

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE (LEVEL 7)		
COURSE CODE	FE0903	SEMESTER	9 th
COURSE TITLE	DEEP FOUNDATIONS AND RETAINING DIAPHRAGMS		
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	6
<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>	Specialized general knowledge and skills development		
PREREQUISITE COURSES:	SOIL MECHANICS I & II, FOUNDATIONS AND RETAINING STRUCTURES, COMPUTATIONAL GEOTECHNICAL ENGINEERING (prerequisite course knowledge without the requirement of passing an exam)		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	eclass.uth.gr/courses/CULT_U_128/		

(2) LEARNING OUTCOMES

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> <i>Consult Appendix A</i> • 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
1. Analysis and design of Deep Foundations and Retaining Diaphragms. 2. Description of construction layouts, construction designs and application of special solving codes. Students are able to analyze and design deep foundations and retaining diaphragms in civil engineering projects and develop responsibility and professional ethics regarding the responsibility of solving and dealing with deep foundations and retaining diaphragms problems.

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?

<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Project planning and management</i>
<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism</i>
<i>Decision-making</i>	<i>Respect for the natural environment</i>
<i>Working independently</i>	<i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Team work</i>	<i>Criticism and self-criticism</i>
<i>Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>
<i>Working in an interdisciplinary environment</i>	<i>.....</i>
<i>Production of new research ideas</i>	<i>Others...</i>
	<i>.....</i>

Cultivation of critical thinking skills in the analysis and synthesis of geotechnical data related to Deep Foundations and Retaining Diaphragms and the evaluation of results. Development of professional and ethical responsibility in the construction of technical projects in the natural environment and in society. Bibliographic search and management of information and data using ICT.

(3) SYLLABUS

1. General presentation of Deep Foundations and Retaining Diaphragms. Reference to numerical methods use.
2. Categories of Deep Foundations. Estimation of ultimate strength and response under vertical and horizontal loading. Eurocode provisions. Construction methods and required equipment. Construction arrangements, pile and pile head reinforcement.
3. Single pile under vertical loading. Pile bearing capacity. Single pile response. t-z method. Pile tests.
4. Pile group under vertical loading. Pile group response. Interaction between piles, empirical stiffness and, bearing capacity factors. Application of numerical methods to define the response of characteristic piles and pile heads.
5. Mechanisms of negative friction. Effects in pile groups. Countermeasures.
6. Single pile under horizontal loading. Pile bearing capacity. Single pile response. p-y method.
7. Pile group under horizontal loading. Pile group response. Interaction between piles, empirical stiffness and bearing capacity factors. Application of numerical methods to define the response of characteristic piles.
8. Retaining Diaphragm walls. Construction methods. Required mechanical equipment. Construction and simulation stages during design of works.
9. An example of calculation and design of a Retaining Diaphragm.
10. Soil – structures interaction. Application in Retaining Diaphragms of extensive depth and multiple reaction systems.
11. Design of anchorages and struts. Assumptions, simulation framework, construction arrangements.
12. Implementation of 2D and 3D codes for the analysis of Deep Foundations. Presentation and operation. Example.
13. Implementation of 2D and 3D codes for the analysis of Retaining Diaphragms. Presentation and operation. Example.
14. General retrospection in analysis and design of deep foundations and retaining diaphragms.

(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>	In lectures, the lecturer uses a laptop PC and a projector. The lecturer communicates with the students and makes educational material available via eclass and email. In addition, the Department's website is used for course announcements. The students solve the relevant exercises during the lectures with the help of the lecturer. Bibliographic research by the students is done online via the university library website.	
TEACHING METHODS <i>The manner and methods of teaching are described in detail.</i> <i>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>	Activity	Semester workload
	Lectures - Theory	56
	Exercises in the hall	28
	Home study	60
	Exam preparation	25
	Examination	3
	Course total	172
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>		
	The language of evaluation is Greek. The final evaluation for grading takes place at the end of the semester with a written exam. The evaluation method and the grading criteria of the exam are communicated to students in the 1st lesson and are announced in eclass.	

(5) ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

In Greek:

- 1) Barnes, G.E., (2005), "Εδαφομηχανική: Αρχές και Εφαρμογές", Εκδόσεις Κλειδάριθμος, Αθήνα.
- 2) Κωμοδρόμος, Αι.Μ., (2019), "Θεμελιώσεις Αντιστηρίξεις – Οριακή ισορροπία – Αριθμητικές Μέθοδοι", Εκδόσεις Κλειδάριθμος, Αθήνα.
- 3) Καββαδάς, Μ., (2007), "Σημειώσεις Θεμελιώσεων Τεχνικών Έργων", Ε.Μ.Π., Αθήνα
(users.ntua.gr/kavvadas/Books/books.htm).

In English:

- 1) Bowles, E.J., (2001), "Foundation Analysis and Design", McGraw Hill, New York.
- 2) Das, B.M., (2011), "Principles of Foundation Engineering", Cengage Learning, Stamford.
- 3) Prakash, S. and Sharma, D.H., (1990), "Pile foundations in engineering practice", John Wiley and Sons Ltd, New York.
- 4) Tomlinson, M.J., (2014), "Pile design and construction practice", E & FN Spon, London.

- Related academic journals:

- 1) Computers and Geotechnics, ISSN: 0266-352X.
- 2) Géotechnique, ISSN 0016-8505.
- 3) International Journal of Geomechanics, ISSN: 1532-3641.
- 4) International Journal for Numerical and Analytical Methods in Geomechanics, ISSN: 0363-9061.
- 5) Journal of Geotechnical and Geoenvironmental Engineering, ISSN: 1090-0241.
- 6) Soil Mechanics and Foundation Engineering, ISSN: 0038-0741.