COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF ENVIRONMENT & AGRICULTURAL ENGINEERING		
ACADEMIC UNIT	NATURAL RESOURCES MANAGEMENT &AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	Postgraduate		
COURSE CODE	**630008**	**SEMESTER**	1°
COURSE TITLE	SPECIFIC WATER QUALITY ISSUES		

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/ Applications and Laboratory practice	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/ Skill development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
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 course aims to acquire basic knowledge and understand the water quality parameters and the characteristics of water resources, the sources of pollution and the characteristics of the main pollutants, the transport processes and the impact of pollutants in groundwater and surface water. Additionally, it is designed to provide students with the basic tools and methodologies for solving problems of water pollution and issues arising from the use of poor quality in agriculture.

After the successful completion of the course, students are expected to:

- understand the basic concepts of groundwater and surface water quality
- understand the characteristics of the main groups of pollutants, their toxicity and their sources
- know the processes that determine the transport and environmental fate of pollutants in the unsaturated soil zone, groundwater and surface water and their main pollution problems.
- be able to use methodologies for solving pollution problems in water bodies
- be able to manage water resources of marginal quality such as brackish water and treated effluent in agriculture
- be aware of the environmental impact of agricultural activities.

- know the methods and techniques for measuring water quality parameters and the criteria for assessing water quality
- have knowledge of European and National legislation on the protection of water resources and the safe utilization of treated wastewater in irrigation

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…*
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Decision-making
Project planning and management
Working independently
Teamwork
Respect for the natural environment
Production of free, creative and inductive thinking

3. SYLLABUS

- Water resources and water quality parameters (physical, chemical, and biological).
- Characteristics of pollutants and impacts on water bodies. Priority pollutants. Heavy metals. Nitrogen and phosphorus. Persistent organic pollutants. Emerging organic pollutants. Endocrine disruptors, Pesticides.
- Mass transport in the unsaturated zone and groundwater. Solution of mass transfer problems by analytical methods. Mathematical model HYDRUS. Multiphase flow, transport of Non-Aqueous Phase Liquids (NAPL) in porous media and groundwater pollution.
- Hydrodynamic, Physicochemical, and biological processes of pollutants in surface water systems. Oxidation of organic compounds and oxygen balance in surface waters. Eutrophication. Methods for the protection and restoration of surface waters.
- Irrigation water quality. Management of poor water quality and reuse of treated wastewater for irrigation. Sustainability of agriculture. Agriculture as a factor in the degradation of water bodies.
- Water sampling. Surface and groundwater quality monitoring networks. Water quality criteria and constants.
- Methods for measuring water quality parameters. Measurement techniques, operation principles of analytical instruments (spectrophotometry, titration, potentiometry, atomic adsorption potentiometry).
- Water sampling. Surface and groundwater quality monitoring networks. Water quality criteria and constants.
- Methods for measuring quality parameters. Measurement techniques, (spectrophotometry, titration, potentiometry, atomic spectroscopy).
- Legistration (National and European) for water protection. Directive EC 60/2000. Regulation on the reuse of treated effluents for irrigation (WRR).

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of ICT, Applications using excel and mathematical models. Laboratory education. Communication with students directly and by mail.
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	50
Application of methodologies/solve exercises in class.	20
Laboratory practice.	15
Writing of project /Study	40
Course total	***125***

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.*	Final written exam Solve assigned exercises. Writing and oral presentation with power point of a project

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Antonopoulos, V. Z. 2010. «Environmental Hydraulics and Surface Water Quality», Eds. A. TZIOLA (in Greek).*
- *Harold F. Hemond H.F., Elizabeth J. Fechner E.J. 2014 Chemical Fate and Transport in the Environment 3rd Edition Academic Press*
- *Schnoor, J. L., 1996. Environmental modeling: fate and transport of pollutants in water, air, and soil. John Wiley and Sons.*
- *WHO, 2006. Guidelines for the Safe Use of Wastewater, Excreta and Greywater. Vol I and II. Wastewater Use in Agriculture, 3rd ed.; World Health Organization: Geneva, Switzerland.*