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	**630001**	SEMESTER	1st
COURSE TITLE	Special topics in Irrigation and Irrigation Systems		

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
Theory: Lectures	3	3
Laboratory: Use of Software Tools	2	2
		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*	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 is the familiarization and understanding of the students, through the presentation of theoretical units and practical laboratory exercises of irrigation scheduling and the modern technologies applied in irrigation systems.
Upon successful completion of the course, the student will be able to:
1. Understand field determination methods for soil water content, to use in scheduling and applying irrigation.
2. Calculate the water balance of an irrigated soil profile and apply it to irrigation by taking into consideration rational criteria and respect for the environment.
3. Be able to calculate the crop water requirements when water is sufficient as well as when it is in deficiency and will be able to decide on the adequacy of the source of water for irrigation of the crops of a specific development plan of an area. To be able to choose the participation rates of the crops in a specific development plan based on the adequacy of the available irrigation water and to be able to plan the possibility of applying deficit irrigation, while he/she will be able to estimate the plant water stress in case of insufficient water supply by using various indicators, to make rational irrigation planning.
4. In addition, he will learn to deal with the phenomenon of water redistribution after irrigation in a practical way and to calculate the available water for the plants.
5 Also, students will familiarize themselves with methods of designing and evaluating irrigation systems in the field. In addition, they will be able to apply the appropriate methods of designing small irrigation pressurized networks without resorting to complex methodologies and specialized software.
6. The student will understand the solution of the equations describing the phenomenon of infiltration using numerical methods and will be trained in using specialized software for this purpose.

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…*

…….
1. Search, Analysis and Synthesis of Data and Information, using the Necessary Technologies 2. Adapting to New Situations 3. Decision-making 4. Autonomous Work 5. Teamwork 6. Project planning and management 7. Respect for the natural environment

3. SYLLABUS

Section 1

Crop evapotranspiration under conditions of sufficient and insufficient irrigation water. Calculation of the irrigation requirements of a representative hectare of the utilization area of an irrigation network, specific irrigation discharge. Deficit irrigation and choice of crop distribution. Irrigation scheduling based on the daily water balance of the irrigated soil profile. Redistribution of water after irrigation. Crop water stress and its control - Plant water stress indicators and their use in irrigation scheduling.

Section 2

Methods for the determination of soil moisture in the field. Neutron method, dielectric methods. Properties of dielectric materials. The relation of soil moisture - dielectric constant. Topp's equation (1980). Key factors influencing soil moisture - dielectric constant relationship. The effect of soil salinity and temperature on low frequency operating devices. Basic methods of device calibration, The method of homogeneous moisture, The Young method. Types of dielectric devices: TDR, Capacitance and FDR, TDT (Principle of operation. Advantages-disadvantages) and their calibration equations. Measurement of hydraulic conductivity (K) and sorptivity (S) in the field using various types of negative pressure infiltrometers. Steady and non-steady flow methods.

Section 3

Design of irrigation systems and small pressurized irrigation networks.

Section 4

The mathematical model of vertical infiltration in homogeneous soil and its numerical solution by the finite difference method. The mathematical model. Initial and boundary conditions. Numerical solution of the mathematical model. Convergence and stability of the mathematical model.

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>In classroom</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Exploitation of Information and Communication Technologies in teaching, in laboratory training and in communication with students.
Use of dedicated software.
Use of integrated e-learning system.
Communication with students via open e-class platform and e-mail.</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>35 hours</td></tr>
<tr><td>Case Studies which complete a full cycle of spatial data analysis and spatial interpolation and final creation of continuous distribution maps of a property in a GIS environment, to address environmental problems.</td><td>75 hours</td></tr>
<tr><td>Exercises and presentations</td><td>15 hours</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>125 hours</td></tr>
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</td></tr>
<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>Four written laboratory exercises (40%) of case studies (development of spatial data, their processing, modeling, calculations, cartography).
Oral examination (60%) on how to deal with and implement case studies that each student (or group of students) faced.
Two papers on the calibration of moisture sensors and the determination of hydraulic conductivity using an infiltrometer in the field.
Two assignments on the design of a surface irrigation system and a small irrigation water distribution network in agricultural plots. (weight: lectures we give / total lectures)
Two assignments concerning irrigation scheduling when water is insufficient or sufficient, as well as the adequacy control of the available amount of water for irrigation of an area corresponding to a specific development plan of an area.
Case study using specific software for the numerical solution of infiltration.</td></tr>
</table>

	Marking Scale: 0-10. **Minimum Passing Mark:** 6.

5. ATTACHED BIBLIOGRAPHY

Proposed literature: (Scientific Journals) Journal of Irrigation and Drainage Engineering (ASCE) Water Resources Research Agricultural Water Management