GEOPHYSICAL MEASUREMENTS

MS in Earth Science Engineering / Specialisation in Geophysical Engineering

Semester 2, 2017/18

The course was not started in the semester.

COURSE COMMUNICATION FOLDER

University of Miskolc
Faculty of Earth Science and Engineering
Institute of Geophysics and Geoinformatics

Course datasheet

Course Title: Geophysical Measurements **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:** MFGFT720012 **Responsible department/institute:** Institute of Geophysics and Geoinformatics / Department of Geophysics
	Type of course: Compulsory
Position in curriculum (which semester): 2	**Pre-requisites (if any):** MFGFT6002D, MFGFT6003D
No. of contact hours per week (lecture + seminar): 2+1	**Type of Assessment (examination/ practical mark / other):** examination
Credits: 4	**Course:** full time

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:
General principles and main tasks of the raw-material exploration. Exploration phases. The principles of geophysical surveys. The role of geophysical methods in the exploration phases. Gravity data acquisition. Measuring devices and measured quantities of the gravity method. Gravity data processing and corrections. Magnetic data acquisition. Measuring devices and measured quantities of the magnetic method. Magnetic gradiometry. Magnetic data processing and corrections. The components and properties of geoelectrical data acquisition systems. Electrode configurations and setting up of electrode spreads. Main aspects of planning geoelectrical surveys. The components and properties of electromagnetic data acquisition systems. Survey configurations of different electromagnetic methods. Main aspects of planning electromagnetic surveys. Quality control of recorded data. The types and properties of seismic sources. The components and properties of seismic data acquisition systems. Main aspects of planning seismic surveys. Quality control of recorded seismic data. The field techniques of improving the signal-to-noise ratio. Basic steps of seismic data processing. Components and properties of data acquisition systems used for vertical seismic profiling (VSP). Basic steps of VSP data processing. Main properties and components of the techniques of borehole geophysical logging (wireline logging and measured while logging). Quality control a well logs. The constructions and properties of resistivity and induction logging tools. The constructions and properties of nuclear logging tools. The constructions and properties of sonic logging tools.
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:
P. Kearey, M. Brooks, I. Hill, 2002: An introduction to geophysical exploration, Blackwell Science Ltd., ISBN 0-632-04929-4
D. V. Ellis, J. M. Singer, 2007: Well logging for earth scientists. Springer, Dordrecht, The Netherlands, ISBN 978-1-4020-3738-2 (HB).
W. M. Telford, L. P. Geldart, R. E. Sheriff., 1990: Applied Geophysics. 2nd Edition. Cambridge University Press, ISBN: 0 521 32693 1
O. Serra, L. Serra, 2004: Data Acquisition and Applications, Editions Serralog, France, ISBN: 978295156125
Other educational materials and study aids on the web page of Geophysical Department: http://www.uni-miskolc.hu/~geofiz/segedlet.html
Operating manuals:

https://scintrexltd.com/wp-content/uploads/2017/02/CG-5-Manual-Ver_8.pdf
https://userpage.fu-berlin.de/geodyn/instruments/Manual_GEM_GSM-19.pdf

Syllabus of the semester

Week	Lecture
1	General principles and main tasks of the raw-material exploration. Exploration phases. The principles of geophysical surveys.
2	The role of geophysical methods in the exploration phases.
3	Gravity data acquisition. Measuring devices and measured quantities of the gravity method. Gravity data processing and corrections.
4	Magnetic data acquisition. Measuring devices and measured quantities of the magnetic method. Magnetic gradiometry. Magnetic data processing and corrections.
5	The components and properties of geoelectrical data acquisition systems. Electrode configurations and setting up of electrode spreads. Main aspects of planning geoelectrical surveys. Quality control of recorded data.
6	The components and properties of electromagnetic data acquisition systems. Survey configurations of different electromagnetic methods. Main aspects of planning electromagnetic surveys. Quality control of recorded data.
7	The types and properties of seismic sources. The components and properties of seismic data acquisition systems.
8	Main aspects of planning seismic surveys. Quality control of recorded seismic data. The field techniques of improving the signal-to-noise ratio (SNR).
9	Basic steps of seismic data processing. Components and properties of data acquisition systems used for vertical seismic profiling (VSP). Basic steps of VSP data processing.
10	Main properties and components of the techniques of borehole geophysical logging (wireline logging and measured while logging).
11	Quality control of well logs.
12	The constructions and properties of resistivity and induction logging tools.
13	The constructions and properties of nuclear logging tools.
14	The constructions and properties of sonic logging tools.

Week	Seminar
1	Spreading systems of geophysical surveys.
2	The steps and products of the workflow of geophysical surveys.
3	The introduction of Scintrex CG-5 Autograv gravimeter.
4	The introduction of GEM GSM-19 Ovehauser magnetometer.
5	The introduction of geoelectrical data acquisition systems.
6	The introduction of VLF measuring devices and ground penetrating radar.
7	The types and properties of seismic sources. The components and properties of seismic data acquisition systems.
8	Main aspects of planning seismic surveys. Quality control of recorded seismic data. The field techniques of improving the signal-to-noise ratio (SNR).
9	Basic steps of seismic data processing. Components and properties of data acquisition systems used for vertical seismic profiling (VSP). Basic steps of VSP data processing.
10	The main functions and properties of the components of a wireline logging system.
11	The main aspects of planning a well logging program.
12	The constructions and properties of resistivity and induction logging tools.
13	The introduction of a gamma spectrometer.
14	The constructions and properties of sonic logging tools.

Exam topics

1. General principles and main tasks of the raw-material exploration. Exploration phases. The principles of geophysical surveys.

2. The role of geophysical methods in the exploration phases. Spreading systems of geophysical surveys.

3. Gravity data acquisition. Measuring devices and measured quantities of the gravity method. Gravity data processing and corrections.

4. Magnetic data acquisition. Measuring devices and measured quantities of the magnetic method. Magnetic gradiometry. Magnetic data processing and corrections.

5. The components and properties of geoelectrical data acquisition systems. Electrode configurations and setting up of electrode spreads. Main aspects of planning geoelectrical surveys. Quality control of recorded data.

6. The components and properties of electromagnetic data acquisition systems. Survey configurations of different electromagnetic methods. Main aspects of planning electromagnetic surveys. Quality control of recorded data.

7. The types and properties of seismic sources. The components and properties of seismic data acquisition systems.

8. Main aspects of planning seismic surveys. Quality control of recorded seismic data. The field techniques of improving the signal-to-noise ratio (SNR).

9. Basic steps of seismic data processing.

10. Components and properties of data acquisition systems used for vertical seismic profiling (VSP). Basic steps of VSP data processing.

11. Main properties and components of the techniques of borehole geophysical logging (wireline logging and measured while logging).

12. The main functions and properties of the components of a wireline logging system.

13. The main aspects of planning a well logging program. Quality control of well logs.

14. The constructions and properties of resistivity and induction logging tools.

15. The constructions and properties of nuclear logging tools.

16. The constructions and properties of sonic logging tools.