I. SUBJECT SPECIFICATION

1 BASIC DATA

1.1 Title
SOIL-STRUCTURE INTERACTION

1.2 Code
BMEEOGMMS52

1.3 Type
Module with associated contact hours

1.4 Contact hours

<table>
<thead>
<tr>
<th>type</th>
<th>hours/week</th>
</tr>
</thead>
<tbody>
<tr>
<td>lectures</td>
<td>3</td>
</tr>
<tr>
<td>seminars/exercise classes</td>
<td>1</td>
</tr>
</tbody>
</table>

1.5 Evaluation
midterm grade

1.6 Credits
5

1.7 Coordinator
name: Balázs Móczár PhD
academic rank: assistant professor
email: moczar.balazs@epito.bme.hu

1.8 Department
Engineering Geology and Geotechnics

1.9 Website
http://oktatas.epito.bme.hu/BMEEOGMMS52

1.10 Language of instruction
Hungarian

1.11 Curriculum requirements
Compulsory in the Structural Engineering (MSc) programme

1.12 Prerequisites
None

1.13 Effective date
1st of September, 2017

2 OBJECTIVES AND LEARNING OUTCOMES

2.1 Objectives
The scope of the subject is to teach the students the fundamentals of geotechnics required for structural design, such as familiarity with and use of EC7. These include geotechnical categori-
zation; types and contents of geotechnical documentations; geotechnical and structural design of piles for different loading types, design of soil-supported ground slabs along with the determination of the values of subgrade reaction modulus; design of pile-supported ground slabs and “rigid inclusion” slabs; structural design of excavation support structures, determination of soil reaction moduli along with their effect on deformations and internal forces; design of ground anchors; geotechnical questions of bridge abutments; and the basics of soil dynamics and geotechnical earthquake engineering.

2.2 Learning outcomes

After successful completion of the course, the student will be able:

A. Knowledge
   1. know the structure and fundamentals of EC7
   2. know the geotechnical categories, types and contents of geotechnical documentations
   3. know the process of pile design and the determination of spring stiffnesses
   4. know the process of designing elastically supported slabs and the determination of spring stiffnesses
   5. know the process of designing pile supported slabs and rigid inclusion and the determination of spring stiffnesses
   6. know the process of designing excavation support structures
   7. know the process of designing earth anchors and their detailing
   8. know the geotechnical aspects of bridge abutments
   9. know the fundamentals of designing for dynamic effects and earthquakes

B. Skills
   1. is able to interpret and apply EC7
   2. is able to design pile foundations
   3. is able to design elastically supported slabs
   4. is able to design pile supported slabs and rigid inclusion foundations
   5. is able to design excavation supporting structures
   6. is able to carry out the geotechnical modelling of bridge abutments and calculate embankment settlements
   7. is able to carry out geotechnical design for dynamic effects and earthquakes

C. Attitudes
   1. is cooperative with the teacher and co-students in gaining new knowledge,
   2. is continuously expanding his/her knowledge through learning,
   3. is open to the application of up-to-date software and state-of-the-art design methods,
   4. seeks to learn and routinely employ the design framework for geotechnical problem solving
   5. strives for accurate task solving

D. Autonomy and responsibility
   1. individually assesses geotechnical problems and tasks associated with structural engineering, as well as their solution based on given sources
   2. is open to reasoned critical remarks
   3. applies a systematic way of thinking

2.3 Methods

Lectures, practical classes, verbal and written communication, application of IT devices and techniques, optionally tasks performed independently or in work groups, work organization techniques.

2.4 Course outline

Week Scope of lectures and practical classes
1. Introduction and fundamentals of geotechnical design according to Eurocode 7-1. Types and contents of geotechnical documentations.
2. Geotechnical and structural design of pile foundations. Design considerations of elastically bedded reinforced concrete slabs. Effect of slab stiffness on ground reactions, and possibilities for the determination of the subgrade reaction modulus.
3. Design of pile-supported ground slabs.
4. Design of rigid inclusion foundation systems.
5. ZH1 (1st midterm test)
6. Structural design of excavation supports.
7. Anchored excavation support systems. Design of temporary and permanent ground anchors.
8. Geotechnical considerations of bridge abutments.
9. ZH2 (2nd midterm test)
10. In-situ geophysical tests: down-hole and cross-hole tests, seismic CPT, other means for the in-situ determination of wave propagation.
11. Laboratory determination of dynamic soil parameters. Small-strain stiffness parameters and stiffness degradation curve.
12. Determination of surface acceleration by site response analysis.
13. ZH3 (3rd midterm test)

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 schedule of the course on the subject website.

