COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF ENVIRONMENT & AGRICULTURAL ENGINEERING		
ACADEMIC UNIT	NATURAL RESOURCES MANAGEMENT &AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**184**	**SEMESTER**	**8th**
COURSE TITLE	WATER QUALITY- ENVIRONMENTAL 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*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures/Exercises and Examples	3+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*	Special background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://oeclass.aua.gr/eclass/courses/611/

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 provide the basic knowledge for the quality of water resources and their pollution management, including basic components of the hydraulic and chemical aspects of transport and fate of pollutants in the environment as well as the environmental legal framework.
The course is designed to give students an understanding of:
- Basic concepts and parameters of water quality, and the characteristics of the main pollutants released into the environment.
- Water quality of irrigation water
- The mechanisms and basic equations governing the transport of pollutants in aquatic systems and the basic chemical processes, parameters and methodologies that determine the environmental fate of pollutants in the aquatic environment.
- The effects of organic waste pollution on the oxygen balance in streams, thermal stratification and nutrients in lake systems, and the dynamics of nitrogen and phosphorus in aquatic systems.
- Methodologies and techniques for monitoring the quality of water resources and techniques to address degradation and pollution problems.

Upon successful completion of the course the student will be able to:
- understand the mechanisms and processes of transport of pollutants in aquatic systems
- evaluate the quality of water resources and detect pollution problems
- manage basic water pollution issues and be able to apply simple methodologies to assess the risk

and environmental fate of hazardous pollutants
- know and be able to propose basic measures to reduce the release and transport of pollutants in water bodies

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
Working independently
Teamwork
Respect for the natural environment

3. SYLLABUS

- Environments: rivers - streams, groundwater, estuaries, lakes, water under technical restriction, sediments
- Water quality parameters. Sources of pollution.
- Water quality parameters, physical parameters, inorganic elements, nutrients - human health, eutrophication - aquatic life, suspended solids in surface waters, biodegradable organic substances, heavy metals and organic pollutants, toxic organic micropollutants, thermal pollution, radioactive substances, micro-organisms.
- Anthropogenic effects on hydrological processes and water quality. Water quality criteria and constants by use.
- Mechanisms of pollutant transport in water systems. Mass transfer equations in aquatic systems.
- Nitrogen and phosphorus in aquatic systems.
- Biological Oxygen Demand. Dissolved oxygen sag in streams
- Basic principles of limnology, thermal stratification, nutrient balance, eutrophication.
Basic chemical processes for the environmental fate of pollutants. Environmental fate of toxic organic substances, pesticides, heavy metals. Transformation processes.
- Toxicity of pesticides, heavy metals and organic pollutants. Pollution by petroleum products.
- Basic determinations and basic techniques for measuring pollutants. Elements of sampling and quality monitoring techniques for water bodies.
- Mechanisms and techniques of water pollution control. Measures to protect the aquatic environment.
- Evolution of legislation on water quality and protection of water bodies (European legislation - EPA). Water Framework Directive (2000/60).

Laboratory work

-exercises and applications related to the topics covered in the lecture material.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of ICT in teaching. Laboratory exercises in student groups. Communication with students directly and by mail. Use of the e-class of the course.
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	39
Laboratory practice (exercises, applications)	26
Essay writing	15
Autonomous study	45
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.*	Evaluation of theory (50%) - Final written examination Evaluation of Laboratory work (50%) - Final written examination (exercises) - Grade of assigned projects

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Antonopoulos, V. Z. (2010). «Environmental Hydraulics and Surface Water Quality», Eds. A. Tziola (in Greek).
2. Dunnivant, F. M., & Anders, E. (2019). Pollutant fate and transport in environmental multimedia. John Wiley & Sons.
3. Hemond, H.F. and Fechner, E.J. (2015) Chemical Fate and Transport in the Environment. 3rd edition, Elsevier, Amsterdam.