## Course descriptions

### Earth Sciences Engineering MSc Program

<table>
<thead>
<tr>
<th>Subject</th>
<th>NEPTUN code</th>
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<tr>
<td><strong>General courses:</strong></td>
<td></td>
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<tr>
<td>Numerical Methods and Optimization</td>
<td>GEMAK712MA</td>
</tr>
<tr>
<td>Engineering physics</td>
<td>MFGFT7100011</td>
</tr>
<tr>
<td>Physical geology</td>
<td>MFFTT710001</td>
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<tr>
<td>Mineralogy and geochemistry</td>
<td>MFFAT710005</td>
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<tr>
<td>Geodesy, spatial informatics</td>
<td>MFGGT710002</td>
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<tr>
<td>Computer science for engineers</td>
<td>GEMAK713MA</td>
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<td>Geophysical exploration methods I</td>
<td>MFGFT7100021</td>
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<tr>
<td>Data and information processing</td>
<td>MFGFT7100031</td>
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<td>Graduate research seminar</td>
<td>MFFAT720007</td>
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<tr>
<td>Structural geology</td>
<td>MFFTT720020</td>
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<tr>
<td>Mineral deposits</td>
<td>MFFTT720021</td>
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<tr>
<td>Engineering Geology and Hydrogeology</td>
<td>MFKHT720020</td>
</tr>
<tr>
<td>Analytical techniques in mineralogy and petrology</td>
<td>MFFAT720025</td>
</tr>
<tr>
<td>Geological interpretation and prospecting</td>
<td>MFFTT730026</td>
</tr>
<tr>
<td>Geophysical interpretation and prospecting</td>
<td>MFGFT730025</td>
</tr>
<tr>
<td>Quality Management</td>
<td>GTVVE7002MA</td>
</tr>
<tr>
<td>Legal and economic studies with regard to mining and geology</td>
<td>MFFAT730027</td>
</tr>
<tr>
<td>Strategic Management</td>
<td>GTVVE2006AB</td>
</tr>
<tr>
<td>Safety techniques and labor safety</td>
<td>MFKOT740010</td>
</tr>
</tbody>
</table>

| **Geophysical engineering module:**                                    |                      |
| Geophysical Measurements                                               | MFGFT720012          |
| Engineering and environmental geophysics                               | MFGFT720013          |
| Geophysical inversion                                                  | MFGFT720014          |
| Engineering physics II                                                 | MFGFT720011          |
| Geophysical Exploration Methods II                                     | MFGFT720015          |
Geophysical data processing ................................................. MFGFT730026
Geostatistics ................................................................. MFGFT730017

Optional subject group I:
  Well logging college ...................................................... MFGFT730030
  Seismic College ............................................................ MFGFT730029

Optional subject group II:
  Introduction to English Geophysical Literature .................... MFGFT730041
  Global environmental Geophysics ................................. MFGFT730027

**Geological engineering module:**

  Historical geology ..................................................... MFFTT720028
  Hydrocarbon geology .................................................. MFFAT720029
  Geological mapping .................................................. MFFTT720029
  Sedimentology ............................................................ MFFAT720030
  Geochemical prospecting methods ................................. MFFAT720031
  Non-metallic industrial minerals ................................. MFFTT730030
  Applied environmental Geology ................................. MFFAT730032

Miskolc, 2019. február 01.

Dr. Less György
szakfelelős
**Course Title:** Numerical Methods and Optimization  
**Instructor:** Dr. József né Mészáros ny. egyetemi docens  
**Code:** GEMAK712MA  
**Responsible department/institute:** GEMAN  
**Type of course:** C  
**Position in curriculum (which semester):** 1  
**Pre-requisites (if any):** -  
**No. of contact hours per week (lecture + seminar):** 1+1  
**Type of Assessment (examination/ practical mark / other):** practical mark  
**Credits:** 2  
**Course:** full time

### Course Description:
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.

1. Extrema of functions.
2. Unconstrained and constrained optimization.
4. Minimization of functions with one variable (golden section, parabola method).
5. Minimization of multivariable functions (Nelder-Mead, Newton, modified Newton, quasi-Newton, minimization with line search).
7. Multi-aided and multicriteria decision problems (Pareto efficient solutions).
8. Linear programming.
10. About Soft Computing (SC) methods: genetic algorithms
11. About Soft Computing (SC) methods: neural network
12. Numerical solutions of ordinary differential equations and system of equations: Runge-Kutta,

### Competencies to evolve:
**Knowledge:** T11  
**Ability:** K4, K5, K6, K7, K8, K9, K10, K11  
**Attitude:** -  
**Autonomy and responsibility:** F1, F3, F4, 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:
**Course Title:** Engineering physics  
**Responsible instructor (name, position, scientific degree):** Dr. Dobróka Mihály, professor emeritus  
**Neptun code:** MFGFT7100011  
**Responsible department/institute:** Institute of Geophysics and Geoinformatics / Department of Geophysics  
**Type of course:** C  

**Position in Curriculum (which semester):** 1  
**Number of Contact Hours per Week (lec.+prac.):** 2+1  
**Pre-requisites (if any):** none  
**Type of Assessment (examination / practical mark / other):** exam  
**Credits:** 4  
**Course:** full-time  
**Program:** Earth Science Engineering MSc

**Course Description:**  
Within the framework of the Earth Science Engineering MSc program, the students gain the deepening knowledge in those fields of the continuum physics, which are necessary to understand the geological processes and geophysical methods.  

**Competencies to evolve:**  
**Knowledge:** T1, T2  
**Ability:** -  
**Attitude:** A3, A4, A5, A7  
**Autonomy and responsibility:** F1, F2, F3, F4, F5

**The short curriculum of the subject:**  

**Assessment and grading:**  
Attendance at lectures is regulated by the university code of education and examination. Writing two tests at least satisfactory level, respectively during the semester is the requirement of signature.  

**Exam grading scale:** unsatisfactory (0-45%), satisfactory (46-60%), medium (61-70%), good (71-85%), excellent (86-100%).

**The 3-5 most important compulsory, or recommended literature (textbook, book) resources:**

<table>
<thead>
<tr>
<th><strong>Course title:</strong> Physical Geology</th>
<th><strong>Code of the course:</strong> MFFTT710001</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teacher:</strong> Dr. Hartai Éva, honorary professor, PhD</td>
<td><strong>Responsible institute:</strong> Institute of Mineralogy - Geology</td>
</tr>
<tr>
<td><strong>Recommended semester:</strong> 1</td>
<td><strong>Type of course:</strong> C</td>
</tr>
<tr>
<td><strong>No. of contact hours/week (sem.+lab.):</strong> 2+1</td>
<td><strong>Pre-requisites:</strong> -</td>
</tr>
<tr>
<td><strong>Type of assessment (exam/pr. mark/other):</strong> exam</td>
<td><strong>Course:</strong> full-time</td>
</tr>
</tbody>
</table>

**Competencies to evolve:**

*Knowledge:* T1, T2, T3, T7, T8, T9  
*Ability:* K1, K2, K3, K5, K6, K7, K9, K11, K12, K13  
*Attitude:*

*Autonomy and responsibility:* F1, F2, F3, F4, F5

**Thematic description of the course:**

**Acquired store of learning:**

*Study goals:* Deepening the students’ abilities for geological interpretation, reconstruction of rock-forming processes.


*Education method:* Obligatory attendance of the lectures and the two fieldtrips. Students present the results of one fieldtrip in ppt, and submit written report on the other fieldtrip.

**Type of Assessment** (exam. / pr. mark. / other): exam

During the semester the following tasks should be completed: students have to complete two field programme: 1) studying sedimentary rocks, reporting in ppt presentations (15%), 2) studying magmatic rocks, written report (15%). Exam: 70%.

**Grading limits:**

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

**The 3-5 most important compulsory, or recommended literature (textbook, book) resources:**

- Angela L. Coe: Field techniques. Wiley-Blackwell 2010  
<table>
<thead>
<tr>
<th>Course Title: Mineralogy and geochemistry</th>
<th>Code: MFFAT710005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsible Instructor: Ferenc Móricz, assistant lecturer</td>
<td>Responsible department/institute: Department of Geology and Mineral Resources</td>
</tr>
<tr>
<td>Position in curriculum (which semester): 1st</td>
<td>Type of course: Compulsory</td>
</tr>
<tr>
<td>Pre-requisites (if any): -</td>
<td></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:** 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 |

**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:

Competencies to evolve:
Knowledge: T7
Ability: K2
Attitude:A2
Autonomy and responsibility: F6

**Assessment and grading:**
Students will be assessed with using the following elements. Attendance15 %Short quizzes10 %Midterm exam40 %Final exam 35 %Total100%Grading scale:% valueGrade85-100%5 (excellent)70 –84%4 (good)55-69%3 satisfactory)40-54%2 (pass)0 -39%1 (failed)

**Compulsory or recommended literature resources:**
- Quest: GeodesyTutorial;
- Vanicek,P.:Geodesy;
- Burkard,R.K.: GeodesyfortheLayman;
- 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;
- Short,N.: The RemoteSensingTutorial
**Course Title:** Computer science for engineers

