COURSE OUTLINE

1. GENERAL

SCHOOL	ENVIRONMENT AND AGRICULTURAL ENGINEERING		
ACADEMIC UNIT	NATURAL RESOURCES AND AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**57**	**SEMESTER**	**7th**
COURSE TITLE	SOIL MECHANICS – SOIL EROSION		

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**
lectures	3	3
Laboratory exercises	2	2
	5	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*	Special background, Specialised general knowledge Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
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 course aims to provide basic knowledge on the physical and mechanical properties of the soils under load and the comprehension of erosion mechanisms. The latter will provide the students with the necessary skills for estimating soil strength under different conditions and assess potential failures in infrastructure works and agricultural buildings, allowing for prevention measures. Students will assess the soil properties and the foundation conditions based on the analysis of the granulometry and humidity factors and particularly assessing for the liquefaction potential. Students are expected to be familiar with the relationship between stress and strain, with the factors that contribute to failure and to assess potential failure from overloads (buildings) or lateral loading (sliding). They will learn key tests and methodologies applied in the field and the labs. Lectures will be focused also on the Hellenic Seismic Code and Eurocode 8, regarding the active faults, the soil categories and the building types. Students will be able to assess the soil categories and the impacts of active faults that define planning regulations per type of building.

In this course students are expected to synthesize the knowledge obtained from other courses such as Geology-Geomorphology, Soil sciences and Strength of materials to assess soil conditions and adjust their planning based and the seismic code and building regulations.

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…*
	…….

Respect for the natural environment
Working in an interdisciplinary environment
Decision-making
Project planning and management
Search for, analysis and synthesis of data and information, with the use of the necessary technology

3. SYLLABUS

1. Basic terminology in Soil Mechanics – Soil formation, Autochonous soils, weathered rocks, Peat, alluvial deposits and fans, Geological background, stratigraphy and sedimentological processes, the importance of granulometry and humidity in soil mechanics, in situ and laboratory sampling methods, Atterberg limits
2. Stresses and mechanical properties of the soils, cohesion, friction, Mohr cycles, effective stress and pore pressure, Total stress, capillary rise above the water table, effective stress above the water table and the role of vegetation,
3. Bearing capacity, Shear strength, Stress and Strain, Mohr-Coulomb failure criterion, Stress paths, Unconfined pressure, triaxial unconsolidated undrained test, Standard Penetration Test,
4. Definition of the geological and geotechnical model – Stratigraphy – Geological and Geotechnical maps, Hellenic Seismic Code and Eurocode 8, Active Faults, seismic risk categories, Soil categories, building categories, liquefaction risk, planning permits and regulations

B. EROSION

1. Forms and types of soil erosion
2. Surface erosion: 2.1. Mechanism of surface erosion, 2.2 Types of surface erosion
3. Mass movements: 3.1 Creep of saturated soil, 3.2 Creep of soil, 3.3 Landslides
4. Genetic and regulatory factors of surface erosion 4.1. Rain height, 4.2 Rain intensity, 4.3 Rain frequency, 4.4. Vegetation, 4.5 Slope and slope length, 5.6 Soil
5. Universal Soil Loss Equation for surface erosion.
6. Protection measures for erosion 6.1 bio-cultivation techniques, 6.2 Technical anti erosion works: terraces, absorption networks, diversion networks
7. Wind erosion

Laboratory exercises

Lab 1	Granulometric analysis and its importance in soil mechanics
Lab 2	Cohesion, Atterberg limits, Geotechnical drills
Lab 3	Effective and Full Stress, Mohr cycles, Mohr-Coulomb Failure

	criterion
Lab 4	Standard Penetration Test
Lab 5	Hellenic Seismic Code and active faults, analysis of geological maps, active faults identification and fault type characterization, maximum expected earthquake magnitude and surface rupture parameters
Lab 6	Hellenic Seismic Code and Eurocode 8, Soil categories, regulations and permits for agricultural and typical building categories
Lab 7	Characteristics of Rainfall and calculation of unit energy of rain part
Lab 8	Calculation of total rain energy
Lab 9	Application of USLE (Universal Soil Loss Equation)
Lab 10	Determination and design of a protection network based on the Soil Loss Equation
Lab 11	Design of slope protection network in Western Greece
Lab 12	Determination of indices for aggregate stability in water

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face to Face contact in classroom
A lecture will be held at the soil mechanics room at the Mineralogy-Geology laboratory</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>PowerPoint presentations
Using internet applications</td></tr>
<tr><td>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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>36</td></tr>
<tr><td>Laboratory exercises</td><td>24</td></tr>
<tr><td>Homework</td><td>65</td></tr>
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<tr><td>Course total</td><td>125</td></tr>
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<tr><td>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.</td><td>Written theory and laboratory exams (100%) including:
- short-answer questions
- open-ended questions
- problem solving and laboratory exercises</td></tr>
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5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1) Soil mechanics (2014). Graham Barnes ISBN-13: 9789604615780, 584p.

- Related academic journals:

1) Engineering Geology
2) Soil Dynamics and Earthquake Engineering
3) Soil science
4) Geoderma
5) Catena
6) Soil and Tillage research