Numerical methods in geotechnics - BMEEOGMMG63

I. Tantárgyleírás

1. Alapadatok

1.1 Tantárgy neve

Numerical methods in geotechnics

1.2 Azonosító (tantárgykód)

BMEEOGMMG63

1.3 Tantárgy jellege

Kontaktórás tanegység

1.4 Óraszámok

Típus	Óraszám / (nap)
Előadás (elmélet)	1
Laboratóriumi gyakorlat	1

1.5 Tanulmányi teljesítményértékelés (minőségi értékelés) típusa

Félévközi érdemjegy

1.6 Kreditszám

3

1.7 Tárgyfelelős

név	Dr. András Mahler
beosztás	Egyetemi docens
email	mahler.andras@emk.bme.hu

1.8 Tantárgyat gondozó oktatási szervezeti egység

Geotechnika és Mérnökgeológia Tanszék

1.9 A tantárgy weblapja

https://epito.bme.hu/BMEEOGMMG63
https://edu.epito.bme.hu/course/view.php?id=2073

1.10 Az oktatás nyelve

magyar és angol

1.11 Tantárgy típusa

Szabadon választható a Szerkezet-építőmérnök (MSc) szakon

1.12 Előkövetelmények

1.13 Tantárgyleírás érvényessége

2022. szeptember 1.

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2. Célkitűzések és tanulási eredmények

2.1 Célkitűzések

The aim of the course is that the students get to know the use of numerical methods that aid geotechnical and engineering geological design. The students get familiar with the advantages and disadvantages of analytical methods and applications of finite element methods to geotechnical and engineering geological problems using different commercially available software. The students get to know the special elements and material models that are typically used in the case of FE modelling of geotechnical problems. The students get to know the most frequently used rock mechanical methods for modelling fractured rocks.

2.2 Tanulási eredmények

A tantárgy sikeres teljesítése utána a hallgató

A. Tudás

1. Knows how to create a model for a specific problem in geotechnics or engineering geology,
2. knows the advantages and disadvantages of analytical geotechnical methods,
3. knows the special element types used in geotechnical FE modelling,
4. knows how to take into account the anisotropic behaviour of jointed rocks,
5. knows the typically used geotechnical non-linear material models.

B. Képesség

1. Is able to use analytical geotechnical software,
2. is able to use proper material model and parameters based on geotechnical test results,
3. is able to model soil/rock behaviour using the finite element method.

C. Attitűd

1. Cooperates with other students and the lecturer during learning,
2. expands her/his knowledge by continuous learning,
3. is open to using new tools of information technology,
4. tries for accurate and errorless problem-solving.

D. Önállóság és felelősség

1. Is able to individually solve geotechnical problems and find solutions to tasks based on the information made available,

2. is open to well-founded criticism,
3. is able to work as part of a group, together with their classmates, on the solutions for various problems,
4. applies a system approach in their thinking.

2.3 Oktatási módszertan

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

2.4 Részletes tárgyprogram

Week	**Topics of lectures and/or exercise classes**
1.	Process of modelling in engineering geology and geotechnics.
2.	Design of retaining structures and pile foundations using analytical geotechnical software.
3.	Slopes stability calculation using numerical methods.
4.	Finite element modelling in engineering geology and geotechnics.
5.	Non-linear material models and their parameters.
6.	Primary consolidation, geosynthetics.
7.	Finite element modelling of deep excavations, unloading, deformations, stability.
8.	Finite element modelling of raft foundations, interface parameters.
9.	Finite element modelling of pile foundations, "embedded pile" element type.
10.	Modelling possibilities of fractured rock masses (hybrid finite element, discrete element methods)
11.	Analytical methods in tunnel design.
12.	Numerical methods in tunnel design (2D solution for a 3D problem)
13.	Dimensioning of rock pillars.
14.	Modelling of discontinuity sets in rock slope stability analysis (hybrid finite element modelling and discontinuity layout optimization methods).

A félév közbeni munkaszüneti napok miatt a program csak tájékoztató jellegű, a pontos időpontokat a tárgy honlapján elérhető "Részletes féléves ütemterv" tartalmazza.

2.5 Tanulástámogató anyagok

Textbooks:

Chen, W.F., LIU, X.L. (1990) Limit analysis in soil mechanics, Elsevier

Jing, L. Stephanson, O. (2007). Fundamentals of discrete elements modelling, Elsevier

Online materials:

Lecture notes

2.6 Egyéb tudnivalók

It is recommended to attend classes with a notebook to use the introduced numerical methods.
The department provides the academic version of the introduced software.

2.7 Konzultációs lehetőségek

The instructors are available for consultation during their office hours, as advertised on the department website.

Special appointments can be requested via e-mail: mahler.andras@epito.bme.hu

Jelen TAD az alábbi félévre érvényes:

Inactive courses

Numerical methods in geotechnics - BMEEOGMMG63

II. Tárgykövetelmények

3. A tanulmányi teljesítmény ellenőrzése és értékelése

3.1 Általános szabályok

The assessment of the learning outcomes is specified in clause 2.2. above, and the evaluation of student performance occurs via tests and homework assignments.

3.2 Teljesítményértékelési módszerek

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

A szorgalmi időszakban tartott értékelések pontos idejét, a házi feladatok ki- és beadási határidejét a "Részletes féléves ütemterv" tartalmazza, mely elérhető a tárgy honlapján.

3.3 Teljesítményértékelések részaránya a minősítésben

Abbreviation	Score
MT1	60%
HW	40%
Sum	**100%**

The midterm test is failed if the sum points of the tests are less than 50% of the obtainable points. In the case of homework, reaching 50% of the points is also required.

3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége

There is no signature for this subject.

3.5 Érdemjegy megállapítása

Determination of the final grade is according to the below-described considerations:
The final grade is the average value of the result of the midterm test and the homework weighted according to 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 Javítás és pótlás

1. Homework – after the payment of the fee determined in the regulation – can be submitted with a delay until 16.00 or in electronic format until 23.59 on the last day of the supplementary period.
2. The submitted and accepted homework can be corrected without any fee until the deadline described in point 1.
3. The midterm test can be retaken in the last practical week free of charge. In the case of correction, the better result will be taken into account from the new and previous results.
4. In case of failing the retake described in point 3. there is a possibility for a second retake – after the payment of the fee determined in the regulation – in the supplementary period. 3.7.

3.7 A tantárgy elvégzéséhez szükséges tanulmányi munka

Activity	**Hours/semester**
contact hours	14×2=28
preparation for the courses	14×2=28
preparation for the tests	10
homework	24
Sum	**90**

3.8 A tárgykövetelmények érvényessége

2022. szeptember 1.

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Inactive courses