**Responsible Instructor** (name, position, scientific degree):
Józsefné Mészáros Dr., associate professor, PhD

**Credits:** 2

**Type of course:** compulsory

**Neptun code:** GEMAK713MA

**Type of Assessment** (exam. / pr. mark. / other): pr. mark

**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:**

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</table>

**Position in Curriculum (which semester):** 1st

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

**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:


The 3-5 most important compulsory, or recommended literature (textbook, book) resources:

**Text books:**

**Other references:**

**Competencies to evolve:**
T2 - The environmental engineer is in posession of knowledge in respect of environmental measuring
technology, and measuring theory.
T7 - The environmental engineer knows and apply the methodology of environmental informatics, and modeling.
Active professional English language skills.
**Course title:** Geophysical exploration methods

**I.**

**Responsible professors:**
Norbert Péter Szabó Dr., PhD, dr. habil., associate professor
Endre Turai Dr., CSc, dr. habil., associate professor
László Gombár Dr., engineering lecturer

**Code:** MFGFT7100021

**Responsible Institute/Department:** Institute of Geophysics and Geoinformatics / Department of Geophysics

**Code:** MFGFT6002D, MFGFT6003D

**Semester:** first

**Number of Contact Hours per Week:**
2 lec. + 1 lab.

**Type of Assessment** (exam. / pr. mark. / other):
exam (oral)

**Type of Program:** full time

**Program and Specializations:** MS in Earth Science Engineering, Geological Engineering, Geophysical Engineering and Geoinformatics Engineering specializations

**Credits:** 4

**Study goals:**
Understanding the surface geophysical methods and the geophysical methods used in boreholes for the purpose that students can design and execute geophysical research and evaluate data.

**Competencies to be developed:**
Knowledge: T1, T2, T4, T7, T8, T9
Ability: K1, K2, K3, K5, K9, K11, K12, K13
Attitude: A1, A2, A3, A4, A5, A7
Autonomy and responsibility: F1, F2, F3, F4, F5

**Course content:**

**Type of assessment:**
Attendance at lectures is regulated by the university code of education and examination. Three writing tests with satisfactory results, and two assignments during the semester is the requirement of signature.

**Grading scale:** >86 %: excellent, 71-85 %: good, 61-70 %: medium, 46-60 %: satisfactory, <45 %: unsatisfactory.

**Compulsory and recommended literature resources:**
Course title: Data and information processing
Responsible instructor (name, position, scientific degree): Dr. Dobróka Mihály, professor emeritus, Dr. Endre Turai associate professor

Neptun code: MFGFT7100031
Responsible department/institute:
Institute of Geophysics and Geoinformatics / Department of Geophysics

Type of course: C

Position in Curriculum (which semester): 2
Pre-requisites: none

Number of Contact Hours per Week (lec.+prac.): 2+1
Type of Assessment (examination / practical mark / other): practical mark

Credits: 4
Course: full-time
Program: Earth Science Engineering MSc

Course Description:
Understanding the basics of inversion method-based geoinformation processing for Earth Science Engineers.

Competencies to evolve:
Knowledge: T1, T2, T3, T6, T9
Ability: K2, K6, K7
Attitude: A1, A2, A3, A4, A5, A7
Autonomy and responsibility: F1, F2, F3, F4, F5

The short curriculum of the subject:

Assessment and grading: Attendance at lectures is regulated by the university code of education and examination. Writing two tests at least satisfactory level, respectively during the semester is the requirement of signature.

Exam grading scale: unsatisfactory (0-45%), satisfactory (46-60%), medium (61-70%), good (71-85%), excellent (86-100%).
The 3-5 most important compulsory, or recommended literature (textbook, book) resources:

**Course Title:** Graduate research seminar  
**Instructor:** Dr. Mádai Ferenc associate professor, PhD  
**Code:** MFFAT720007  
**Responsible department/institute:** ÁFI

<table>
<thead>
<tr>
<th>Position in curriculum (which semester):</th>
<th>Pre-requisites (if any): -</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of contact hours per week (lecture + seminar): 0+2</td>
<td>Type of Assessment (examination/practical mark/other): practical mark</td>
</tr>
</tbody>
</table>

| Credits: 2 | Course: full time |

**Competencies to evolve:**

- **Knowledge:** T1, T5, T8, T12
- **Ability:** K1, K2, K3, K5, K6, K7, K8, K9, K10, K11
- **Attitude:** A2, A3, A4, A5, A6, A7, A8, A9

**Autonomy and responsibility:** F1, F2, F3, F4, F5

**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.

**Type of Assessment** (exam./pr. mark/other): **pr. mark**

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:** Structural geology

**Responsible instructor:** Dr. Németh Norbert, associate professor

**Neptun code:** MFFT720020

**Responsible department/institute:** ÁFI

**Type of course:** C

**Position in Curriculum (which semester):** 2

**Number of Contact Hours per Week (lec.+prac.):** 1+2

**Credits:** 4

**Pre-requisites:**

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

**Course:** full-time

**Course Description:** Introduction of the structural features of the rocks, the representation of the structures, the deformation of the rock bodies and its physical background.

**Competencies to evolve:**

**Knowledge:** T1, T2, T3, T4, T7, T8, T9

**Ability:** K1, K2, K3, K5, K9, K11, K12, K13

**Attitude:** A1, A2, A3, A4, A5, A7

**Autonomy and responsibility:** F1, F2, F3, F4, F5

**The short curriculum of the subject:**

1. Representation and data analysis
2. Syngenetic structural elements of the rocks
3. Stress and strain
4. Brittle deformation features
5. Folds, foliations and lineations
6. Deformation mechanisms
7. Inner structure of the Earth and plate tectonics
8. Tectonic position and related structural features

The course includes field practice and working with data recorded there.

**Assessment and grading:** Attendance at lectures is regulated by the university code of education and examination. Writing a test and constructing a geological profile at least on satisfactory level, respectively during the semester is the requirement of signature.

**Exam grading scale:** unsatisfactory (0-45%), satisfactory (46-60%), medium (61-70%), good (71-85%), excellent (86-100%).

**Compulsory or recommended literature resources:**

**Compulsory:**

**Recommended:**
**Course title:** Mineral deposits  
**Teacher:** Dr. Zajzon Norbert, associate professor  
**Code of the course:** MFFTT720021  
**Responsible institute:** Institute of Mineralogy and Geology  
**Type of course:** C  
**Recommended semester:** 2  
**Pre-requisites:** MFFAT710005  
**No. of contact hours/week (sem.+lab.):** 2+1  
**Type of assessment (exam/pr. mark/other):** exam  
**Credit points:** 4  
**Course:** full-time  

**Task and target of the course:** The key target of the course is to introduce the geology of raw material deposits, their spatial distribution, their quantity and quality for the different commodities.  

**Competencies to evolve:**  
*knowledge:* T1, T2, T3, T4, T7, T8, T9  
*ability:* K1, K2, K3, K5, K11, K12, K13  
*attitude:* A1, A2, A3, A4, A5, A7  
*autonomy and responsibility:* F1, F2, F3, F4, F5  

**Thematic description of the course:**  
During the introduction the students get familiar with the different groups of commodities – ores, industrial minerals, solid fossil energy minerals, construction materials and their use and history. In the next period, the students will learn the ore forming geological processes and their appearances, which creates the different deposits. Also they will learn the genetic classification of the deposits with national and international examples. It prepares the students to be able to recognize the geological features of mineralizations, alterations and tectonic preformation. It covers all the important mines and ore districts in Europe and worldwide. During the laboratory classes the students can learn the natural occurrences of the ores, non-ores and industrial minerals. They will learn the physical and chemical properties, and texture of the different raw material types, and how to identify and distinguish them. To the proper use of geological maps and sections in 3D, the students will do exercises to develop their capabilities. During the related field trips the students will examine real deposits in the field.  

**Type of assessment during the semester:**  
1. Test about recognizing the different hand specimens of ores, raw materials (35%).  
2. Written test about the classification of ores with examples (65%).  

**Grading limits:**  
> 80 %: excellent  
70 – 80 %: good  
60 – 70 %: average  
50 – 60 %: satisfactory  
< 50 %: unsatisfactory  

**Recommended literature:**  
Course Title: Engineering Geology and Hydrogeology
Instructor: Dr. Péter Szűcs, full professor
Code: MFKHT720020

Responsible department/institute: Institute of Environmental Management
Type of course: Compulsory

Position in curriculum (which semester): 2.
Pre-requisites (if any): MFKHT6505SP or MFKHT6401SP

No. of contact hours per week (lecture + seminar): 2+1
Type of Assessment (examination/ practical mark / other): exam
Credits: 4
Course: full time

Aim of course:
It introduces students to the key concepts of engineering geology, modern hydrogeology, and field hydrogeology, soil formation, soil classification methods, laboratory and field soil tests, water-to-rock underwater stress, and groundwater flow patterns.

Competencies to evolve:
knowledge: T1, T2, T3, T4, T7, T8, T9
ability: K1, K2, K3, K5, K6, K7, K8, K9, K10, K11, K12, K13
attitude: A1, A2, A3, A4, A5, A7
autonomy and responsibility: F1, F2, F3, F4, F5

Course description:

Assessment and grading:
Participation in presentation lectures and practical classes is mandatory. Field trips and classroom calculations. The successful completion of the course is based on the successful completion of the semester test and the successful completion of the exam.

Grading scale:
> 85%: 5/excellent;
75 – 84%: 4/good;
63 – 74%: 3/satisfactory;
50 – 62%: 2/pass;
< 50%: 1/failed.

