COURSE DESCRIPTION

1. Course title: Foundation Engineering
2. Course code: RB-S1-15-W3C
3. Validity of course description: 2015
4. Level of studies: BSc programme
5. Mode of studies: intramural studies
6. Field of study: Civil Engineering (FACULTY SYMBOL) RB
7. Profile of studies: general
8. Programme: 1) SE
9. Semester: 6
10. Faculty teaching the course: Department of Geotechnics and Roads (RB7)
11. Course instructor: dr inż. Krzysztof Sternik
12. Course classification: common subjects
13. Course status: obligatory subject
14. Language of instruction: English
15. Pre-requisite qualifications:
   Soil Mechanics, Foundation Engineering sem. 4, sem. 5
16. Course objectives:
The purpose of the course is to learn slope stability problem and various methods of supporting cut slopes. Various methods of strengthening subsoil for foundation purposes and designing principles for foundations under vibrations and seismic loading are also discussed. Simple sheet pile wall design and dewatering system design are the practical aspects of the course in the 6th semester.
17. Description of learning outcomes:

<table>
<thead>
<tr>
<th>No.</th>
<th>Learning outcomes description</th>
<th>Method of assessment</th>
<th>Teaching methods</th>
<th>Learning outcomes reference code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Knowledge on slope stability problem</td>
<td>exam</td>
<td>lecture</td>
<td>K1A_W06+++ K1A_W08++</td>
</tr>
<tr>
<td>2</td>
<td>Knowledge on designing principles for retaining walls and excavation supporting systems</td>
<td>exam</td>
<td>lecture</td>
<td>K1A_W06+++ K1A_W08++</td>
</tr>
<tr>
<td>3</td>
<td>Knowledge on miscellaneous methods for stabilization of subgrade soils</td>
<td>exam</td>
<td>lecture</td>
<td>K1A_W06+++ K1A_W08+++</td>
</tr>
<tr>
<td>4</td>
<td>Knowledge on basic design procedures for foundations under vibrations and seismic effects on foundations</td>
<td>exam</td>
<td>lecture</td>
<td>K1A_W06+++ K1A_W08+++</td>
</tr>
<tr>
<td>5</td>
<td>Ability to calculate active and passive pressures</td>
<td>oral defense of project, written project</td>
<td>project</td>
<td>K1A_U09+++</td>
</tr>
<tr>
<td>6</td>
<td>Ability to design a sheet pile wall</td>
<td>oral defense of project, written project</td>
<td>project</td>
<td>K1A_U09+++</td>
</tr>
<tr>
<td>7</td>
<td>Ability to calculate flux in the excavation</td>
<td>oral defense of project, written project</td>
<td>project</td>
<td>K1A_U09+++</td>
</tr>
<tr>
<td>8</td>
<td>Ability to design a simple dewatering system</td>
<td>oral defense of project, written project</td>
<td>project</td>
<td>K1A_U09+++</td>
</tr>
<tr>
<td>9</td>
<td>Competence of being responsible for the design of sheet pile wall and dewatering system</td>
<td>oral defense of project, written project</td>
<td>project</td>
<td>K1A_K01+++ K1A_K02++</td>
</tr>
</tbody>
</table>
18. Teaching modes and hours:
lecture: 20, classes: 4, project: 11,
19. Syllabus description:
Lecture: SLOPE STABILITY ANALYSIS: Slope stability problems, Slopes in soils presenting special problems, Slope stability charts, Detailed analyses of slope stability, Stabilization of slopes
RETAINING WALLS AND EXCAVATION SUPPORT SYSTEMS: Design considerations for retaining walls, Earth pressures, Equivalent fluid pressures, Design procedures for retaining walls,
Crib wall, Excavation support systems, Strutted excavations, Stability of bottom of excavation, Anchored walls
STABILIZATION OF SUBGRADE SOILS: Vibrocompaction, Vibrodissplacement compaction, Grouting and injection,
Precompression, Reinforcement, Miscellaneous methods (Remove and replace, Lime treatment, Portland cement, Stabilization using fills)

DESIGN FOR EQUIPMENT VIBRATIONS AND SEISMIC LOADINGS: Single degree of freedom, damped, forced systems, Foundations on elastic soils, Wave transmission, attenuation, and isolation, Evaluation of S-wave velocity in soils, Settlement and liquefaction, Seismic effects on foundations

Classes: Introduction to sheet pile wall design. Presentation of all steps in the design: active and passive pressure, effect of hydrostatic pressure and seepage pressure, dimensioning of sheet piles, embedment and anchorage, drawing.

Introduction to dewatering system design: determination of the number, size, spacing, and penetration of wells or wellpoints and the rate at which water must be removed from the pervious strata to achieve the required groundwater or pressure relief.

Project: Sheet pile wall design: active and passive pressures, water pressure, dimensioning of sheet piles, embedment and anchorage, drawing. Dewatering system design: the number, size, spacing, and penetration of wells, drawing.

20. Examination: yes

21. Primary sources:
- Wilun Z.: "Zarys geotechniki". WGiL, Warszawa, 2003
- Polish Standard: "PN-81/B-03020 Posadowienie bezpośrednie budowl".
- Polish Standard: "PN-83/B-03010 Ściany oporowe".
- EN 1997-1. "Eurocode 7".

22. Secondary sources:
- Das B M.: "Principles of Foundation Engineering". Global Engineering, Christopher M. Schortt
- WWW: "http://environment.uwe.ac.uk/geocal/geoweb.htm".

23. Total workload required to achieve learning outcomes:

<table>
<thead>
<tr>
<th>No</th>
<th>Teaching mode</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Participation in lectures</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Participation in exercises</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Participation in project classes</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Participation in additional consultations</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>Own work on preparatory to exam, colloquium, etc.</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Own work on preparatory to project</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Defense of the laboratory report, project etc.</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Participation in knowledge checking (exam, test, etc.)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Summary:</td>
<td>54</td>
</tr>
</tbody>
</table>

24. Total hours: 108 (1 ECTS = 27 h, PO 19/14/15)

25. Number of ECTS credits: 4

26. Number of ECTS credits allocated for contact hours: 2

27. Number of ECTS credits allocated for in-practice hours: 3

28. Comments:

1) shortened form of a speciality for the Civil Engineering: SE - Structural Engineering