2.5 Study materials
a) Online materials
1. Lecture notes: Dr. Móczár Balázs-Józsa Vendel: Talaj-és szerkezet kölcsönhatása

2.6 Other information
1) Attendance to exercise classes is compulsory. The signature and credits from the subject will be refused to students missing 3 or more exercise classes.
2) Each student is required to submit their original work. Copying and submitting work of others, cheating and plagiarism in any form is unacceptable. Whoever violates the Studies and Exam Regulations of the University will be given a failing grade (1), without the possibility of retake and repeat, and will be reported to the Dean’s Office. The definitions of cheating and plagiarism are to be found in the Studies and Exam Regulations.

2.7 Consultation
The instructors are available for consultation during their office hours, as advertised on the department website. Special appointments can be requested via e-mail: moczar.balazs@epito.bme.hu
II. SUBJECT REQUIREMENTS

3 ASSESSMENT AND EVALUATION OF THE LEARNING OUTCOMES

3.1 General rules

The assessment of the learning outcomes specified in clause 0. above and the evaluation of student performance occurs via 3 tests, 3 homework assignments and exercise class activities.

3.2 Assessment methods

<table>
<thead>
<tr>
<th>Evaluation form</th>
<th>abbrev.</th>
<th>assessed learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. midterm test</td>
<td>ZH1</td>
<td>A.1-A.5; B.1-B4; C.5; D.4</td>
</tr>
<tr>
<td>2. midterm test</td>
<td>ZH2</td>
<td>A.6-A.8; B.5-B6; C.5; D.4</td>
</tr>
<tr>
<td>3. midterm test</td>
<td>ZH3</td>
<td>A.9; B.7; C.5; D.4</td>
</tr>
<tr>
<td>1. homework</td>
<td>HF1</td>
<td>A.1-A.5; B.1-B4; C.1-C.5; D.1-D.4</td>
</tr>
<tr>
<td>2. homework</td>
<td>HF2</td>
<td>A.6-8; B.7; C.1-C.5; D.1-D.4</td>
</tr>
<tr>
<td>3. homework</td>
<td>HF3</td>
<td>A.9; B.7; C.1-C.5; D.1-D.4</td>
</tr>
</tbody>
</table>

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

3.3 Evaluation system

<table>
<thead>
<tr>
<th>abbreviation</th>
<th>score</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZH1</td>
<td>25%</td>
</tr>
<tr>
<td>ZH2</td>
<td>15%</td>
</tr>
<tr>
<td>ZH3</td>
<td>15%</td>
</tr>
<tr>
<td>HF1</td>
<td>15%</td>
</tr>
<tr>
<td>HF2</td>
<td>15%</td>
</tr>
<tr>
<td>HF3</td>
<td>15%</td>
</tr>
<tr>
<td>Total achievable during the semester</td>
<td>100%</td>
</tr>
<tr>
<td>Sum</td>
<td>100%</td>
</tr>
</tbody>
</table>

All three midterm tests and the three homeworks are failed if the sum points of the tests are less than the 50% of the obtainable points. It is also required to reach at least 50% of the points for every evaluation.

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:

The final grade is the sum of the percentage result of the midterm test and the homework tasks (summing up to a maximum of 100 points)
<table>
<thead>
<tr>
<th>grade</th>
<th>points (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>excellent (5)</td>
<td>80&lt;=P</td>
</tr>
<tr>
<td>good (4)</td>
<td>70&lt;=P&lt;80%</td>
</tr>
<tr>
<td>satisfactory (3)</td>
<td>60&lt;=P&lt;70%</td>
</tr>
<tr>
<td>passed (2)</td>
<td>50&lt;=P&lt;60%</td>
</tr>
<tr>
<td>failed (1)</td>
<td>P&lt;50%</td>
</tr>
</tbody>
</table>

3.6  **Retake and repeat**

1) The 3 midterm tests can be retaken once each. A second retake is possible for only one midterm test.

2) Homework can be submitted with delay – after the payment of the fee determined in the Studies and Exam Regulations – until 16:00 of the last day of the supplementary period, or submitted in electronic format until 23:59 on the same day.

3.7  **Estimated workload**

<table>
<thead>
<tr>
<th>activity</th>
<th>hours/semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>contact hours</td>
<td>14x4=56</td>
</tr>
<tr>
<td>preparation for the courses</td>
<td>7x2=14</td>
</tr>
<tr>
<td>preparation for the tests</td>
<td>2x8+2x2=20</td>
</tr>
<tr>
<td>homework</td>
<td>10</td>
</tr>
<tr>
<td>home studying of the written material</td>
<td>20</td>
</tr>
<tr>
<td><strong>in total</strong></td>
<td><strong>120</strong></td>
</tr>
</tbody>
</table>

3.8  **Effective date**

September 1, 2020.