Compulsory or recommended literature resources:
Dr. Kleb Béla: Mérnökgeológia Budapest, 1980
**Course title:** Analytical techniques in mineralogy and petrology  
**Teacher:** Dr. Zajzon Norbert, associate professor  
**Code of the course:** MFFAT720025  
**Responsible institute:** Institute of Mineralogy - Geology  
**Type of course:** Compulsory

<table>
<thead>
<tr>
<th>Recommended semester:</th>
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<tbody>
<tr>
<td>Pre-requisites:</td>
<td>none</td>
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<tr>
<td>No. of contact hours/week (sem.+lab.):</td>
<td>1+1</td>
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<tr>
<td>Type of assessment (exam/pr. mark/other):</td>
<td>pr. mark</td>
</tr>
<tr>
<td>Credit points:</td>
<td>2</td>
</tr>
<tr>
<td>Course:</td>
<td>full time</td>
</tr>
</tbody>
</table>

**Task and target of the course:** The key target of the course is to introduce the different analytical methods used in mineralogy and geology for the students. There are laboratory classes with individual work about the learned methods nearby the theoretical classes. Thru these exercises the students learn what is the best available method to answer certain geological questions.

**Competencies to evolve:**  
**knowledge:** T1, T2, T3, T4, T7, T8, T9  
**ability:** K1, K2, K3, K5, K11, K12, K13  
**attitude:** A1, A2, A3, A4, A5, A7  
**autonomy and responsibility:** F1, F2, F3, F4, F5

**Thematic description of the course:**  
1. Description of the work, formulating analytical pairs, work and lab safety teaching  
2. Physical properties (hardness, magnetic, solubility, density), density measurements  
3. X-ray diffraction lecture I.  
4. X-ray diffraction lecture II.  
5. X-ray diffraction practice  
6. DTA lecture  
7. DTA quantitative calculations  
8. Writing of test 1.  
9. Scanning electron microscopy lecture I.  
10. Scanning electron microscopy lecture II.  
11. Scanning electron microscopy practice  
12. Formula calculations  
13. Consultation  

**Type of assessment during the semester:** There are two written tests about the theoretical part (50% of the final grade). Both must be written to minimum 50%. Two laboratory report must be written about the individual work (50% of the final grade). Missing, or not passed tests can be completed at the end of the semester in oral exam. To have accepted grade, the student must be present at least 80% of the classes.

**Grading limits:**  
> 80 %: excellent  
70 – 80 %: good  
60 – 70 %: average  
50 – 60 %: satisfactory  
< 50 %: unsatisfactory
**Recommended literature:**


**Course Title:** Geological interpretation and prospecting  
**Instructor:** Dr. Földessy János professor emeritus  
**Code:** MFFAT730026  
**Responsible department/institute:** ÁFI

**Position in curriculum (which semester):** 3  
**Pre-requisites (if any):** Mineral deposits (MFFTT720021)

**No. of contact hours per week (lecture + seminar):** 2+2  
**Type of Assessment (examination/ practical mark / other):** examination

**Credits:** 4  
**Course:** full time

**Competencies to evolve:**  
**Knowledge:** T1, T2, T3, T4, T5, T7, T8, T9,  
**Ability:** K1, K2, K3, K5, K6, K7, K8, K9, K10, K11, K12, K13,  
**Attitude:** A1, A2, A3, A4, A5, A7,  
**Autonomy and responsibility:** F1, F2, F3, F4, F5

**Acquired store of learning:**

**Study goals:** To develop ability interpreting results of observations and data acquisition regarding exploration of geological media and mineral raw materials, sampling during mapping, drilling exploration. It makes capable to evaluate the geological data from mining and processing aspects, and making economic decisions regarding exploration and exploitation based upon the results. Gaining experience in using softwares for geological documentation and evaluation. Preparation of geological models in sample databases using professional softwares, like Rockworks.

**Course content:**
- Short summary of the most important mineral exploration techniques and methods in the field and in the office.  
- Study of statistical evaluations, the effect of natural variability  
- Processing of archive geological exploration data to reveal the types of errors in geological interpretation and the way of their mitigation.  
- Mineral resource assessment, preparation of comprehensive geological reports,  
- Geoinformatic processing of mineral raw material exploration data,  
- Thematic map preparation and reading,  
- Determining statistical parameters

**Education method:** Lectures and parallel exercises - exercises are prepared from real archive geological data.  
**Working in teams (3 students each):**  
- Assignment of evaluation of complex thematic map series regarding mineral potential of unexplored areas,  
- Geostatistical processing of mineral exploration data,  
- regional development database and map series evaluation, preparation of a raw material utilization plan,

**Type of Assessment (exam. / pr. mark. / other):** pr. mark  
During the semester the following tasks should be completed: two quiz (30-30%), one ppt presentation of a technical report (20%), completing tasks on (20%).

**Grading limits:**  
>80%: excellent,  
70-79%: good,  
60-69%: medium,  
50-59%: satisfactory,  
<50%: unsatisfactory.
Compulsory or recommended literature resources:

- Bőrő L. (szerk): Teleptan. Geolitera, Szeged
<table>
<thead>
<tr>
<th>Course Title:</th>
<th>Geophysical interpretation and prospecting</th>
<th>Code:</th>
<th>MFGFT730025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructors:</td>
<td>Dr. Gábor Pethő CSc, PhD, Private Professor Dr. Krisztián Baracza, PhD, Senior Lecturer</td>
<td>Responsible department/institute:</td>
<td>Institute of Geophysics and Geoinformatics / Department of Geophysics</td>
</tr>
<tr>
<td>Position in curriculum (which semester):</td>
<td>3</td>
<td>Type of course:</td>
<td>Compulsory</td>
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<tr>
<td>No. of contact hours per week (lecture + seminar):</td>
<td>2+2</td>
<td>Pre-requisites (if any)</td>
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<td>Credits:</td>
<td>4</td>
<td>Type of Assessment (examination/ practical mark / other):</td>
<td>examination</td>
</tr>
<tr>
<td>Course:</td>
<td>full time</td>
<td></td>
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</tbody>
</table>

### Course Description:
In the scope of this subject students acquire knowledge about the closing phase of geological-geophysical exploration and study the linkage and hierarchy of different geophysical methods. They learn how to determine the most probable geological model by using geophysical measurement results and other geoscientific information jointly. They study the points of view of exploration and measurement planning related to the interpretation of data acquired.

### Competencies to evolve:
**Knowledge:** T1, T2, T3, T4, T5, T7, T8, T9
**Ability:** K1, K2, K3, K5, K6, K7, K8, K9, K10, K11, K12, K13
**Attitude:** A1, A2, A3, A4, A5, A7

### Short curriculum of the subject:
### Assessment and grading:
During the semester the following tasks should be completed:
- presentation on a report covering the process from exploration planning to interpretation (60%),
- exam (40%)

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

### Compulsory or recommended literature resources:
4. Periodicals: Geophysical Transactions, The Leading Edge, First Break, etc.
5. Work-help tutorials, geophysical softwares
**Course Title:** Quality Management

**Credits:** 2

**Responsible Instructor** *(name, position, scientific degree):*
László Berényi Dr., associate professor, PhD

<table>
<thead>
<tr>
<th>Type of course: compulsory</th>
<th>Neptun code: GTVVE7002MA</th>
</tr>
</thead>
</table>

Type (lec. / sem. / lab. / consult.) and Number of Contact Hours per Week: 2 lec.

**Type of Assessment** *(exam. / pr. mark. / other):* exam.

40%: successful midterm test; 20%: presentation about a chosen quality management tool; 40%: oral exam.

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

Position in Curriculum (which semester): 3rd

Pre-requisites *(if any):* -

**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.

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.

The 3-5 most important compulsory, or recommended literature *(textbook, book)* resources:


**Competencies to evolve:**

K5 - During his/her work he/she investigates the possibility of research, developmental, and innovation
aims, and he/she aspires to their implementation

K9 - The environmental engineer is able to plan, and perform environmental impact assessment, and perform impact studies.
K13 - The environmental engineer is able to perform energy-efficiency analyses, surveys, audits, to define measures, and support of their realization

Active professional English language skills.
**Course Title:** Legal and economic studies with regard to mining and geology  
**Instructor:** Dr. Mádai Ferenc, associate professor  
**Code:** MFFTT730027  
**Responsible department/institute:** Institute of Mineralogy and Geology  
**Type of course:** Compulsory  
**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 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

-----------

1. The concept of sustainable development, its role for the mineral extractive industry, marginal cost defining factors, concept of mineral rent,
2. The Hotelling rule and its resolution under certain conditions,
3. Financial analysis of mining projects, cost types, deposit parameters (flow, fund, bonity, quality),
4. Discounted cash flow methods in the mineral industry, mineral taxation.

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

<table>
<thead>
<tr>
<th>Element</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>
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<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:**
- Wagner H. et al. 2006: Minerals planning policies and supply practices in Europe – European Commission Directorate, General Enterprise, University of Leoben
# Course Title:
Strategic Management

# Instructor:
Dr. Balaton Károly, full professor

# Code:
GTVVE2006AB

# Responsible department/institute:
Institute of Management Science

# Position in curriculum (which semester):
4

# Pre-requisites (if any):
GTVVE7002MA

# No. of contact hours per week (lecture + seminar):
2+0

# Type of course:
Compulsory

# 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, French and Japanese basic model sin the minor of Hungarian practice. Through the flow of EU Co. the subject focuses on he buying foreseen tendencies of corporate governances in case of cluster, network and multiple corporational forms.

