

COURSE OUTLINE

(1) GENERAL

SCHOOL	UNIVERSITY OF THESSALY		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	FE0400	SEMESTER	8 ^o
COURSE TITLE	COMPUTATIONAL GEOTECHNICAL ENGINEERING		
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>	Specialized general knowledge, skills development		
PREREQUISITE COURSES:	Rigid Body Mechanics Soil Mechanics I, Soil Mechanics II Foundation and Retaining Structures		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	-		

(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
Introduction to the application of numerical methods for solving geotechnical engineering problems. Understanding the fundamental principles of simulating geotechnical engineering problems. Comparison of predictions of numerical methods with results of conventional analysis methods (limit equilibrium methods).

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...
	

The students acquire the following general competences:

1. Search for, analysis and synthesis of data and information
2. Decision-making
3. Project planning

(3) SYLLABUS

Principles of analysis of a continuous problem. Introduction to the Finite Element Method (FEM). Approaching a continuous problem using finite elements. Discretization rules. Master elements of finite elements. Isoparametric elements. Formulation of interpolation functions/shape functions. Definition of matrix equations. Determination of the stiffness matrix for a homogeneous element. Numerical integration/Gaussian integration. Conversion of general loadings to nodal loads. Introduction of stress fields and initial stress conditions. Formulation of equations at the finite element level and at the global level. Introduction to the Finite Difference Method (FDM). Linear elastic behavior of soils. Constitutive equations of an elastic isotropic medium. Application of linear elastic analysis to geotechnical engineering problems. Limitations and assumptions of linear elastic analysis. Introduction to the simulation of problems with elastoplastic behavior. Nonlinear behavior of soils and geostructures. Perfect elastoplastic behavior. Hardening elastoplastic behavior. Other "sources" of nonlinear behavior. Fundamental principles of discretization and simulation of geotechnical problem characteristics. Application examples in finite element and finite difference codes.

(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>	Use of ICT in teaching, communication with students	
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. 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	56
	Study	30
	Project	43
	Preparation for examinations	10
	Examinations	1
	Course total	140

STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i> <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>	Assessment is conducted through a semester-project and an oral exam in Greek. Through the exam the student's ability to apply the topics taught in the course is assessed.
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(5) ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

1. Comodromos E. (2009). Computational Geotechnical Engineering – Soil Structure Interaction. Kleidarithmos Ed., Athens (in Greek, distributed)
2. Bathe, K.J. and Wilson, E.L. (1976). Numerical Methods in Finite Element Analysis. Prentice- Hall, Englewood Cliffs, NJ.
3. Zienkiewicz, O.C., (1977). The Finite Element Method. 3rd Edition, McGraw-Hill Book Co., New York.

- Related academic journals:

1. Journal of Geotechnical and Geoenvironmental Engineering, ASCE
2. International Journal for Numerical and Analytical Methods in Geomechanics
3. Canadian Geotechnical Journal
4. Computers & Geotechnics
5. Acta Geotechnica
6. Soils and Foundations
7. Geotechnical and Geological Engineering