COURSE OUTLINE

1. GENERAL

SCHOOL	AGRICULTURAL SCIENCES		
DEPARTMENT	AGRICULTURE		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	AGRI_EX10	**SEMESTER OF STUDIES**	7th or 9th
COURSE TITLE	IRRIGATION WATER MANAGEMENT AND QUALITY		

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*	SPECIALISED GENERAL KNOWLEDGE, 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 essential knowledge considering the management of water resources, for the students of the Department of Agriculture.

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

1. Estimate and manage the demand for various water uses and apply water resources management techniques.
2. Understand the basic and critical features of water resources development, their connection with the

global financial and operational objectives along with decision-making principles, especially in water crisis conditions, e.g. drought, desertification, environmental degradation etc.

3. Understand and estimate the modern concepts of water management in agriculture, such as the Water Footprint of the agricultural products.
4. Realize the design procedures and techniques for the study, analysis and determination of surface and groundwater quality.
5. Apply spatial analysis techniques of irrigation water quality data using tools such as geographic information systems.
6. Realize the environmental legislation, criteria and standards to assess the quality status of water bodies.

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

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
Team work
Production of free, creative and inductive thinking
Working in an interdisciplinary environment
Respect for the natural environment
Production of new research ideas

3. SYLLABUS

1. Concepts and components of water resources management, water resources availability and different water uses
2. Water management authorities, Water resources development works and hydrosystems
3. Economic and social aspects, Water pricing, Legislation framework for the protection and management of water resources
4. Virtual water and water footprint
5. Indicators and Environmental Standards of Water Quality.
6. Processes and mechanisms of irrigation water interactions with the soil.
7. Physical and chemical parameters and quality criteria for irrigation water.
8. Design principles and techniques for sampling surface water and groundwater (Part I).
9. Design principles and techniques for sampling surface water and groundwater (Part II).
10. Methods for determining irrigation water quality parameters. Sample analysis techniques (Part I).
11. Methods for determining irrigation water quality parameters. Sample analysis techniques (Part II).
12. Analysis of irrigation water quality data using geographic information system (Part I).
13. Analysis of irrigation water quality data using geographic information system (Part II).

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: Special Water Sampling - Irrigation water sampling
Laboratory exercise 2: Determination of water hardness, $Ca^{2+,}$ $Mg^{2+,}$ by UV-Vis absorption spectrophotometry
Laboratory exercise 3: Spectrophotometric Determination of Sulfate Ions-Colorimetric Method
Laboratory exercise 4: Determination of carbonate and bicarbonate ions
Laboratory exercise 5: Implementation of geographic information system for the spatial assessment of irrigation water quality parameters (Part I)
Laboratory exercise 6: Implementation of geographic information system for the spatial assessment of irrigation water quality parameters (Part II)
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
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 3 contact hours per week x 13 weeks)	39
Laboratory practice, fieldwork (2 contact hours per week x 7 weeks)	14
Hours for private study of the student / preparation of the teamwork case study 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. Optionally, two mid-term examinations with the final examination grade to be the mean mark, for the theoretical part. 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.

5. RECOMMENDED LITERATURE

1. Grigg, N. S., 1996, “Water Resources Management”, McGraw‐Hill, New York.
22. Yuncong L. and K. Migliaccio “Water Quality Concepts, Sampling, and Analyses” CRC Press, 2010
3. UNEP/ WHO. Water quality monitoring: A practical guide to the design and implementation of freshwater quality studies and monitoring programmes. 1996
4. FAO Irrigation and Drainage Paper 29, Water quality for agriculture, ISBN 92-5-102263-1