### Structure of lectures:
- Basis of corporate forms and changes from 1820. State-theoretical roots of corporate governance.

### Competencies 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 the following elements.

| Attendance: | 15 % |
| Short quizzes | 10 % |
| Midterm exam | 40 % |
| Final exam | 35 % |
| **Total** | **100%** |

### Grading scale:

<table>
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<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

## Compulsory or recommended literature resources:
**Compulsory reading:**
**Course Title:** Safety techniques and labor safety  
**Instructor:** Dr. Tibor Szabó, associate professor  
**Code:** MFKOT740010  
**Responsible department/institute:** DPE/IPNG (OMTSZ/KFGI)  
**Course Element:** Compulsory

<table>
<thead>
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<th>Position in curriculum (which semester):</th>
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<tbody>
<tr>
<td>Pre-requisites (if any):</td>
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</tr>
<tr>
<td>No. of contact hours per week (lecture + seminar):</td>
<td>2+0</td>
</tr>
<tr>
<td>Type of Assessment (examination / practical mark / other):</td>
<td>examination</td>
</tr>
<tr>
<td>Credits:</td>
<td>2</td>
</tr>
</tbody>
</table>

**Course Description:**
1. Basics of fire and explosion protection.
2. Fundamentals of combustion theories.
3. Fundamentals of burning of different materials, auto ignitions.
4. Fire protection.
5. Safety aspects of pressure vessels.
6. Safety aspects of bottles and other equipment.
7. Safety aspects of machines and processes: safety devices, safety questions of settlements and operating.
8. Chemicals safety.
9. Personal protective equipment.
10. Legal background and regulations of labors safety.
11. Requirements for healthy and safe working.
12. Objective and personal conditions of working.
13. Special requirements of processes.
14. The most important rights and duties of employees and employers

**Competencies to evolve:**

- **Knowledge:** T1, T3, T10
- **Ability:** K10
- **Attitude:** A3, A4, A5, A6, A7
- **Autonomy and responsibility:** F1, F2, F3, F4, F5

**Assessment and grading:**

<table>
<thead>
<tr>
<th>Students will be assessed with using the following elements.</th>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance:</td>
<td>5 %</td>
<td></td>
</tr>
<tr>
<td>Midterm exam</td>
<td>40 %</td>
<td></td>
</tr>
<tr>
<td>Final exam</td>
<td>55 %</td>
<td></td>
</tr>
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</table>

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<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 59%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>

**Compulsory or recommended literature resources:**

**Geophysical engineering module**

<table>
<thead>
<tr>
<th>Course Title:</th>
<th>Geophysical Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructors:</td>
<td>Péter Tamás Vass Dr., associate professor, László Gombár Dr., teacher of engineering, Endre Turai Dr., associate professor, Norbert Péter Szabó Dr., associate professor</td>
</tr>
<tr>
<td>Code:</td>
<td>MFGFT720012</td>
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<tr>
<td>Responsible department/institute:</td>
<td>Institute of Geophysics and Geoinformatics / Department of Geophysics</td>
</tr>
<tr>
<td>Type of course:</td>
<td>Compulsory</td>
</tr>
<tr>
<td>Position in curriculum (which semester):</td>
<td>2</td>
</tr>
<tr>
<td>Pre-requisites (if any):</td>
<td>MFGFT6002D, MFGFT6003D</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>
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</table>

**Course Description:**
Within the frame of this subject the students specialized in geophysical engineering study the application of geophysical methods in the different exploration phases, as well as the principles and aspects of planning geophysical surveys. An additional aim of the subject is to familiarize the students with the working principles and use of geophysical measurement devices.

*The short curriculum of the subject:*

**Lecture:**

**Seminar:**
Spreading systems of geophysical surveys. The steps and products of the workflow of geophysical surveys. The introduction of Scintrex CG-5 Autograv gravimeter. The introduction of GEM GSM-19 Ovehauser magnetometer. The introduction of geoelectrical data acquisition systems. The introduction of VLF measuring devices and ground penetrating radar. The introduction of a gamma spectrometer. The main functions and properties of the components of a wireline logging system. The main aspects of planning a well logging program.

**Competencies to evolve:**

**Knowledge:** T1, T2, T3, T4, T5, T7, T8, T9

**Ability:** K1, K2, K3, K9, K12, K13

**Attitude:** A1, A2, A3, A4, A5, A7

**Autonomy and responsibility:** F1, F2, F3, F4, F5
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:
Other educational materials and study aids on the web page of Geophysical Department: http://www.uni-miskolc.hu/~geofiz/segedlet.html
Operating manuals:
**Course title:** Engineering and environmental geophysics  
**Responsible professors:** Norbert Péter Szabó Dr., PhD, dr. habil., associate professor  
László Gombár Dr., engineering lecturer  
**Code:** MFGFT720013  
**Responsible Institute/Department:** Institute of Geophysics and Geoinformatics / Department of Geophysics  
**Semester:** second  
**Pre-requisites:** MFGFT6002D, MFGFT6003D  
**Number of Contact Hours per Week:** 2 lec. + 1 lab.  
**Type of Assessment** (exam. / pr. mark / other): pr. mark  
**Credits:** 4  
**Type of Program:** full time  
**Program and Specializations:** MS in Earth Science Engineering, Geophysical Engineering  

**Study goals:**  
Analysis of geotechnical, engineering geological, hydrogeological and environmental applications of near-surface geophysical methods, as well as a description of specific methods and their development trends.  
**Competencies to be developed:**  
Knowledge: T1, T2, T3, T4, T5, T6, T7, T8, T9  
Ability: K1, K2, K3, K12, K13  
Attitude: A1, A2, A3, A4, A5, A7  
Autonomy and responsibility: F1, F2, F3, F4, F5  

**Course content:**  
Principles of surface geophysical methods. Gravity, magnetic, DC geoelectric, electromagnetic surveys. Ground penetrating radar (GPR), seismic refraction and surface wave’s methods. Surface Nuclear Magnetic Resonance (sNMR) method. Description of the engineering geophysical penetration sounding methods and applications. Characterization of shallow unconsolidated sediments. Special borehole geophysical measurements: borehole radar, NMR. Investigating the relationship between the petrophysical, lithological and geotechnical characteristics and measured physical parameters. Single and joint interpretation of geophysical data (single and joint inversion, tomography) based on different physical bases for 1D, 1.5D, 2D and 3D models. Application of shallow geophysical methods for environmental and engineering tasks and water prospecting. Special tasks in void detection, hydrogeophysics, archaeological geophysics. Forensic and military applications. Presentation of geophysical instruments in laboratory. Instruments applied in the field practice.  

**Type of assessment:**  
Attendance at lectures is regulated by the university code of education and examination. Two writing tests (the weight of each grade item is 50 %). One assignment during the semester is the requirement of signature.  
**Grading scale:**  
\[86 \text{ %}: excellent, 71-85 \text{ %}: good, 61-70 \text{ %}: medium, 46-60 \text{ %}: satisfactory, <45 \text{ %}: unsatisfactory.
Course Title: Geophysical inversion  
Responsible instructor (name, position, scientific degree): Dr. Mihály Dobróka, professor emeritus  
Neptun code: MFGFT720014  
Responsible department/institute: Institute of Geophysics and Geoinformatics / Department of Geophysics  
Type of course: C  
Position in Curriculum (which semester): 2  
Pre-requisites (if any): none  
Number of Contact Hours per Week (lec.+prac.): 0+2  
Type of Assessment (examination / practical mark / other): practical mark  
Credits: 4  
Course: full-time  
Program: Earth Science Engineering MSc / Geophysical Engineering  

Course Description:  
In the frame of the course learn the Geophysical Engineering MSc students how can be the geological and geophysical information from the measured data obtained by recent inversion methods.  
Competencies to evolve:  
Knowledge: T1, T2, T3, T6, T7  
Ability: K2  
Attitude: A1, A2, A3, A4, A5, A7  
Autonomy and responsibility: F1, F2, F3, F4, F5  

The short curriculum of the subject:  

Assessment and grading:  
Attendance at lectures is regulated by the university code of education and examination. Writing two tests at least satisfactory level, respectively during the semester is the requirement of signature.  
Exam grading scale: unsatisfactory (0-45%), satisfactory (46-60%), medium (61-70%), good (71-85%), excellent (86-100%).  

The 3-5 most important compulsory, or recommended literature (textbook, book) resources:  


**Course Title:** Engineering physics II  
**Responsible instructor** (name, position, scientific degree): Dr. Mihály Dobróka, professor emeritus  
**Neptun code:** MFGFT720011  
**Responsible department/institute:** Institute of Geophysics and Geoinformatics / Department of Geophysics  
**Type of course:** C  
**Position in Curriculum (which semester):** 2  
**Pre-requisites (if any):** MFGFT7100011  
**Number of Contact Hours per Week (lec.+prac.):** 1+1  
**Type of Assessment (examination / practical mark / other):** practical mark  
**Credits:** 2  
**Course:** full-time  
**Program:** Earth Science Engineering MSc / Geophysical Engineering  

**Course Description:**  
Within the framework of the Geophysical Engineering MSc program, the students gain the deepening knowledge in those fields of the electrodynamics, which are the necessary to understand deeper the geological processes and geophysical methods.  

