1. Course number and name

RB-S1-19-S41-A6, Engineering Geology and Soil Mechanics II

2. Credits and contact hours*

3 ECTS, lectures: 15 hours**, laboratory: 15 hours**

3. Instructor's or course coordinator's name

Magdalena Kowalska, CEng, MSc, PhD, Assistant Prof.

4. Text book, title, author, and year

- Atkinson J. (2014) Fundamentals of Ground Engineering, CRC Press, ISBN 9781482206173
- Barnes G. E. (2016) Soil mechanics, Red Globe Press, ISBN: 9781137512208
- Lambe T.W., Whitman R. V. (1991) Soil Mechanics, Wiley, ISBN: 978-0-471-51192-2
- Whitlow R. (2000) Basic soil mechanics, Longman, ISBN 10: 0582381096

a. other supplemental materials

- PN-EN ISO 17892-1:2015-02 Geotechnical investigation and testing — Laboratory testing of soil — Part 1: Determination of water content
- PN-EN ISO 17892-5:2017-06 Geotechnical investigation and testing — Laboratory testing of soil — Part 5: Incremental loading oedometer test
- PN-EN 13286-2:2010 Unbound and hydraulically bound mixtures – Part 2: Test methods for the determination of the laboratory reference density and water content – Proctor compaction

5. Specific course information

a. brief description of the content of the course (catalog description)

Lectures: (1) Soil model and its parameters, (2) Physical and chemical properties of soils, (3) Non-typical soils: sensitive and swelling, (4) State of stress and strain in the ground, (5) Compressibility and consolidation, (6) Groundwater flow, (7) Shear strength of soil and Coulomb-Mohr failure envelope.

Laboratory: Geological-Engineering Cross-section, (2) Proctor compaction test, (3) Oedometer test

b. prerequisites or co-requisites

None

c. indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program

Required.

6. Specific goals for the course

a. specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic

The student can:

- describe soil components and use physical parameters of the soil model,
- determine stress distribution in the ground,
- describe stress-strain behavior of typical soils and soil stiffness,
- assess the groundwater flow velocity and check stability of excavation base due to hydraulic heave and soil piping,
- explain the dependency of shear strength of soil on normal stress, loading history and drainage conditions,
- prepare a geological-engineering cross-section based on borehole logs,
- conduct a Proctor test to determine compaction characteristics of soil,
- conduct oedometric test to determine consolidation and compression characteristics of soil.

b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

K1A_W07, K1A_U06

7. Brief list of topics to be covered

1. Three phase-soil model (soil skeleton, air, groundwater) and parameters of its description: density, unit weight, water content, void ratio, porosity, saturation degree.
2. Physical and chemical properties of soils: soil structure, activity, density, consistency (Atterberg limits), compactness – Proctor test (theory and practice).
3. Non-typical soils: sensitive and swelling.
4. State of stress and strain in the ground: Mohr circle, stress and strain paths, initial and induced stress, effective stress, coefficient of earth pressure at rest, loading history (OCR).
5. Compressibility and consolidation: stress-strain behavior of typical soils, stiffness moduli, coefficient of consolidation, oedometric test (theory and practice).
6. Groundwater flow: Darcy's law, coefficient of permeability, flow nets, seepage pressure, hydraulic heave and soil piping.
7. Shear strength of soil and Coulomb-Mohr failure envelope: effective angle of friction, effective cohesion, undrained shear strength, dilatancy and contraction, peak/critical/residual shear strength.
8. Geological-engineering cross-section.

*- Consultations were not included in the contact hours, **-per semester