COURSE OUTLINE

1. GENERAL

SCHOOL	AGRICULTURAL SCIENCES		
DEPARTMENT	CROP SCIENCE		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	CRS_505	**SEMESTER OF STUDIES**	5th
COURSE TITLE	Irrigation-Drainage		

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*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures	2	
Laboratory exercises	2	
Tutorials	1	
Total	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, Skills Development
PREREQUISITE COURSES:	Typically, there are not prerequisite courses.
TEACHING AND ASSESSMENT LANGUAGE:	Greek. Teaching may be however performed in English in case foreign students attend the course.
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (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 at the acquisition of knowledge in irrigation as well as the design and operation of irrigation systems.

The syllabus of this course aims to understanding of:

1. Basic concepts of soil water movement, the mechanisms and theories that govern the distribution and storage of soil water
2. The procedures and methodologies for the study and estimation of soil parameters involved in the application of irrigation
3. Basic principles of irrigation water quality and the best practices during irrigation with water of poor quality
4. The different types of irrigation systems, their operating principles, the methodologies for the design and dimensioning of surface irrigation, sprinkler systems and micro-irrigation
5. The main parts, the operation, the advantages and the disadvantages of irrigation systems

General Abilities

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

By the end of this course the students will be able to:

1. To understand and handle topics related to the rational management and application of irrigation water, to detect problems in the design and application of irrigation
2. To identify soil properties required for the design and installation of irrigation systems
3. Have knowledge for the selection and installation of appropriate irrigation systems (irrigation with surface irrigation, sprinkler systems and micro-irrigation)
4. Design irrigation systems
5. Acquire necessary skills to continue their professional advance
6. Interact with interdisciplinary problems in the field of irrigation

Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above):

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Production of free, creative and inductive thinking
Criticism and self-criticism
Respect for the natural environment
Project planning and management

3. SYLLABUS

1. Introduction
2. Soil properties – Soil moisture - Infiltration
3. Evapotranspiration (Part I)
4. Evapotranspiration (Part II)
5. Simplified methods of evapotranspiration estimation
6. Crop water needs – Crop evapotranspiration
7. Crop water needs – Irrigation scheduling
8. Surface irrigation
9. Sprinkler irrigation
10. Micro-irrigation (Part I)
11. Micro-irrigation (Part II)
12. Quality of irrigation water
13. Precision irrigation

The **Laboratory exercises** include experiments and exercises in the laboratory and in the field, in order to present applications of the methodologies discussed in the theoretical part

Laboratory exercise 1: Infiltration experiment and estimation of the infiltration equations using the graphical method and the least squares method

Laboratory exercise 2: Evapotranspiration estimation using the methods: FAO-56 Penman-Montheith, Hargreaves-Samani and Parametric
Laboratory exercise 3: Sprinkler system design study (Part I): Layouts, sprinkler types, irrigation uniformity, selection of sprinklers, irrigation materials and parts
Laboratory exercise 4: Sprinkler system design study (Part II): Hydraulic computations of laterals, main lines and pump selection
Laboratory exercise 5: Drip irrigation system design study (Part I): Layouts, emitter types, drip lines, irrigation parameters, irrigation materials and parts
Laboratory exercise 6: Drip irrigation system design study (Part II): Hydraulic computations of laterals, main lines and pump selection

4. TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD *Face-to-face, Distance learning, etc.*	Lectures in class, in the laboratory and in the field (face to face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, laboratory education, communication with students*	Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching. Problem solving with the use of spreadsheet software. Direct communication with the students (face to face and by e-mail), Support of the learning process and uploading of the educational material to the electronic platform (e-class): https://eclass.upatras.gr
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 (2 contact hours per week x 13 weeks)	26
Laboratory practice, fieldwork (2 contact hours per week x 7 weeks)	14
Tutorials (1 contact hour per week x 13 weeks)	13
Hours for private study of the student and preparation for mid-term or/and final examination / Final examination	72
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***125 hours (total student work-load)***

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.*	1. Written examination after the end of the semester. Minimum passing grade: 5. **Evaluation of theoretical part (50%)** Written examination. It is mandatory to obtain pass grade (≥5). **Evaluation of the laboratory work (50%)** Written examination. It is mandatory to obtain pass grade (≥5). All the above are taking place in Greek as well as in English for foreign students (e.g. ERASMUS students) if any.

5. RECOMMENDED LITERATURE

1. FAO Irrigation Manual, Volume II, Module 7, 2002, “Surface Irrigation Systems”.
2. FAO Irrigation Manual, Volume III, Module 8, 2001, “Sprinkler Irrigation Systems”.
3. FAO Irrigation Manual, Volume IV, Module 9, 2002, “Localized Irrigation Systems”.
4. FAO Irrigation and Drainage Paper 29 Rev. 1, 1985, “Water quality for agriculture”.
5. Allen, R.G., Pereira, L.S., Raes, D., Smith, M., and others, 1998. Crop evapotranspiration-Guidelines for computing crop water requirements-FAO Irrigation and drainage paper 56. *FAO, Rome*, 300 (9).

6. Tegos, A., Malamos, N., and Koutsoyiannis, D., 2015. A parsimonious regional parametric evapotranspiration model based on a simplification of the Penman–Monteith formula. *Journal of Hydrology*, 524, 708–717.
7. Bartram, J. and Ballance, R., 1996. *Water Quality Monitoring: A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes*. Taylor & Francis.