**Competencies to evolve:**  
Knowledge: T1, T2  
Ability:  
Attitude: A3, A4, A5, A7  
Autonomy and responsibility: F1, F2, F3, F4, F5  

**The short curriculum of the subject:**  

**Assessment and grading:**  
Attendance at lectures is regulated by the university code of education and examination and two individual assignments during the semester are the requirements of signature.  

**Exam grading scale:** unsatisfactory (0-45%), satisfactory (46-60%), medium (61-70%), good (71-85%), excellent (86-100%).  

**The 3-5 most important compulsory, or recommended literature (textbook, book) resources:**  
**Course Title:** Geophysical Exploration Methods II  
**Instructors:** Péter Tamás Vass Dr., associate professor, László Gombár Dr., teacher of engineering, Endre Turai Dr., associate professor, Norbert Péter Szabó Dr., associate professor  
**Code:** MFGFT720015  
**Responsible department/institute:** Institute of Geophysics and Geoinformatics / Department of Geophysics  
**Type of course:** Compulsory

<table>
<thead>
<tr>
<th>Position in curriculum (which semester): 2</th>
<th>Pre-requisites (if any) MFGFT710004</th>
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</thead>
<tbody>
<tr>
<td>No. of contact hours per week (lecture + seminar): 2+1</td>
<td>Type of Assessment (examination/ practical mark / other): examination</td>
</tr>
</tbody>
</table>

**Credits:** 4  
**Course:** full time

**Course Description:**  
The main objective of the subject is to familiarize the students specialized in geophysical engineering with the details of different geophysical methods used in the fields of raw-material exploration and environmental investigations.  
*The short curriculum of the subject:*  
**Competencies to evolve:**  
*Knowledge:* T1, T2, T3, T4, T5, T6, T7, T8, T9  
*Ability:* K1, K2, K3, K12, K13  
*Attitude:* A1, A2, A3, A4, A5, A7  
*Autonomy and responsibility:* F1, F2, F3, F4, F5

**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:**  
UBC Geophysical Inversion Facility – Inversion manuals (GRAV3D and MAG3D).  
http://gif.eos.ubc.ca/documentation  
Other educational materials and study aids on the web page of Geophysical Department:  
http://www.uni-miskolc.hu/~geofiz/segedlet.html
Course Title: Geophysical data processing
Instructor: Dr. Endre Turai, associate professor, CSc, PhD.
Code: MFGFT730026
Responsible department/institute: Department of Geophysics / Institute of Geophysics and Geoinformatics
Type of course: obligatory
Position in curriculum (which semester): 3
Pre-requisites (if any): -
No. of contact hours per week (lecture + seminar): 2+2
Credits: 4
Course: full time

Course Description:
Introduce to the spectral geophysical data processing methods for MSc academic specialization in geophysical engineering.
Competencies to evolve:
Knowledge: T1, T2, T3, T4, T5, T6, T7, T9.
Ability: K1, K2, K3, K6, K7, K12, K13.
Autonomy and responsibility: F1, F2, F3, F4, F5.

The short curriculum of the subject:

Assessment and grading:
Signature requirements: attendance on the seminars and solution of one personal task with presentation.
Exam grading scale:
% value Grade
86 -100% 5 (excellent)
71 – 85% 4 (good)
61 – 70% 3 (satisfactory)
46 - 60 % 2 (pass)
0 – 45% 1 (failed)

Compulsory or recommended literature resources:
<table>
<thead>
<tr>
<th>Course title: Geostatistics</th>
<th>Code: MFGFT730017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsible professor: Norbert Péter Szabó Dr., PhD, dr. habil., associate professor</td>
<td>Responsible Institute/Department: Institute of Geophysics and Geoinformatics / Department of Geophysics</td>
</tr>
<tr>
<td>Semester: third</td>
<td>Pre-requisites: -</td>
</tr>
<tr>
<td>Number of Contact Hours per Week: 2 lec. + 2 lab.</td>
<td>Type of Assessment (exam. / pr. mark. / other): exam (oral)</td>
</tr>
<tr>
<td>Credits: 4</td>
<td>Type of Program: full time</td>
</tr>
<tr>
<td>Program and Specializations: MS in Earth Science Engineering. Geophysical Engineering specialization</td>
<td></td>
</tr>
</tbody>
</table>

Study goals:
The subject deals with the theoretical description and practical issues of mathematical statistical methods used in earth sciences.

Competencies to be developed:
Knowledge: T3, T4, T5, T6
Ability: K1, K2
Attitude: A1, A2, A3, A4, A5, A7
Autonomy and responsibility: F1, F2, F3, F4, F5

Course content:

Education method: Lectures with projected MS-PowerPoint presentation. Demonstration of statistical methods using own developed MATLAB codes (recipes) and the MATLAB Statistical Toolbox.

Type of assessment:
Attendance at lectures is regulated by the university code of education and examination. Two writing tests with satisfactory results, and one assignment (MS-PowerPoint presentation) during the semester is the requirement of signature.

Grading scale: >86 %: excellent, 71-85 %: good, 61-70 %: medium, 46-60 %: satisfactory, <45 %: unsatisfactory.

Compulsory and recommended literature resources:
**Course title:** Optional courses - Group I

**Well logging college**

**Responsible professors:**
- Norbert Péter Szabó Dr., PhD, dr. habil., associate professor
- Péter Vass Dr., PhD, associate professor

**Code:** MFGFT730030

**Responsible Institute/Department:** Institute of Geophysics and Geoinformatics / Department of Geophysics

**Semester:** third

**Pre-requisites:** MFGFT7100021

**Number of Contact Hours per Week:**
- 2 lec. + 2 lab.

**Credits:** 4

**Type of Assessment** (exam. / pr. mark. / other):
- exam (oral)

**Type of Program:** full time

**Program and Specializations:** MS in Earth Science Engineering, Geophysical Engineering specialization

**Study goals:**
In the course of the subject, the Geophysical Engineering (MSc) students will be learning about special well logging measurement, data processing and interpretation methods. The subject also serves to deepen the topic of the thesis work chosen by the student and to prepare for the final exam.

**Competencies to be developed:**
- Knowledge: T1, T2, T3, T4, T5, T6, T7, T8, T9
- Ability: K1, K2, K3, K12, K13
- Attitude: A1, A2, A3, A4, A5, A7
- Autonomy and responsibility: F1, F2, F3, F4, F5

**Course content:**
- Special well logging methods. Lithology, porosity and saturation logs. Nuclear magnetic resonance (NMR) measurement. Estimation of effective porosity and pore-size distribution. Permeability estimation based on special well logging measurements (NMR, Stoneley wave travel time).
- Geophysical inversion methods used in well logging (non-linear depth-by-depth and interval inversion).
- Multivariate statistical analysis of well logs (factor analysis, cluster analysis). Rock typing and statistical exploration of petrophysical parameters. Studying interpretation systems used in the oil industry. Processing, analysis and evaluation of well logging datasets collected from Hungarian and international wells.

**Type of assessment:**
- Attendance at lectures is regulated by the university code of education and examination. One writing test with satisfactory results, one individual assignment and one powerpoint presentation are the requirement of signature.

**Grading scale:** >86 %: excellent, 71-85 %: good, 61-70 %: medium, 46-60 %: satisfactory, <45 %: unsatisfactory.

**Compulsory and recommended literature resources:**
- User manuals on WellCAD, Techlog, Express, MATLAB etc. softwares.
**Course Title:** Seismic College (Optional subject group (1))  
**Instructor:** Dr. Gombár László engineer teacher  
**Code:** MFGFT730029  
**Responsible department/institute:** Department of Geophysics and Geodesy/Geophysical Faculty  
**Type of course:** Optional  

| Position in curriculum (which semester): | 3 | Pre-requisites (if any): |  
|---|---|---|---|
| No. of contact hours per week (lecture + seminar): | 2+2 | Type of Assessment (examination/practical mark/other): | examination |
| Credits: | 4 | Course: | full time |

**Course Description:**  
Summarization of seismic data acquisition, data processing and interpretation methods. Applications and uses of seismic methods for raw material exploration. New seismic technologies and methods.

**Competencies to evolve:**  
**Knowledge:** T1, T2, T3, T4, T5, T6, T7, T8, T9  
**Ability:** K1, K2, K3, K12, K13  
**Attitude:** A1, A2, A3, A4, A5, A7  
**Autonomy and responsibility:** F1, F2, F3, F4, F5

**The short curriculum of the subject:**  
Actual, up-to-date topics connected to new results and development tendencies in the field of seismic data acquisition, data processing and interpretation. Year to year selected special topics are offered to the students in the fields of raw materials’ (especially hydrocarbon) exploration, as well as of seismic technology development. This subject is also useful for the students to obtain deep insight in the topics of selected thesis work.

