COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF ENVIRONMENT AND AGRICULTURAL ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF NATURAL RESOURCES DEVELOPMENT AND AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	Postgraduate		
COURSE CODE	**630012**	SEMESTER	2nd
COURSE TITLE	Special topics in Soil Physics		

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 and Laboratory exercises	5	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		5

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific Area
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
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 purpose of the course for the student is:

1. To understand the physical/hydraulic properties of soils and crop growth substrates.

2.To be able to follow the appropriate methods of determining soil physical properties in the laboratory and in the field.

3. To understand the laws of soil water dynamics and to use them for the purpose of the sustainability of soils and growing plants.

4. To understand the phenomenon of Hysteresis of water in porous media, to apply various models to describe it and to explain soil behavior in cases where hysteresis plays an important role.

5. To combine field drainage data as well as measurements using disc infiltrometers to determine soil hydraulic properties under field conditions and be able to explain the post-fire behavior of forest soils.

6. To calculate various indices of the soil structure stability to water, to estimate the possibility of destruction of the surface soil by water erosion, in the case of intense runoff.

7. To Identify and evaluate organic and inorganic substrates used to grow crops, to propose the appropriate composition of various mixtures used for crop growth, as well as the use of the appropriate soil conditioners for improving the physical-hydraulic properties of soils.

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

Adapting to new situations

Decision-making

Working independently

Team work

Working in an international environment

Working in an interdisciplinary environment

Production of new research ideas

Project planning and management

Respect for difference and multiculturalism

Respect for the natural environment

Showing social, professional and ethical responsibility and sensitivity to gender issues

Criticism and self-criticism

Production of free, creative and inductive thinking

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Others…

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1. Search, Analysis and Synthesis of Data and Information
2. Autonomous Work

3. Promotion of free, creative, and inductive thinking

3. SYLLABUS

1. Internal drainage of a soil profile - use of the instantaneous profile method to determine the hydraulic properties of a layered soil profile.

2. Infiltration of water using infiltrometers (single cylinder infiltrometer, two concentric cylinder infiltrometer, negative pressure disc infiltrometer) and their use to determine the hydraulic properties of soils.

3. Indicators of the soil structure stability to the action of water (use of S.M.C., instability index, geometric mean diameter, gravimetric mean diameter, etc.)

4. The hydraulic properties of porous media and the role of hysteresis

5. The hysteresis of the water content (θ) – soil water pressure head (H) relationship

(Prediction models of the θ-H hysteretic relationship, The model of independent domains, The Mualem models, The Parlange model)

6. The hysteresis in the hydraulic conductivity-pressure head or water content relationship

7. Darcy's Law in the presence of hysteresis

8. Development of soil water content profiles in the presence of hysteresis

9. The role of hysteresis in soil water redistribution

10. Organic and inorganic substrates for growing crops (peats, coir, perlite, rockwool, etc.).

11. Origin of substrates, their use, their peculiarities, and their comparison with soils.

12. Methods of determining physical-hydraulic properties of substrates.

13. Principles of synthesis of mixtures using various substrates.

14. Soil improvers (natural, artificial, and synthetic soil improvers)

15. The role of soil improvers in improving the physical-hydraulic properties of soils.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In classroom, in the laboratory and in the field.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Exploitation of Information and Communication Technologies in teaching, in laboratory training and in communication with students.

Use of ICT in teaching, laboratory education, 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*	<table><tr><th>*Activity*</th><th>*Semester workload*</th></tr><tr><td>Lectures</td><td>65 hours</td></tr><tr><td>Practical Laboratory Exercises focusing on the application of methodologies and exercises in the field.</td><td>45 hours</td></tr><tr><td>Processing of laboratory measurements</td><td>15 hours</td></tr><tr><td>Course total</td><td>***125 hours***</td></tr></table>
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.*	I. Final written exam (50%) which includes: Theory questions (multiple choice and short answer) and problem solving. II. Final written exam (25%) about laboratory exercises and laboratory work. III. Two assignments (25%) with presentation and oral examination **Marking Scale:** 0-10. **Minimum Passing Mark:** 6.

5. ATTACHED BIBLIOGRAPHY

Proposed literature:

Hydrology of Agricultural Soils – Drainage – A. Poulovassilis (in Greek)
Environmental Soil Physics, D. Hillel.
Soil Physics, William A. Jury and Robert Horton, 6th Edition, Wiley.

Scientific Journals

-Soil Science
-Soil Science Society of America Journal
-Vadose Zone Journal
-Water Resources Research
-Agricultural Water Management
-Soil research

-Geoderma