COURSE DESCRIPTION

SCHOOL	TECHNOLOGY		
DEPARMMENT	ENVIRONMENT		
LEVEL OF EDUCATION	*Undergraduate*		
LESSON CODE	**NEW COURSE**	**SEMESTER**	5nd till 8th
LESSON TITLE	WATER QUALITY AND TREATMENT		

INDEPENDENT TEACHING ACTIVITIES *if credit units are awarded to distinct parts of the course eg. Lectures, Laboratory Exercises etc. If credits are united for the whole course, list the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
THEORY	2	2
COATCHING SCHOOL	2	2
LABORATORY EXERCISES	-	-
Add rows if necessary. The teaching organization and the teaching methods used are described in detail in 4.	4	4

TYPE OF COURSE *Background, General Knowledge, Scientific Area, Skills Development*	Skills Development
PRELIMINARY COURSES:	NO
LANGUAGE OF TEACHING AND EXAMS:	GREEK
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE website (URL)	

1. **LEARNING OUTCOMES**

Learning outcomes

Describe the learning outcomes of the course and the specific knowledge, skills and abilities that students will acquire upon successful completion of the course.

Refer to Annex A.

- *Description of the Level of Learning Outcomes for each course of study according to the Qualifications Framework of the European Higher Education Area*
- *Descriptive Indicators of Levels 6, 7 & 8 of the European Lifelong Learning Qualifications Framework*

and Annex B.

- *Summary Guide for Writing Learning Outcomes*

WATER QUALITY & TREATMENT provides students with a clear understanding of the different uses of water and therefore selects water quality control criteria. How important it is to take into account many parameters (chemical, microbiological, natural, radiological) for the final assessment of water quality. Assess when human health is exposed to poor water quality under current legislation. Finally to be a worthy consultant on water technology & treatment.

The purpose of the course is:
1. Undergraduate students understand basic concepts that are developed in the course.
2. Students should be able to apply the knowledge they have acquired in the course to other courses in the following semesters related to Biology, Geology etc.
3. Students must meet the requirements of "Good Laboratory Practice" in subsequent Laboratory courses of the Department's curriculum or other undergraduate or postgraduate curricula.
4. Students evaluate, analyze and calculate laboratory measurement data and write laboratory

reports.
5. Students should be able to apply the knowledge they have acquired in the course to solving environmental problems.

General Competences

In view of the general competences that the graduate must have acquired (as listed in the Diploma Supplement and listed below) in which of them does the course aim?

Search, analyze and synthesize data and information, using the necessary technologies	*Project planning and management*
Adaptation to new situations	*Respect for diversity and multiculturalism*
Decision making	*Respect for the natural environment*
Independent work	*Demonstrate social, professional and ethical responsibility and gender sensitivity*
Teamwork	*Exercising criticism and self-criticism*
Working in an international environment	*Promoting free, creative and inductive thinking*
Working in an interdisciplinary environment	
Generation of new research ideas	

- Search, analyze and synthesize data
- Decision making
- Independent Work
- Teamwork
- Respect for the natural environment
- Exercising criticism and self-criticism
- Promote free, creative and inductive thinking

2. **COURSE CONTENTS**

Theory content

1. Importance of water. Hydrological cycle. Texture of water.
2. Waterborne epidemics.
3. Biological & physicochemical processes in water.
4. Surface, underground, marine, drinking, thermal and bathing waters. Differences and their quality characteristics.
5. Diversification of natural and polluted waters.
6. Impact of pollution on water quality characteristics.
7. Toxic Organic Compounds.
8. Water pretreatment methods.
9. Physical & chemical precipitation of water.
10. Flocculation, adsorption, ion exchange.
11. Use of selective membranes for microfiltration, ultrafiltration, nanofiltration.
12. Reverse Osmosis. Desalination
13. Legislation.

Coatching school content

1. Sampling (for microbiology and chemistry analyzes) - sample preservation.
2. Determination of pH, conductivity, acidity, alkalinity, total hardness.
3. Microbiological testing of water (Total flora 22°37°, E. Coli, Coliforms, Enterococci)
4. Determination of residual and total chlorine.
5. Quantitative determination of ions by colorimetric (NO_3^-, NH_4^+, SO_4^{2-}, Ca^{2+}, K^+)
7. Determination of degree of salivation.
8. Determination of heavy metal concentration.
9. Determination of BOD & COD.
10. Determination of the flocculant quantity to pH ratio.

11. Removal of detergent & organic compounds with activated carbon.
12. Removal of cations or anions from water by cationic or anionic resin.
13. Chlorination - water chlorination.

3. **TEACHING AND LEARNING METHODS - EVALUATION**

HOW TO TEACH THE COURSE **Face to face, Distance learning etc.**	• Amphitheater lectures and • laboratory exercises in the lab.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES **Use of ICT in Teaching, in Laboratory Education, in Communication with Students**	• Use Powerpoint slides. • Communication with students via e-mail. • Using the e-class
TEACHING ORGANIZATION **The method and methods of teaching are described in detail.** **Lectures, Seminars, Laboratory Exercise, Field Exercise, Study & Bibliographic Analysis. Tutorial, Internship, Interactive Teaching, Study Tours, Project Design, Work / Work Writing, etc. The student study hours for each learning activity are recorded as well as the non-instructional study hours so that the overall workload at semester level corresponds to ECTS standards.**	

Activity	***Semester Workload***
Theory	26
Practical Exercises (Coatching school)	26
Laboratory exercises	0
Independent study of theory	26
Weekly individual laboratory assessment evaluation reports	22
Total Course	***100***

STUDENTS ASSESSMENT *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Inferential, Multiple Choice Assessment, Short Answer Questions, Problem Development Questions, Problem Solving, Written Thesis, Report / Report, Oral Examination, Public Presentation, Practical, Artistic, Laboratory Others* *Specify clearly defined assessment criteria and if and which are accessible to students.*	I. ***Evaluation in theory*** • Evaluation is done writen • Evaluation in theory can only be carried out once the laboratory exercises have been completed. • The grade is 75% of the final gradeII. II. ***Evaluation in Laboratory exercises*** **Laboratory evaluation includes:** • Completion of laboratory exercises • Delivery of written work for each laboratory exercise (A) • Written examination (B) **Laboratory grade: 25% (A) + 75% (B)** **Final grade** **75% theory grade + 25% Laboratory grade**

- Suggested Bibliography *:*

- Water chemistry Ziti editions Thessaloniki 2005
- Qualitative characteristics and water treatment. M. Mitrakas Tziola Publications Thessaloniki 2016.
-Water & wastewater treatment processes. K. Chrysikopoulos. Tziola Publications 2018
- Fred Pontius (Technical Editor), Water quality and treatment, Ahandbook of community water

supplies, American water Works association McGraw-Hill, 4th Edition ISBN 0-07-001540-6
- Water treatment plant design, American Society of Civil Engineers & American water works association, McGraw 1990 2nd Edition.
- Mitrakas M. Quality characteristics of water and water treatment. Tziolas edition Thessaloniki 2020
- Instrumental environmental analysis Deligiannakis I., Chela D., Konstantinou I. Tziola Publications 2019.
- Environmental chemistry & engineering. Darakas Efth., Petala M., Tsiridis V. Tziola Publications 2020
- Water Purification, Tsonis S, Papasotiriou Publications, Athens 2003.

Supplementary Bibliography

Lecturer's notes and full material on theory lectures and introductory lab presentations available through the asynchronous education platform