**Assessment and grading:**  
**Signature requirements:** attendance on the seminars and solution of one personal task with presentation.  
Exam grading scale:  
| % value | Grade |  
|---|---|---|
| 86 – 100% | 5 (excellent) |  
| 71 – 85% | 4 (good) |  
| 61 – 70% | 3 (satisfactory) |  
| 46 - 60% | 2 (pass) |  
| 0 – 45% | 1 (failed) |

**Compulsory or recommended literature resources:**  
Dr. Ádám Oszkár, 1987: Szeizmikus kutatás I-II. Tankönyvkiadó, Budapest.  
Articles presented in periodicals like: Magyar Geofizika, Geophysical Transactions, Geophysics, Geophysical Prospecting.  
Other seismic software available at the Geophysical Faculty.
<table>
<thead>
<tr>
<th><strong>Course title:</strong></th>
<th>Optional subject - Group II Introduction to English Geophysical Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Code:</strong></td>
<td>MFGFT730041</td>
</tr>
<tr>
<td><strong>Responsible professor:</strong></td>
<td>Norbert Péter Szabó Dr., PhD, dr. habil. associate professor</td>
</tr>
<tr>
<td><strong>Responsible Institute/Department:</strong></td>
<td>Institute of Geophysics and Geoinformatics / Department of Geophysics</td>
</tr>
<tr>
<td><strong>Semester:</strong></td>
<td>third</td>
</tr>
<tr>
<td><strong>Number of Contact Hours per Week:</strong></td>
<td>0 lec. + 2 lab.</td>
</tr>
<tr>
<td><strong>Pre-requisites (if any):</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>Type of Assessment (exam. / pr. mark. / other):</strong></td>
<td>pr. mark</td>
</tr>
<tr>
<td><strong>Type of Program:</strong></td>
<td>full time</td>
</tr>
<tr>
<td><strong>Program and Specializations:</strong></td>
<td>MS in Earth Science Engineering, Geophysical and Geological Engineering specialization</td>
</tr>
</tbody>
</table>

**Study goals:**
Under the optional subject, MSc students of geosciences will be acquainted with the terminology of geophysics in English and will be instructed to find out in the literature.

**Competencies to be developed:**
Knowledge: T1, T3, T4, T5, T9  
Ability: K1, K2, K3, K5, K6, K7, K11, K12, K13  
Attitude: A1, A2, A3, A4, A5, A7  
Autonomy and responsibility: F1, F2, F3, F4, F5

**Course content:**

**Type of assessment:**
Attendance at lectures is regulated by the university code of education and examination. One assignment (making an individual paper) during the semester is the requirement of signature.

**Grading scale:**
> 86 %: excellent, 71-85 %: good, 61-70 %: medium, 46-60 %: satisfactory, <45 %: unsatisfactory.

**Compulsory and recommended literature resources:**
| **Course Title:** Global environmental Geophysics (Optional subject group (2)) | **Code:** MFGFT730027 |
| **Instructor:** Dr. Gábor Pethő private university professor | **Responsible department/institute:** Institute of Geophysics and Space Informatics/ Geophysical Dept. |
| **Type of course:** Optional |
| **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):** examination |
| **Credits:** 2 | **Course:** full time |

**Course Description:**
Competencies to evolve:
- **Knowledge:** T1, T2, T3, T4, T5, T6, T7, T8, T9
- **Ability:** K1, K2, K3, K12, K13
- **Attitude:** A1, A2, A3, A4, A5, A7
- **Autonomy and responsibility:** F1, F2, F3, F4, F5

**Main objectives of the course:**
There are two goals: training global environmental geophysics to a level that graduated engineers can begin to work in the field of general geophysics and maintain communication with colleagues working as experts in the field of global environmental geophysics.

**Short curriculum of the course:**

**Assessment and grading:**
*Signature requirements:* attendance on the lectures and seminars and the solution of one personal task with presentation.

Exam grading scale:
- % value: 86 –100%  85 –70%  61 – 60%  0 – 45%
- Grade: 5 (excellent)  4 (good)  3 (satisfactory)  2 (pass)  1 (failed)

https://www.ctbto.org/verification-regime/monitoring-technologies-how-they-work/
# Geological engineering module

<table>
<thead>
<tr>
<th>Course Title: Historical geology</th>
<th>Neptun code: MFFTT720028</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsible Instructor: György Less Dr., professor, DSc</td>
<td>Responsible Department: Dpt. of Mineralogy and Geology</td>
</tr>
<tr>
<td>Type of course: C</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Position in Curriculum (which semester): second</th>
<th>Pre-requisites: Physical geology (MFFTT 710002)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type (lec. / sem. / lab. / consult.) and Number of Contact Hours per Week: <strong>lec. 2, sem. 1</strong></td>
<td>Type of Assessment (exam. / pr. mark. / other): exam</td>
</tr>
<tr>
<td>Credits: 4</td>
<td>Course: full time</td>
</tr>
</tbody>
</table>

**Study goals:** The aim of the subject is to give knowledge (1) on the role of time in the geological processes, (2) on the different methods of age-determination, (3) on the structural evolution of the Earth and (4) on the history of life in the Earth with special emphasis on the utility of all these in prospecting raw materials) and how to reconstruct paleoenvironments in geology as basic information for raw material exploration.

**Competencies to evolve:**

**Knowledge:** T1, T2, T3, T4, T5, T7, T8, T9  
**Ability:** K1, K2, K3, K5, K6, K7, K9, K11, K12, K13  
**Attitude:** A1, A2, A3, A4, A5, A7  
**Autonomy and responsibility:** F1, F2, F3, F4, F5

**Course content:**

- Different methods of stratigraphical correlation and their significance in raw material prospecting.
- Age-determining methods: biostratigraphy, radiometry, magnetostratigraphy, chemostratigraphy, event stratigraphy, sequence stratigraphy. Reconstruction of different palaeoenvironments and their application in raw material prospecting. Different magmatic, metamorphic and sedimentary facies types. The geological time scale, the structural, climatological and biological evolution of the Earth during the Precambrian, the Paleozoic, the Mesozoic and the Cenozoic. The evolution of Homoidea.

**Inter-semester control:**

Criterion for signature:

Completion of inter-semester test with at least satisfactory result (see below). It can be repeated once. Practical requirements: obligatory participation in the field-trips, ppt-presentation for one of them.

**Grading limits:**

80%: excellent, 70–80%: good, 60–70%: average, 50–60%: satisfactory, <50%: unsatisfactory

**The 3-5 most important compulsory, or recommended literature (textbook, book) resources:**

**Course Title:** Hydrocarbon geology  
**Responsible Instructor:** Dr. Velledits Felictiász  
**Neptun code:** MFFAT720029  
**Responsible Department:** Dpt. of Mineralogy and Geology  
**Type of course:** C

**Position in Curriculum** (which semester): second  
**Pre-requisites:** Physical geology (MFFTT 710001)

**Type (lec. / sem. / lab. / consult.) and Number of Contact Hours per Week:** lec. 2, lab. 0  
**Type of Assessment (exam. / pr. mark. / other):** exam

**Credits:** 2  
**Course:** full-time

**Study goals:**
Introduce students  
- the basic concepts of hydrocarbone geology  
- the geological exploration and interpretation methods in the value chain of crude oil and gas exploration, field development and production  
- the steps needed to solve the basic hydrocarbone geological tasks.

**Competencies to evolve:**
**knowledge:** T1, T2, T3, T4, T5, T7, T8, T9  
**skills:** K1, K2, K3, K5, K6, K7, K9, K11, K12, K13  
**attitude:** A1, A2, A3, A4, A5, A7  
**autonomy and responsibility:** F1, F2, F3, F4, F5

**Type of Assessment (exam. / pr. mark. / other):**
Grading limits:
- >80%: excellent,  
- 70-79%: good,  
- 60-69%: medium,  
- 50-59%: satisfactory,  
- <50%: unsatisfactory

The 3-5 most important compulsory, or recommended **literature** (textbook, book) **resources:**
BércziI.: Petroleum Geology, (Jegyzet, 1988, Montanuniversität Leoben)  
BércziI.: Development Geology (Jegyzet, 2003, HOT Engineering&Shell Iran Offshore )  
University of Texas: Petroleum Geology & Reservoirs,  
[www.utexas.edu/ce/petex/aids/pubs/petroleum-geology](http://www.utexas.edu/ce/petex/aids/pubs/petroleum-geology)  
Carbonate reservoirs:  
<table>
<thead>
<tr>
<th><strong>Course Title:</strong></th>
<th>Geological mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Responsible Instructor:</strong></td>
<td>György Less Dr., professor, DSc</td>
</tr>
<tr>
<td><strong>Neptun code:</strong></td>
<td>MFFTT720029</td>
</tr>
<tr>
<td><strong>Responsible Department:</strong></td>
<td>Dpt. of Mineralogy and Geology</td>
</tr>
<tr>
<td><strong>Type of course:</strong></td>
<td>Compulsory</td>
</tr>
<tr>
<td><strong>Position in Curriculum (which semester):</strong></td>
<td>second</td>
</tr>
<tr>
<td><strong>Pre-requisites:</strong></td>
<td>Physical geology (MFFTT 710002)</td>
</tr>
<tr>
<td><strong>Type (lec. / sem. / lab. / consult.) and Number of Contact Hours per Week:</strong></td>
<td>lec. 1, lab. 2</td>
</tr>
<tr>
<td><strong>Type of Assessment (exam. / pr. mark. / other):</strong></td>
<td>pr. mark</td>
</tr>
<tr>
<td><strong>Credits:</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>Course:</strong></td>
<td>full time</td>
</tr>
</tbody>
</table>

**Study goals:** The subject gives knowledge on the figuration of geological phenomena on topographic maps, on preparing geological maps, cross-sections, their legend and on assembling explanatory report.

