COURSE DESCRIPTION

SCHOOL	TECHNOLOGY		
DEPARMMENT	ENVIRONMENT		
LEVEL OF EDUCATION	*Undergraduate*		
LESSON CODE	**NEW COURSE**	**SEMESTER**	2nd
LESSON TITLE	ANALYTICAL & ENVIRONMENTAL CHEMISTRY		

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	3	3
LABORATORY EXERCISES	2	2
Add rows if necessary. The teaching organization and the teaching methods used are described in detail in 4.	5	5

TYPE OF COURSE *Background, General Knowledge, Scientific Area, Skills Development*	BACKGROUND
PRELIMINARY COURSES:	GENERAL CHEMISTRY
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*

ANALYTICAL & ENVIRONMENTAL CHEMISTRY provides students with the basic background of the Environment and is essential for successful course attendance in the Department's Curriculum. The course content aims at introducing students to basic concepts of the structure of the environment (soil, water, atmosphere) but also the methodologies that the environmentalist must know for the qualitative and quantitative determination of organic and inorganic chemicals that pollute or simply constitute the environment. physiological texture of water, soil or atmosphere. The laboratory part of the course provides the opportunity for the development of laboratory skills and the acquisition of laboratory experience and knowledge necessary for the successful follow-up of courses that follow the curriculum of the Department.

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. Subject of Environmental Chemistry (Environment, Environmental Sphere, Environmental Pollution).
2. Hydrospheres
3. Hydrosphere chemistry,
4. Soil (composition, soil organic matter, soil acidity, cation exchange capacity)
5. Chemistry of the atmosphere.
6. Air pollution (acid rain, global warming, greenhouse effect).
7. Categories of biological and organic molecules (amino acids-peptides-proteins, carbohydrates, lipids and other organic compounds).
8. What is analytical chemistry.
9. Criteria for selecting analytical method. Methods calibration curve.
10. Introduction to Spectrophotometry - Organology. Beer-Lambert's Law.
11. Applications of spectrophotometry.
12. Introduction to separation techniques. Gas chromatography. Liquid chromatography.
13. Introduction to atomic spectroscopy. Atomic absorption spectrometry.

Laboratory content

1. Receipt - Calibration - Instruments - Utensils - Materials - Reagents - Safety.
2. Neutralization.
3. Oximetry - Alkalimetry
4. Oxidation ($KMnO_4$)
5. Reduction ($K2Cr_2O_7$)
6. Iodometry
7. Field Exercises (Water & Soil pH Measurement, Conductivity).

8. Photometric Determination of Detergents.
9. Determination of Alkalinity and Bicarbonate.
10. Determination of total, transient, permanent water hardness.
11. Chemically Required Oxygen (COD).
12. Biochemically Required Oxygen (BOD_5).
13. Chromatography.

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	13
Laboratory exercises	26
Independent study of theory	47
Weekly individual laboratory assessment evaluation reports	13
Total Course	**125**

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 65% 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: 20% (A) + 80% (B)

Final grade

65% theory grade + 35% Laboratory grade

- Suggested Bibliography *:*

- Wastewater engineering: treatment and reuse. Metcalf & Eddy. 4th Edition Tziolas editions 2018.
- Principles of Instrumental analysis 5th Edition ISBN 0-03-002078-06

-Environmental chemistry and mechanical. Darakas E. ISBN 978-960-418-640-2 Tziolas Editions
- Principles of instrumental analysis 5η Έκδοση, D. Skoog, J. Holler, T. Nieman. Kostarakis editions 2005
- 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
-Environmental Engineering (Pollution & Environmental Protection). Kougolos Ath. Tziola Publications 2019.
- Instrumental environmental analysis Deligiannakis I., Chela D., Konstantinou I. Tziola Publications 2019.

Supplementary Bibliography

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