

COURSE OUTLINE

1. GENERAL

SCHOOL	AGRICULTURAL SCIENCES		
ACADEMIC UNIT	ANIMAL PRODUCTION, FISHERIES & AQUACULTURE		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	AS_504	SEMESTER	5 th
COURSE TITLE	POLLUTION-WATER QUALITY		
INDEPENDENT TEACHING ACTIVITIES <i>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</i>		WEEKLY TEACHING HOURS	CREDITS
(the credits are awarded for the whole course)		2 (Lectures) + 2 (Lab. work)	6
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	Specialized General Knowledge (Pollution-Water Quality) Skills Development (Lab exercise on evaluating pollution and water quality)		
PREREQUISITE COURSES:	There are no prerequisite courses. However, the students should already have a basic knowledge on General & Analytical Chemistry		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be performed in English in case of foreign students		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
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*

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

- understand the organoleptic, physical and chemical characteristics of natural waters
- know the most important sources of environmental and water pollution
- know the basic techniques for purification of aqueous systems
- know the sampling techniques and apply the correct sampling rules and methodologies
- deepen on the basic analytical techniques for determining the quality of water
- choose the appropriate method of analysis and plan the experimental procedure for qualitative and quantitative analysis of basic water quality parameters
- know the most important water quality regulations for different uses

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

Respect for difference and multiculturalism

Adapting to new situations

Respect for the natural environment

Decision-making

Showing social, professional and ethical responsibility and sensitivity to gender issues

Working independently

Team work

Criticism and self-criticism

Working in an international environment

Production of free, creative and inductive thinking

Working in an interdisciplinary environment

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Production of new research ideas

Others...

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By the end of this course the student will, furthermore, have developed the following skills (abilities):

- Ability to write and present work related to the subject
- Ability to compare different methods of analysis for measuring and determining environmental parameters
- Ability to interact for issues of interdisciplinary nature
- Ability to search for regulations and legislation on the protection and quality of water and environment
- Study skills needed for continuing professional development

Generally by the end of this course the student will have developed the following general abilities (from the above list)

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

Respect for the natural environment

Criticism and self-criticism



3. SYLLABUS

- Pollution and Environmental Protection
- Natural Water and Wastewater: Natural and Chemical Characteristics of Natural Water
- Processes in natural waters
- Pollution of Water Systems (Pollution from Organic Wastes, Suspended Solids, Heat Pollution)
- Pollution of Water Systems (Pollution from Pharmaceuticals, Heavy Metals)
- Eutrophication, Eutrophication Indicators of Water
- Microbial contamination of water
- Natural water-purification mechanisms
- Purification of potable water
- General Principles of Water and Waste Water Purification
- Biological Waste Water Treatment Advanced Oxidation
- Processes for water and wastewater treatment
- Water Quality Regulations: Potable Water, Water for Animal Production, Fisheries and Aquaculture

Laboratory Exercises

1. Introduction to the Laboratory - Safety and health rules
2. Sampling water - Sample maintenance
3. Organoleptic characteristics of water: Color-Odor-Taste-Turbidity
4. Physical Characteristics of Water: Electrical Conductivity-pH-Salinity
5. Physical Characteristics of Water: Hardness - Ca^{2+} , Mg^{2+}
6. Physical Characteristics of Water: Determination of Total Suspended Solids
7. Inorganic Water Components: Spectrophotometric determination of ammonium
8. Inorganic Water Components: Determination of nitrate, sulphate and phosphate using ionic chromatography
9. Organic Water Components: Determination of Chemically Oxygen Demand (COD)
10. Organic Water Components: Determination of Total Organic Carbon (TOC)
11. Determination of chlorophylls
12. Microbiological examination of water-Nutrients
13. Microbiological examination of water-Determination of the total number of microorganisms

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Face to face. During the course, students are asked to write and present a brief bibliography project on actual pollution problems as well as water quality techniques. Laboratory exercises on the analysis of environmental and water quality parameters.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	<ul style="list-style-type: none">• Use of ICT (powerpoint) in teaching• Use of ICT (powerpoint) in laboratory exercises• Use of ICT in Student Communication (Learning Support through the e-class platform)

TEACHING METHODS <i>The manner and methods of teaching are described in detail.</i> <i>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.</i> <i>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</i>	Activity	Semester workload
	Lectures	26
	Laboratory practice	26
	Study and analysis of bibliography	13
	Writing and presentation of a brief project	13
	Writing short lab reports	13
	Final examination	3
	Private study time of the students for the lab preparation and final examination	56
	Course total (25 work load for each ECTS credit)	150
STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i> <i>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</i> <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>	<ol style="list-style-type: none"> 1. Project (A) 2. Laboratory work (Average score of individual reports of laboratory exercises) (B) 3. Written final examination (C) <p style="text-align: center;"><i>Each case is graded on a scale of 0-10</i></p> <p>Final grade (FG): $FG = 0.15A + 0.35B + 0.5C$</p> <p style="text-align: center;"><i>Minimum passing grade: 5 (Grade: 0-10)</i></p> <p>Greek language is used. For foreign students (e.g. Erasmus students) it can be done in English</p> <p>In the case of failure, the grade of the work (A) and the individual laboratory exercises (B) is retained and only the final written examination is repeated</p>	

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Water pollution control, Wiley, Editor(s): Suresh T. Nesaratnam First published: 2014

- Related academic sources and journals:

- Water Research (Elsevier) <https://www.journals.elsevier.com/water-research/>
- Standard Methods for the examination of water and wastewater, 22nd Edition (2014)