**Competencies to evolve:**
- **Knowledge:** T1, T2, T3, T4, T5, T7, T8, T9
- **Ability:** K1, K2, K3, K5, K6, K7, K9, K11, K12, K13
- **Attitude:** A1, A2, A3, A4, A5, A7
- **Autonomy and responsibility:** F1, F2, F3, F4, F5

**Course content:**
The aim of preparing geological maps. The geological map and its additional parts (geological cross-sections, stratigraphical columns and legend). Geological phenomena figured in the geological maps: lithostratigraphical units, structural characteristics. Different types of geological boundaries and their recognition on the field. Orientation on the field with topographical map and with GPS.
Documentation of field observations in the field booklet and on the topographical map. Preparation of geological cross-sections. Preparation of covered and uncovered (without Quaternary deposits) geological maps with stratigraphical column and legend. Assembly of explanatory reports.

**Inter-semester control:**
Criterion for signature: Preparation of two geological cross-sections based on real Carpathian geological maps (from Slovakia and Romania); Preparation of covered and uncovered (without Quaternary deposits) geological map of an about 2 sq. km territory (in 2-3-man groups) with one geological cross-section, with stratigraphical column and legend. Assembly of a short explanatory report about the territory.

**Grading limits:**
>90%: excellent, 75-90%: good, 60-75%: medium, 45-60%: satisfactory, <45%: unsatisfactory.

The 3-5 most important compulsory, or recommended **literature** (textbook, book) **resources:**
**Course Title:** Sedimentology  
**Instructor:** Dr. Velledits Felicitás, associate professor  
**Code:** MFFAT720030  
**Responsible department/institute:** ÁFI

<table>
<thead>
<tr>
<th>Position in curriculum (which semester):</th>
<th>2</th>
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<tbody>
<tr>
<td>Pre-requisites (if any):</td>
<td>MFFAT710005</td>
</tr>
<tr>
<td>No. of contact hours per week (lecture + seminar):</td>
<td>1+1</td>
</tr>
<tr>
<td>Type of Assessment (examination/ practical mark / other):</td>
<td>practical mark</td>
</tr>
<tr>
<td>Credits:</td>
<td>2</td>
</tr>
</tbody>
</table>

**Course: full time**

**Study goals:** To acquaint students with the most important sediments like sand, silt, clay, carbonates, evaporites, cherts etc. and the processes that result in their formation.


At the end of the course they have to be able to interpret the ancient environmental conditions in sediment source areas and depositional sites, based on constituents, textures, structures, and fossil content of the deposits. They have to differentiate between continental, littoral, and marine deposits of the geologic record.

**Compatencies to evolve:**
Knowledge: T1, T2, T3, T5, T7, T8, T9  
Ability K1, K2, K3, K5, K6, K7, K11, K12, K13  
Attitude: A1, A2, A3, A4, A5, A7  
Autonomy and responsibility: F1, F2, F3, F4, F5

**Course Description:**
1. The place of sedimentology in earth sciences. The main stages in the development of sedimentology.
2. The main groups of sedimentary rocks: (siliciclastic) rocks, biogenic rocks, rocks formed by chemical precipitation, organic sediments, volcanic rocks.
10. Sedimentary environments of siliciclastic rocks. Alluvial fans, eolithic and fluviatile facies (sediments of meandering and braided rivers).

**Assessment:**
two written exam: Midterm exam, and Final exam. In both exam must be reached 50%.

**Grading scale:**

<table>
<thead>
<tr>
<th>% value</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 - 100%</td>
<td>5 (excellent)</td>
</tr>
<tr>
<td>80 – 70%</td>
<td>4 (good)</td>
</tr>
<tr>
<td>70 - 60%</td>
<td>3 (satisfactory)</td>
</tr>
<tr>
<td>60 - 50%</td>
<td>2 (pass)</td>
</tr>
<tr>
<td>0 - 50%</td>
<td>1 (failed)</td>
</tr>
</tbody>
</table>
Compulsory or recommended literature resources:
Balogh Kálmán (ed.) Szedimentológia I-III,
Hartai Éva: Változó Föld
Asquith & Gibson: Basic well log analysis for geologists, AAPG, Methods in exploration series
Serra, 1985: Sedimentary environments from wireline logs. Schlumberger p.211
Andrew D. Miall, 1990: Principles of sedimentary basin analysis. Springer-Verlag, - 668 oldal
**Course name:** Geochemical exploration methods  
**Course leader:** Dr. Mádai Ferenc, egyetemi docens  
**Course code:** MFFAT720005  
**Department:** Department of Mineralogy and Petrology

<table>
<thead>
<tr>
<th>Recommended semester: 2</th>
<th>Pre-requisites: MFFAT710001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly hours: 1+2</td>
<td>Assignment (a/gy/v): Practical mark</td>
</tr>
<tr>
<td>Credits: 4</td>
<td>division: full time</td>
</tr>
</tbody>
</table>

**Main objectives of the course:**
Introduction into a basic area of mineral exploration methods, including the theoretical background of geochemical sampling, the detailed discussion of different sampling and analytical methods, as well as the methods of data processing and interpretation. Completion of a geochemical exploration project, including field sampling, sample preparation, data processing and interpretation is an important part of the course.

**Relevant competences:**
- knowledge: T1, T2, T3, T4, T5, T7, T8, T9
- skills: K1, K2, K3, K5, K6, K7, K8, K9, K11, K12, K13
- attitude: A1, A2, A3, A4, A5, A7
- autonomy and responsibility: F1, F2, F3, F4, F5

**Short curriculum of the course:**
- Geochemical distribution of chemical elements in different rock types,
- Periodic table for geochemists
- Concept of the geochemical background.
- Geochemical delineation of a mineralization, a mineral deposit.
- Primary dispersion, methods of its exploration.
- Geochemical aspects of weathering.
- Geochemistry of the surface environment.
- Sorption processes
- Secondary dispersion and methods of its exploration.
- Sampling methods, sampling standards.
- Soil surveys, vegetation and water surveys.
- Stream sediment sampling methods, heavy minerals geochemistry.
- Major analytical methods.
- Data processing and statistical methods.

**Assignment:** completion of three exercises during the semester and participation in a 2-3 days field trip and completion of a sampling plan based on the field trip.

1. CIPW norm calculation exercise (20%)
2. Evaluation of a REE dataset (15%)
3. Geochemical evaluation of a drillcore (15%)
4. Field trip work and completion of the sampling plan (50%)

**Grading limits:**
- > 80 %: excellent
- 70 – 80 %: good
- 60 – 70 %: medium
- 50 – 60 %: passed
- < 50 %: failed
### The 3-5 most important compulsory, or recommended literature (textbook, book) resources:

**Course Title:** Non-metallic industrial minerals  
**Instructor:** Dr. Kristály Ferenc, senior research fellow  
**Code:** MFFTT730030  
**Responsible department/institute:** ÁFI

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

**Competencies to evolve:**  
Knowledge: T1, T2, T3, T4, T5, T7, T8, T9  
Ability: K1, K2, K3, K5, K6, K7, K8, K9, K11, K12, K13  
Attitude: A1, A2, A3, A4, A5, A7  
**Autonomy and responsibility:** F1, F2, F3, F4, F5

**Acquired store of learning:**

**Study goals:** The course will allow students to gather knowledge on the non-metallic mineral resources, geological characteristics of the deposits, type and mode of the accumulations, spatial distribution and quality-quantity data of the mineral types, technological requirements, exploration, exploitation and beneficiation techniques.

The introductory part is a short review on the geological settings and related petrological-geochemical knowledge, related non-metallic resources, industrial mineral groups. The first part dissects the grouping on genetical and industrial-application point of view mineral resources. During the semester detailed knowledge is offered on 1) native element, 2) sulphide, 3) halogenide, 4) oxide/hydroxide, 5) carbonate/nitrate, 6) borate, 7) sulphate, 8) phosphate and 9) silicate types of industrial minerals. Students get familiar with their mineralogy, deposits and formation, extraction and uses based on detailed international data. We also study the rock type industrial minerals, their generating and applications. In the case of silicates emphasis is put on clay minerals, feldspars and zeolites. Separate lecture+laboratory visit discusses the exploration and beneficiation techniques. During the laboratory exercises and field trips students learn to recognize industrial minerals, to give mineralogical characterization, exploration and quality remarks, their natural types of occurrence.

**Education method:** Lectures with .ppt presentation, laboratory exercises for sample and specimen preparation, fieldtrips, methods for data validation and documentation.

**Type of Assessment** (exam. / pr. mark. / other): exam

Short written test. Individual data research + presentation (60-40%) in an assay. Oral examination.

**Grading limits:**

>90%: excellent,  
76-90%: good,  
60-76%: medium,  
50-60%: satisfactory,  
<50%: unsatisfactory.

