COURSE OUTLINE

(1) GENERAL

SCHOOL	**UNIVERSITY OF THESSALY**		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**ΓΕ0101**	**SEMESTER**	7ο
COURSE TITLE	Soil Dynamics		

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, specialized general knowledge, skills development*	Specialized general knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	-

(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 students study: the response of single and two-degrees of freedom systems, the propagation of waves in one, two and three dimensions, the cyclic behavior of soil, the seismic response of multi-layered soil formations, the seismic stability of slopes, seismic earth pressures on retaining structures, the dynamic soil-structure interaction of simple systems, and vibrations of machine foundations.
At the end of the course the students are capable of solving:

1. Problems of a single degree and two degrees of freedom systems.
2. Problems of wave propagation in one, two and three dimensions.
3. Problems related to dynamic properties, dynamic compaction and liquefaction of soils.
4. Problems related to the seismic response of multi-layered soil formations.
5. Seismic stability of slopes and seismic earth pressures on retaining systems.
6. Problems related to vibrations of machine foundations.

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

Introduction to Soil Dynamics and Geotechnical Earthquake Engineering. Introduction to Seismology. Earth structure, tectonic plates, seismic faults. Characteristics of strong ground motion. Assessment of ground motion parameters. Seismic risk. Seismic response of an SDOF system. Response spectra. Dynamic response of a 2 DOF system. Seismic waves. Wave propagation in one dimension. Applications of wave propagation in one dimension. Wave propagation in 2 and 3 dimensions. Surface waves. Rayleigh waves. Love waves. Dynamic behavior of soil element. Laboratory measurement of soil properties. Cyclic behavior and dynamic compaction of soil element. Liquefaction and cyclic mobility of granular soil. In situ measurement of dynamic properties. Seismic response of a multi-layered soil profile. Equivalent linear and nonlinear numerical analysis. Numerical Applications. Effect of soil characteristics and topography on the seismic response. Examples of seismic response from actual earthquakes. Design spectra. Micro-zonation studies. Newmark Method. Seismic stability of slopes. Seismic pressures on retaining structures. Dynamic soil - structure interaction. Dynamic impedance. Kinematic and inertial soil – structure interaction. Machine vibrations. Dynamic impedance for various foundation conditions.

(4) 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*	Use of ICT in teaching, communication with students

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

Activity	*Semester workload*
Lectures	56
Exercises	49
Examinations	3
Preparation for examinations	12
Course total	*120*

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.*	Assessment is conducted through written examinations at the end of the semester in the Greek language. The examinations are based on solving a series of problems that cover all the fundamental chapters of the course. They require a thorough understanding of the theory and extensive preparation through the completion of exercise booklets throughout the semester.

(5) **ATTACHED BIBLIOGRAPHY**

-Suggested bibliography:

1. Soil Dynamics, P. Dakoulas, UTh., 2005 (distributed, in Greek).
2. Soil Dynamics, G. Gazetas, NTUA, 2006 (in Greek).
3. Geotechnical Earthquake Engineering, K. Pitilakis, 2010 (in Greek).
4. Kramer, S., Geotechnical Earthquake Engineering, Prentice Hall, NJ, 1996.
5. Greek Seismic Code, TEE, 2008.

- Related academic journals:

1. Soil Dynamics and Earthquake Engineering, Elsevier