsory reading:**

**Recommended reading:**