COURSE OUTLINE

1. GENERAL

SCHOOL	AGRICULTURAL SCIENCES		
DEPARTMENT	AGRICULTURE		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	AGRI_503	**SEMESTER OF STUDIES**	5th
COURSE TITLE	AGRICULTURAL HYDRAULICS		

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	3	
Laboratory exercises	2	
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 hydrology, hydraulics and their applications in the fields of irrigation and drainage.

The syllabus of this course aims to understanding of:

1. Basic concepts for the hydrological cycle, water sources, irrigation projects
2. Basic concepts and principles that govern the water status in the ground, the relationships between soil, plant and atmosphere, theories of water movement in the unsaturated and the saturated zone
3. Basic concepts and principles of hydraulic governing the water transport in open channels and pipes
4. Basic concepts and principles for drainage systems design

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. Demonstrate knowledge and understanding of the essential phenomena, concepts, principles and theories related to the water sources, the dynamics of soil water, the water transport in open channels and pipes, crop water needs and drainage

2. Apply this knowledge and understanding with a view to expanding knowledge in more complex aspects of agricultural hydraulics and tackle unfamiliar problems

3. Acquire necessary skills to continue their professional advance

4. Interact with interdisciplinary problems in the field of agricultural hydraulics

Generally, by the end of this course the students 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

3. SYLLABUS

1. Introduction
2. Water budget
3. Soil hydraulic properties
4. Soil water dynamics
5. Introduction to fluid mechanics
6. Hydrostatics
7. Hydrodynamics
8. Water flow in pipes (Part I)
9. Water flow in pipes (Part II)
10. Water flow in open channels
11. Drainage of soils (Part I)
12. Drainage of soils (Part II)
13. Design parameters of drainage networks

Laboratory exercises

Laboratory exercise 1: Creation and processing of water balance variables timeseries

- **Laboratory exercise 2:** Sampling and determination of soil hydraulic properties – Direct and indirect methods for the determination of soil moisture and soil water pressure head
- **Laboratory exercise 3:** Determination of the soil water retention curve and hydraulic conductivity

- **Laboratory exercise 4:** Pipes and materials– Calculation of frictional pressure losses, Selection of the optimal pipe sizes, Moody diagram
- **Laboratory exercise 5:** Open channels and hydraulic constructions – Flow measurement, - Calculation of water speed and flow rate in streams and open channels
- **Laboratory exercise 6:** Drainage pipes and drainage networks. Measurement of saturated hydraulic conductivity in the laboratory and in the field. Calculation of drainage pipes equidistance
- **Laboratory exercise 7:** Recapitulation – Exemplary solution of exercises

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. 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*	
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. Optionally, two mid-term examinations, with the final examination grade to be the mean mark. It is mandatory to obtain pass grade (≥5) in each examination. 2. 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.

Activity	***Semester workload***
Lectures (3 contact hours per week x 13 weeks)	39
Laboratory practice, fieldwork (2 contact hours per week x 7 weeks)	14
Mid-term examinations (2 mid-term examinations x 2 contact hours each)	4
Hours for private study of the student and preparation for mid-term or/and final examination / Final examination	68
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***125 hours (total student work-load)***

5. RECOMMENDED LITERATURE

1. Mott, R.L., 2006, “Applied fluid mechanics”, Prentice Hall
2. Hillel, D., 1998, “Environmental Soil Physics”, Academic Press
3. Mays, L. W., and Y. ‐ K. Tung, 1992, “Hydrosystems Engineering and Management”, McGraw-Hill, New York