**Compulsory or recommended literature resources:**

https://minerals.usgs.gov/minerals/pubs/myb.html  
https://www.ima-europe.eu/
**Tantárgy neve:** Applied Environmental Geology  
**Instructor:** Dr Viktor Mádai, associate professor  
**Code:** MFFAT730032  
**Responsibele department/institute:** Department of Geology and Mineral Deposits  
**Type of course:** C  

**Position in curriculum (which semester):** 3  
**Pre-requisites:** MFFAT720031  
**Number of Contact Hours per Week (Lec.+prac.):** 2+2  
**Type of Assessment (examination/practical mark/other):** exam  
**Credits:** 4  
**Course:** full-time

## Course Description:

**Knowledge:** T1, T2, T3, T4, T5, T7, T8, T9  
**Ability:** K1, K2, K3, K5, K6, K7, K8, K9, K11, K12, K13  
**Attitude:** A1, A2, A3, A4, A5, A7  
**Autonomy and responsibility:** F1, F2, F3, F4, F5

**The short curriculum of the subject:** 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.


**Method of course check in:** During registration week through NEPTUN system  
**Education method:** Lectures and seminars

## Assessment and requirements:

**Conditions for signature:**  
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.

**Conditions of successful completion of the subject:** signature + exam mark
**Type of Assessment, 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

**Used teaching equipments:**

**Compulsory 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

**Recommended literature resources:**
*Foley, Duncan: Investigations in environmental geology*, Prentice Hall, Upper Saddle River N.J, 2009,
*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,
*Patnaik, P.: Handbook of environmental analysis: chemical pollutants in air, water, soil, and solid wastes*, Taylor and Francis, 2009,
### Kompetenciakódok

<table>
<thead>
<tr>
<th>T1</th>
<th>Érti a földtudományi mérnöki szakterületek (geológius-mérnöki, geofizikus-mérnöki, geoinformatikus-mérnöki) műveléséhez szükséges általános és specifikus elméletekkel leírt folyamatokat, ezek belső összefüggéseit, illetve a folyamatokra épülő tervezési és értelmezési eljárásokat.</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2</td>
<td>Biztos tudással rendelkezik a földtudományi mérnöki szakterületek magas szintű műveléséhez szükséges speciális műszaki és természetföldtudományi ismeretkörökben, többek között a numerikus módszerek, műszaki fizika területén, illetve ezek összefüggéseiben.</td>
</tr>
<tr>
<td>T3</td>
<td>Ismeretei alapján átláthatja a nyersanyagkitermelő ágazat felépítését, az ásványi nyersanyagok kitermelésére és előkészítésére alkalmazott technológiákat, illetve a geokörnyezeti feladatok körét, ezek közül sártársadalmi-gazdasági környezetét és szabályozási rendszerét.</td>
</tr>
<tr>
<td>T4</td>
<td>Behatolóan ismeri és érti a földtudományi mérnöki feladatokhoz alkalmazott legjobb gyakorlatokat és azokat a távlati fejlesztési irányokat, amelyek a szakterületen középtávon várhatók.</td>
</tr>
<tr>
<td>T5</td>
<td>Ismeri a földtudományi szakterületeken alkalmazott legjobb elérhető gyakorlatok problémamegoldási (kutatás tervezési és vezetési) technikáit.</td>
</tr>
<tr>
<td>T6</td>
<td>Részleteiben ismeri a természeti erőforrások felkutatására alkalmas földtani és geofizikai módszereket.</td>
</tr>
<tr>
<td>T7</td>
<td>Jól megalapozott ismeretekkel rendelkezik az ásványi nyersanyagtelepeken feltárásának módszereiről.</td>
</tr>
<tr>
<td>T8</td>
<td>Részletes ismeretekkel és biztos alkalmazási gyakorlattal rendelkezik a műszaki földtudományi szakterületek ismeretszerzési és adatgyűjtési módszereiről - ezek műszeres mérés-technikai és informatikai adatfeldolgozási eljárásairól.</td>
</tr>
<tr>
<td>T9</td>
<td>Jól megalapozott ismeretekkel rendelkezik a földtudományi mérnöki szakterületekhez kapcsolódó jogi, közgazdasági, közigazgatási, biztonságtéchnikai, munka- és tűzvédelmi, információ-technológiai, környezetvédelmi szakterületekről.</td>
</tr>
<tr>
<td>T10</td>
<td>Képes a műszaki földtudományi szakterületeken belüli az általános és specifikus alap és alkalmazott tudományi elméletek alkalmazására, ezek rendszerbe foglalására, önálló mérnöki feladatok (pl. komplex földtani előtervezés, illetve kutatásokat összefoglaló zárójelentés, környezeti terhelhetőség és hatásvizsgálatok földtani-geofizikai részei) megoldására.</td>
</tr>
</tbody>
</table>

### Képesség

| K1 | Ismereteit hitelesen képes közvetíteni prezentációk, írásos dokumentumok elkészítésével magyarul és/vagy idegen nyelven. |
| K2 | A műszaki földtudományi ismereteket leíró elméletek és terminológia innovatív alkalmazásával képes komplex tervezési, kivitelezés, hatósági engedélyezési feladatok ellátására (földtani-geofizikai kutatási tevékenységek tervezésére). |
| K3 | Képes a műszaki földtudományi feladatokhoz kapcsolt társtudományi és szakterületi jogi és közgazdasági ismeretek és tevékenység áttekintésére, a kapcsolódások optimalizálására. |
| K4 | Képes a műszaki földtudományi feladatokon belül közigazdasági szakaszok kezelésére és koordinálására, az együttműködési kapcsolatok megvalósítására, az infrastruktúra megvalósítására és felújítására. |
| K5 | Képes a műszaki földtudományi feladatokon belül valósítani az adatgyűjtési és tevékenység áttörését, az adatgyűjtési és tevékenység áttörését, az adatgyűjtési és tevékenység áttörését, az adatgyűjtési és tevékenység áttörését, az adatgyűjtési és tevékenység áttörését, az adatgyűjtési és tevékenység áttörését, az adatgyűjtési és tevékenység áttörését, az adatgyűjtési és tevékenység áttörését. |
| K6 | Közrekerülő adatgyűjtési és adatgyűjtési adatokat alkalmaz. |
| K7 | Elméletben és gyakorlatban képes ezek felhasználásával innovatív készséget igénylő műszaki problémák megoldására (különös tekintettel többszintű, földalatti adatgyűjtésre, méréses elvégzésére, és ezek innovatív képességet igénylő feldolgozására és értelmezésére. |
| K8 | Képes a nyersanyagkutatási és termelési adatok felhasználására és geoinformatikai adatbázisokra (rendszerekbe) való szervezésére. |
| K9 | Képes a földtani szerkezetek szakszerű megkutatására és feltárására, ezen kutatási fázisok megtervezésére. |
| K10 | Képes áttekinteni a nyersanyagkitermelő ágazat felépítését, az ásványi nyersanyagok kitermelésére és előkészítésére alkalmazott technológiákat, illetve a geokörnyezeti feladatok körét, ezek külső társadalmi-gazdasági környezetét és szabályozási rendszerét. |
| K11 | Képes a műszaki földtudományi feladatokra alapozott, illetve ezeket magába építő nagyobb és összetettebb tevékenységeket keretében belül a kapcsolódó szakterületekkel megszervezni az együttműködést, és iránytani a (munka)csoportot. |
| K12 | Képes az ásványvagyon mennyiségi és minőségi számbavételére, gazdaságossági kiértékelésére, koncessziós anyagok összeállítására, valamint ilyen típusú jelentések véleményezésére. |
| K13 | Képes az ásványi nyersanyag kitermelés során (tervezés, beruházás, üzemeltetés, bezárás) felmerülő földtani-geofizikai jellegű feladatok megoldásában való közreműködésre és a megoldási lehetőségek elemzésére. |
| A1 | Nyitott és fogékony a műszaki földtudományi szakterületeken zajló szakmai és technológiai módszertani fejlesztések megismerésére, elfogadására, kezelésük elsajátítására, fejlesztésükben való közreműködésére. |
| A2 | Innovatív készségét és ismereteit aktívan alkalmazza a földtudományi mérnöki szakterületeken felmerült szakmai problémák megoldásában. |
| A3 | Felvállalja és tevékenységével meggyőzően igazolja, hogy ismeri és betartja a szakmai és etikai értékek. |
| A4 | Hivatástudata, szakmai szolidaritása elmélyült. |
| A5 | Tiszteletben tartja és tevékenységében követi a munka- és szakmai kultúra etikai elveit és írott szabályait, és képes ezek betartására is, kisebb munkacsoportok irányítása során. |
| A6 | Munkája során az SHE, illetve a QA/QC (biztonsági egészségvédelmi, környezetvédelmi) illetve a minőségbiztosítási és ellenőrzési) követelményrendszereit betartja és betartatja. |
| A7 | Megfelelő motivációval rendelkezik a gyakran változó munka-, földröjji és kulturális körülmények közötti tevékenységek végzésére. |

### Felkészülés

| F1 | Munkáját - a kapott stratégiai irányítás és külső környezeti követelmények behatolásával - önállóan képes megtervezni, illetve alkalmas munkacsoportok irányítására is. |
| F2 | Felelősséget vállal és elszámolhatóan az irányítása alatt végzett munkafolyamatokért, munkafolyamatokért, az ezenkomb dolgozó munkatársakért. |
| F3 | Döntéseit körültekintően, más szakterületek (elsősorban jogi, közgazdasági, és környezetvédelmi) képviselőivel konzultálva, önállóan hozza, melyért felelősséget vállal. |
| F4 | Konstruktív csapatmunka mellett a rábízott működési területen szakmai döntésekre képes, autonóm szakember. |
| F5 | Elkötelezett a fenntartható természeti erőforrás gazdálkodás gyakorlata mellett.