Geophysics Msc - BMEEOAFMF51

I. Subject Specification

1. Basic Data

1.1 Title

Geophysics Msc

1.2 Code

BMEEOAFMF51

1.3 Type

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Lecture	2

1.5 Evaluation

Midterm grade

1.6 Credits

3

1.7 Coordinator

name	Dr. Lajos Völgyesi
academic rank	Professor emeritus
email	volgyesi.lajos@emk.bme.hu

1.8 Department

Department of Geodesy and Surveying

1.9 Website

https://epito.bme.hu/BMEEOAFMF51
https://fiek2.mywire.org/course/view.php?id=3478

1.10 Language of instruction

hungarian and english

1.11 Curriculum requirements

Compulsory in the Land Surveying and Geoinformatics (MSc) programme

1.12 Prerequisites

1.13 Effective date

1 September 2021

2. Objectives and learning outcomes

2.1 Objectives

Geophysics has three basic objectives.

The most important thing is to supply and complete the knowledge about the Earth, to know the interaction that exists between geodesy discussing the geometry of the Earth and geophysics discussing the physics of the Earth. Since the geoid (the theoretical shape of the Earth) is defined by a physical concept (the gravity), geophysics is in close connection to the geodesy and cosmic geodesy. An important aim of the course is to get knowledge of students about the physical structure and processes inside the Earth by seeing the connections between the shape of the Earth and the inner processes and material structure of our planet. The subject seeks to provide the physical background and explanation of the most important contexts and phenomena that students encountere in learning of the different subjects. Another important goal of the course is to draw attention to the dynamism of our Earth; that everything is constantly changing around us.. Surveyors need to be aware of where, under what circumstances, and for how long our control points can be considered to be motionless. To do this, we need to know to what extent the shift of our control points is caused by different causes e.g. movements caused by temperature changes, tectonic movements of the earth's surface, or e.g. the displacement of the coordinate system (displacement of the center of mass or the precession and nutation motion of the Earth). The Earth must therefore not be seen as a boring empty body, not as some abstract mechanical concept, but as a constantly evolving, exciting, changing living planet. This is important for geodesy, because most of the changes due to the physical processes that take place exceed the accuracy of today's modern geodetic measurements. Finally, surveyors need to know and understand the language of earth science professionals just as much as civil engineers, as they have an increasing role to play in this field as well.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. is familiar with the terminology of earth sciences and geophysics,
2. understands the relationship and interdependence of geodesy and geophysics,
3. informed about the structure, time change and geodetic significance of the geomagnetic field,
4. knows the geothermal conditions and radioactive phenomena of the Earth,
5. has a comprehensive knowledge of earthquakes, the internal structure of the Earth,
6. knows in detail the structure of the Earth’s gravity field, the mathematical and physical basis of the force field,
7. be able to apply spherical harmonicss to describe the Earth’s gravity field,
8. knows the concept, geodetic significance and use of the normal gravity field, disturbed potential and various gravity anomalies,
9. knows the Earth’s tide phenomenon in detail,
10. is aware of the physical basis of rotation movements, knows exactly the phenomenon of precession and nutation,
11. understands the phenomenon, geodetic and astronomical effects of lunisolar and planetary precession, and understands the essence of disturbing precession and astronomical nutation,
12. knows the phenomenon of free nutation, forced nutation, polar motion, polar wandering, and its geodetic and astronomical effects,
13. knows the global tectonics of the Earth.

B. Skills

1. is able to understand the following geodetic subjects on the basis of his basic knowledge of geophysics,
2. is able to understand the relationship between geodesy and different earth sciences,
3. is able to mathematically describe the Earth's gravity field, the geodetic application of potential disturbance and gravitational anomalies,
4. is able to understand the changes in geodetic and astronomical coordinate systems and time changing of the coordinates by knowing the phenomena of the Earth's rotation..

C. Attitudes

1. cooperates with the lecturer and fellow students in expanding the knowledge,
2. considers importance attending lectures and continuous mid-year learning,,
3. in addition to the compulsory curriculum, it expands its knowledge through continuous acquisition of knowledge.

D. Autonomy and Responsibility

1. carry out his studies with appropriate responsibility,
2. openly accepts well-founded critical remarks,
3. assists fellow students in preparation in necessary situations.

2.3 Methods

Lectures, written and oral communication.

2.4 Course outline

Week	**Topics of lectures and/or exercise classes**
1.	The role and significance of geophysics in earth sciences and geodesy.
2.	Basic concepts of Earth’s magnetic field, normal geomagnetic field and anomalies.
3.	Time variation of geomagnetic field, the origin of the magnetic field, the explanation of the changes.
4.	Basic seismological concepts, formation, propagation and registration of earthquake waves, spatial and temporal distribution of earthquakes.
5.	Free oscilations of the Earth, the inner structure of the Earth based on earthquake waves.
6.	Radioactivity and geothermics and their significance in geodynamics

7.	Base concepts of the gravity and gravitation, description of the gravity field by spherical harmonics
8.	Normal gravity field, spheroids and gravity anomalies
9.	Aplying of gravity anomalies in geophysics and geodesy.
10.	Time variation of gravity field, the Earth's tide
11.	The rotation of the Earth: Motion of a heavy and a free gyroscope, lunisolar and planetary precession, general precession, disturbing precession.
12.	Earth's rotation: Euler's free nutation, forced mutation, polar motion, polar wandering.
13.	Geotectonics: continental drift, ocean floor spreading, plate tectonics.
14.	Geoscientific foundation of 4D geodesy

The above programme is tentative and subject to changes due to calendar variations and other reasons specific to the actual semester. Consult the effective detailed course schedule of the course on the subject website.

2.5 Study materials

On-line materials will be available in the homepage of the subject

2.6 Other information

2.7 Consultation

Appointments: as specified on the department's website, or in consultation with the course instructors via e-mail.

This Subject Datasheet is valid for:

2023/2024 semester I

II. Subject requirements

Assessment and evaluation of the learning outcomes

3.1 General rules

The assessment of the learning outcomes specified in clause 2.2 above and the evaluation of student performance occurs via a midterm test and an oral exam.
Duration of the midterm test is 30 minutes.

3.2 Assessment methods

Evaluation form	Abbreviation	Assessed learning outcomes
Midterm test	MT1	A.1-A.8
Oral exam (summary assessment)	E1	A.1-A.13; B.1-B.4; C.1-C.3; D.1-D.3

The dates of deadlines of assignments/homework can be found in the detailed course schedule on the subject's website.

3.3 Evaluation system

Abbreviation	Score
MT1	10%
E1	90%
Sum	**100%**

3.4 Requirements and validity of signature

The condition for obtaining a signature is that the student achieves at least 50% of the scores according to 3.3 and midterm tests (MT1) is successful.
Anyone who has signature and not register for exam course, his/her midterm result will be overwriten by the recapture result.
The midterm result that can be taken into account at the examination grade previously obtained from the subject can be accepted retroactively for 2 semester.

3.5 Grading system

Grade	Points (P)
excellent (5)	85-90%
good (4)	72,5-85%
satisfactory (3)	65-72,5%
passed (2)	50-65%
failed (1)	50% below

3.6 Retake and repeat

In case of retaking an assessment the second result will be taken into account from the new and previous results.
In case of failing the retake, there is a possibility for a second retake – after the payment of the predetermined fee - in the completion week

3.7 Estimated workload

Activity	Hours/semester

contact hours	14×2=28
mid-year learning	14×3=42
preparation for the assessments	20
Sum	**90**

3.8 Effective date

1 September 2021

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