6.2 CE0620 – Geotechnical Works

(1) GENERAL

SCHOOL	ENGINEERING SCHOOL		
ACADEMIC UNIT	CIVIL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**CE0620**	**SEMESTER**	**6**
COURSE TITLE	**Geotechnical Works**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialization Course
PREREQUISITE COURSES:	Soil Mechanics (CE0540) English level B2 or higher is required for Erasmus incoming students
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek (English/Erasmus)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/ET200/

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The purspose of the course is to complete the basic soil mechanics concepts in continuation of the "Soil Mechanics" course and to connect them to simple geotechnical engineering calculations methods.

Upon the successful accomplishment of the course the student will be able to:

- To know the concept of permeability of soils and to calculate permeability from falling and constant head test data.

- To know the consolidation of soils process and to apply the Terzaghi consolidation theory for the calculation of the settlement time evolution and magnitude.
- To calclulate the settlement under one dimensional consolidation conditions for linear elastic and no linear material with application of the loading and unloading – reloading curves.
- To distinguish the normally consolidated and overconsolidated soil states.
- To know how the overconsolidation concept affects the settlement calculation, to calculate the overconsolidation stress and ratio.
- To be able to calculate the compressibility, Cc, and unloading – reloadind, Cr or Cs, coefficients.
- To check a gravity retaining wall against sliding and overturning and to calculate the corresponding facotrs of safety.
- To calculate the stability anf the factor of safety of planar slide in dry soil.
- To calculate the maximum height of vertical excavation under undrained and drained conditions in fine grained soil.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?;.

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Search for, analysis and synthesis of data and information, with the use of the necessary technology*
Adapting to new situations	*Adapting to new situations*
Decision-making	*Decision-making*
Working independently	*Working independently*
Team work	*Team work*
Working in an international environment	*Working in an international environment*
Working in an interdisciplinary environment	*Working in an interdisciplinary environment*
Production of new research ideas	*Production of new research ideas*

The course aims that the student acquires - practice the following general skills:

- Search, analysis and synthesis of data
- Execution of autonomous or team work
- Design of geotechnical works
- Development of inductive thinking

(3) SYLLABUS

1. Introduction – Recap of necessary knowledge from “Soil Mechanics” - Presentation of geotechnical engineering applications in Civil Engineering
2. Porous soil D’Arcy flow. Actual and apparent flow velocity. Coefficient of permeability. Hydraulic gradient. Laboratory tests of constant and falling head. Data evaluation. Typical porous flow examples.
3. Terzaghi’s consolidation theory. One dimensional consolidation settlement. Non linear bahvaiour influence. The soil consolidation mechanism. Settlement and excess pore water pressure evolution with time using Terzaghi’s consolidation theory. Coefficient of consolidation, time factor, degree of consolidation. The influence of bundary conditions. Calculation using consolidation theory.
4. One dimensional compression. Non linear behaviour. Semilogarithmic compression and unloading – reloading curves. Normally consolidated and overconsolidated soil. Overconsolidation ratio. Settlement calculation of normally consolidated and overconsolidated soil. Heave calculation during unloading. Oedometer. Estimation of coeffients of compressibility and unloading – reloading.
5. Retaining walls. Basic principles and geomtery. Sliding and overturning check. The factor of safety concept and its application. The passive earth pressures role.
6. Planar sliding. Calculation of critical sliding plane. Sliding check using factor of safety.
7. Vertical excavation in fine grained soil. Calculation of the critical sliding plane. Sliding check using factor of safety.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face in-class teaching. When needed, distance teaching (synchronous/asynchronous)</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Use of I.C.T. in Teaching and Student Communication</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non- directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>In Class (/Distance) Teaching</td><td>52</td></tr>
<tr><td>Literature Study</td><td>50</td></tr>
<tr><td>Exercises / Paradigms</td><td>48</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>150</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open- ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>Language of evaluation: Greek (English/Erasmus)

Written examination, 2,5-hours

Problem solving, Multiple choice test, Questions and Answers,

Written Essay / Project

The evaluation criteria are announced to the students well before the examination; weights per subject /exercise are explicitly indicated.

The examination results (including total / partial grading) are announced on the web. Students may require to have access to their tests, they may ask for clarifications on mistakes, grading etc.</td></tr>
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(5) ATTACHED BIBLIOGRAPHY

Greek Bibliography:

1. Budhu M., SOIL MECHANICS AND FOUNDATIONS. GOTSIS KON/NOS & CO, 2020. (in Greek)
2. Koletsos K., Geotechnical Engineering. University Studio Press Editions, 2004. (in Greek)
3. Barnes G., Soil Mechanics: Principles and Applications. Kleidarithmos Editions, 2014. (in Greek)
4. Kavvadas M., Elements of Soil Mechanics. 2nd endition. Tsotras Editions, 2016. (in Greek)

Foreign Bibliography:

1. Das, Braja M., Advanced Soil Mechanics, 4th Edition, London, CRC Press, 2013
2. Soil Mechanics DESIGN MANUAL 7.01, NAVFAC, 1986
3. Verruijt Arnold, SOIL MECHANICS, Delft University of Technology, 2001, 2006