1.1.1 Geotechnical Failures and Soil Improvement Methods

GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	CIVIL ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	ΓΕΩ014	**SEMESTER**	9th
COURSE TITLE	Geotechnical Failures and Soil Improvement Methods		

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:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	

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*

Upon successful completion of the course, the student will be able to:

• Recognize, understand and describe the basic forms of geotechnical failures and their causes.

• Identify and comprehend the physical and mechanical geotechnical parameters associated with potential failure and requiring improvement.

• Distinguish and evaluate the mechanism of the resulting improvement for each soil strengthening method quantitatively assess the achieved improvement.

• Design and/or synthesize solutions based on the knowledge acquired during the lessons, and evaluate the particular requirements of the problem at hand, in order to achieve the optimal result of soil improvement.

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	*Project planning and management*
	Respect for difference and multiculturalism

Adapting to new situations *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

The course contributes to the following skills:

- Search, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Working independently
- Team work
- Working in an interdisciplinary environment
- Project planning

SYLLABUS

Study, analysis and design of measures for improving soils at risk of geotechnical failures. Issues related to soil failures (exceeding bearing capacity and/or settlements, liquefaction, etc.), slopes, underground structures, etc. are examined.

Content of theory lectures and application exercises:

- Basic characteristics and mechanical strength parameters of the soil.
- Presentation of basic types of geotechnical failures. Study of related soil properties, loading characteristics and causes leading to failure.
- Methods of improvement and strengthening soils under various risks (exceeding bearing capacity, exceeding settlements, soil liquefaction, landslides, slope failure, hydraulic excavation, etc.). Design, process, review of geotechnical parameters that are improved by each method.
- Detailed presentation and study of selected soil improvement methods based on literature methods and code provisions (soil compaction, soil replacement, soil reinforcement with grouting, micropiles, reinforced earth, geotextiles, soil preloading, drainage methods, gravel piles, etc.). Correlation with actual geotechnical failure cases addressed by each proposed improvement method.
- Monitoring the behavior of improved soils.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Lecture presentations using computer and projector, in person or by teleconference (remotely) if required. Support of the learning process through the e-learning platform and electronic communication with students (online announcements and comments, e-mail, announcements on the Department's website etc.). If required, support of students by using teleconference tools and software.
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.*	

Activity	*Semester workload*
Lectures	26
Practice/exercises	26
Practice/exercises	30
Individual study	48

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		
	Course total (26 hours workload per ECTS credit)	***130***
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.*	Written final examination including: • Theoretical knowledge and judgment questions on course subjects • Solving problems-exercises Written assignment (compulsory) which includes: • Processing and solving exercises-problems • Assessment of understanding key concepts of the course	

ATTACHED BIBLIOGRAPHY

- [In Greek] Κωστόπουλος Σ.Δ. (2008), "Γεωτεχνικές Κατασκευές ΙΙ", Εκδόσεις Ίων, ISBN: 978-960-411-657-7
- [In Greek] Ρόζος Δ. (2008), " Βελτίωση γεωτεχνικής συμπεριφοράς γεωλογικών σχηματισμών", Ηλεκτρονικό σύγγραμμα (διάθεση δωρεάν)
- [In Greek] Χριστούλας Στ. (1998), "Επιλογές Εφαρμοσμένης Γεωτεχνικής Μηχανικής", Εκδόσεις Συμεών, ISBN: 978-960-7888-11-1
- [In Greek] Barnes G.E. (2014), "Εδαφομηχανική: Αρχές και Εφαρμογές (3η έκδοση)", Εκδόσεις Κλειδάριθμος, Αθήνα, ISBN: 978-960-461-578-0