Geodynamics - BMEEOGMMS51

I. Subject Specification

1. Basic Data

1.1 Title

Geodynamics

1.2 Code

BMEEOGMMS51

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. Ákos Török. Dr. Lajos Völgyesi
academic rank	Professor
email	torok.akos@emk.bme.hu

1.8 Department

Department of Engineering Geology and Geotechnics

1.9 Website

https://epito.bme.hu/BMEEOGMMS51
https://edu.epito.bme.hu/course/view.php?id=2064

1.10 Language of instruction

hungarian and english

1.11 Curriculum requirements

Optional in the Structural Engineering (MSc) programme

1.12 Prerequisites

1.13 Effective date

5 February 2020

2. Objectives and learning outcomes

2.1 Objectives

The subject focuses on the understanding of dynamic effects that are transferred from the geo-logical environment to the engineering structures. The students are getting familiar with geo-physics, rock stress and its interpretation and graphic representation, local and world-scale (Word Stress Map). The deformations caused by seismic waves in igneous, metamorphic and sedimentary rocks also form part of the subject, as well as deformations caused by historic earthquakes. A main topic is the understanding of the Earth's structural geology and seismicity with special emphasis on the Carpathian basin. The lectures will help in learning the detection methods of seismic waves and acquire the information content of the seismograms. By complet-ing the course the students will able to determine the parameters that are necessary for appro-priate seismic design. Engineering seismological approach will help the students to place the structures in the geological environment allowing the minimal risk and reducing the cost by proper seismic design.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. knows the fundamentals of geophysics, Earth's magnetic and gravitational fields
2. knows the principles of rock stress
3. knows the faulted and folded structures and related rock deformations,
4. aware of the mechanisms of earthquake generation,
5. knows the detection and registration methods of earthquakes and the information content of seismograms
6. knows the seismic behaviour of rock types
7. aware of the historic seismic events and the role of engineering seismic
8. knows the seismicity of the Carpathian-Pannonian system, and the Earth in general
9. understand and recognize the seismic sensitivity of engineering structures,
10. knows the geodynamic risks and the parameters that are necessary for safe seismic desig

B. Skills

1. able to describe the seismic properties of rocks,
2. able to draw and graphically interpret the geological structures related to seismicity,
3. able to classify seismic waves and interpret their seismic effect,
4. able to understand the rock stress and can use it in the engineering design,
5. able to choose specific sites for waste disposal,
6. can prepare a list of the most important geological-geophysical parameters needed for seismic design
7. able to present an engineering geologically feasible seismic design
8. can read and interpret international references and written reports
9. able to express her/his thoughts orderly in written and oral.

C. Attitudes

1. improve her/his knowledge with continuous learning,
2. open to use the information technology tools,
3. pursue to know and use of the toolkit which need for the environmental geological problem solu-tion,
4. pursue to the exact and errorless task solution.

D. Autonomy and Responsibility

1. thinks through and solve independently the geodynamics related tasks and problems according to given sources,
2. consider logical steps and solutions in geodynamics
3. open to accept the critical comments,
4. use the systematic approaches in her/his mind.

2.3 Methods

Lectures, communication in written and oral form, use of IT tools and techniques, task solved independently and in groups as well, work organization techniques.

2.4 Course outline

Week	**Topics of lectures and/or exercise classes**
1.	Earth's physics and geophysics.
2.	Rock stress (definition, measurements).
3.	Rock deformation, faulted and folded structures.
4.	Seismology, principles, mechanisms of earthquake generation, earth-quakes and deformation.
5.	Registration and evaluation of seismic waves, intensity, basin structure and Vs30 values
6.	Word Stress Map and local rock stresses in Hungary.
7.	Gravitational, magnetic and geothermal anomalies and their relationship with structures and seismicity.
8.	Structural geology and seismicity of the Earth and the Carpathian basin.
9.	Seismograms and their interpretation, most important parameters and surface acceleration.
10.	Seismic behaviour of igneous, metamorphic and sedimentary rocks, wave propagation in these rocks.
11.	Detection methods of seismic waves under laboratory conditions, longi-tudinal and transversal waves.
12.	Engineering seismology, detection of previous earthquakes, input geolog-ical parameters of seismic design
13.	Structures in geological environment, evaluation of seismic hazards.
14.	Reducing seismic risks and steps of seismic safe design in the frame of geodynamics.

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

a) Textbooks
1. Amadei, B, Stephansson, B.O. (1997) Rock Stress and Its Measurement. Springer
2. Ansal, A. (eds) (2004-2016): Geotechnical, Geological and Earthquake Engineering. könyvsorozat, Springer
3. Bath, M. (1979): Introduction to Seismology. Birkhauser
4. Fossen, H. (2016) Structural Geology (2nd ed.), Cambridge Univ. Press
5. Price, D.G.(2009): Engineering Geology, Principles and Practice. Springer
6. Rogers, N. (ed) (2007): An Introduction to Our Dynamic Planets. Cambridge Univ. Press
b) Online materials
1. Lecture notes

2.6 Other information

1) The topics lectures provide information on of Hungarian and international case studies re-lated to geodynamics.

2.7 Consultation

The instructors are available for consultation during their office hours, as advertised on the de-partment website. Special appointments can be requested via e-mail: torok.akos@epito.bme.hu

This Subject Datasheet is valid for:

Inactive courses

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 tests, homework assignments.

3.2 Assessment methods

Evaluation form	Abbreviation	Assessed learning outcomes
1. midterm test	MT1	A.1-A.5; B.1, B.2, B.6; C.2, C.4; D.3
2. midterm test	MT2	A.6-A.10; B.5-B.8; C.2, C.4; D.3
1. homework	HW	A.1-A.10; B.1-B.8; C.1-C.4; D.1-D.4

3.3 Evaluation system

Abbreviation	Score
MT1	40%
MT2	40%
HW	20%
Sum	**100%**

The midterm test is failed if the sum points of the two tests are less than the 50% of the obtaina-ble points. In case of the homework to reach the 50% of the points is also required.

3.4 Requirements and validity of signature

There is no signature for this subject.

3.5 Grading system

Determination of the final grade is according to the below described considerations:
There is no minimum requirement for the midterm tests separately; the sum results of the two midterm test have to reach at least 50% of the obtainable points.
The final grade is the average value of the result of the two midterm test and the homework weighted according to the clause 3.3.

Grade	Points (P)
excellent (5)	80<=P
good (4)	70<=P<80%
satisfactory (3)	60<=P<70%
passed (2)	50<=P<60%
failed (1)	P<50%

3.6 Retake and repeat

1) There is no minimum requirement for the individual midterm tests therefore it cannot be retaken separately.
2) Homework – after the payment of the fee given in the regulation – can be submit with delay until 16.00 or in electronic format until 23.59 of the last day of the completion week.
3) The submitted and accepted homework can be corrected without any fee until the dead-line described in the point 2.
4) The two midterm test can be retaken in merged form in the completion week free of charge. In case of correction the better result will be taking into account from the new and previous results.

3.7 Estimated workload

Activity	**Hours/semester**
contact hours	14×2=28
preparation for the courses	14×1=14
preparation for the tests	2×18=36
homework	12
Sum	**90**

3.8 Effective date

5 February 2020

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Inactive courses