

COURSE OUTLINE

(1) GENERAL

SCHOOL	UNIVERSITY OF THESSALY		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	GK3602	SEMESTER	7
COURSE TITLE	Tunnels & Underground Structures		
INDEPENDENT TEACHING ACTIVITIES <i>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</i>	WEEKLY TEACHING HOURS	CREDITS	
	4	5	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialized general knowledge, skills development</i>	Special background		
PREREQUISITE COURSES:	Soil Mechanics I & II		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	ecommo.users.uth.gr		

(2) LEARNING OUTCOMES

<p>Learning outcomes <i>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.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> • <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i> • <i>Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i> • <i>Guidelines for writing Learning Outcomes</i>
<p>Advanced knowledge in the field of analysis and design of foundations and retaining structures. Advanced skills to solve complex problems with analytical-simulation and synthesis requirements.</p>

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

Analysis and design of foundations and retaining structures

(3) SYLLABUS

General presentation of foundations and retaining structures. Short reference to limit equilibrium methods (advantages – disadvantages). Reference to the implementation of numerical methods in foundation and retaining design.

Shallow foundations. Brief reference to methods estimating ultimate strength (description of failure mechanism – limit equilibrium) – Description of Eurocode 7 provisions. Bearing capacity under seismic loading – Reference to EAK-2000 and EC- 8 code provisions.

Parametric definition of the bearing capacity envelope under the combination of vertical and horizontal loading and bending moment. Analysis and design of strip and mat foundations.

Deep foundations. Pile bearing capacity under vertical loading (DIN 1054, EC-7). Single pile response under vertical loads. t-z method.

Pile bearing capacity under horizontal loading (Broms method). Single pile response under horizontal loads, p-y method.

Pile tests. Results elaboration, back analysis using numerical methods.

Pile group response under vertical loading. Interaction between piles, empirical stiffness and bearing capacity factors. Application of numerical methods to define characteristic piles' and pile heads' response.

Pile group response under horizontal loading. Interaction between piles, empirical stiffness and bearing capacity factors. Application of numerical methods to define characteristic piles' response.

Example of a pile group under vertical and horizontal loading. Analysis and design of piles' and pile head's reinforcement.

Retaining structures. Reference to earth pressures (earth pressures at rest, active, passive). Pressure variation according to displacements. Pressure variation due to seismic action. Design of reinforced concrete retaining walls (flexible).

Design of sheet piles retaining walls (constructive details). Design of pile and diaphragm walls, with or without anchorages or struts.

Examples of sheet piles and diaphragm retaining structures.

Introduction to solving retaining problems by using numerical methods. Assumptions and basic simulation principles. Examples.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	Yes	
TEACHING METHODS <i>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.</i> <i>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</i>	<i>Activity</i>	<i>Semester workload</i>
	Lectures – Theory – Exercises	56
	Homework: Study and analysis	66
	Preparation for final oral examination	25
	Final examinations	3
	Course total	150
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure <i>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</i> <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>	Language of evaluation: Greek Final examination: 100%	

(5) ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

Comodromos, M.A. (2019). *Foundations – Retaining Structures: limit equilibrium – numerical methods*, ISBN 978-960-461-958-8. Klidarithmos ed., Athens (in Greek).

Bowles, E.J. (1996). *Foundation analysis and design*. 5th edition, McGraw Hill, N.Y.

Poulos, G.H. (1980). *Pile foundation analysis and design*. J. Wiley & Sons, N.Y.

Tomlinson, M. J. (1994). *Pile design and construction practice*. E&FN Spon, London.

Prakash, S. and Sharma, D.H. (1990). *Pile foundations in engineering practice*. J. Wiley & Sons, N.Y.

Sanglerat, G., Olivari, G. and Cambou, B. (1983). *Problèmes pratiques de mécanique des sols et de fondations*. Deuxième édition, Dunod, Paris.

Barnes, G.E. (2005). *Εδαφομηχανική: Αρχές και Εφαρμογές*. Εκδόσεις Κλειδάριθμος, (in Greek).

- Related academic journals:

Geotechnique

Journal of Geotechnical and Geoenvironmental Engineering, ASCE

International Journal for Numerical and Analytical Methods in Geomechanics

Canadian Geotechnical Journal

Computers & Geotechnics

Tunnelling and Underground Space Technology
Geotechnical and Geological Engineering