# COURSE OUTLINE

## 1. GENERAL

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|---|---|---|---|
| **SCHOOL** | Faculty of Engineering | | |
| **DEPARTMENT** | Environmental Engineering | | |
| **LEVEL OF STUDIES** | Level 7 | | |
| **COURSE CODE** | **15BY2N** | **SEMESTER** | **2nd** |
| **COURSE TITLE** | Analytical Chemistry | | |

| **TEACHING ACTIVITIES** | **TEACHING HOURS PER WEEK** | **ECTS CREDITS** |
|---|---|---|
| Theory | 4 hours | |
| Laboratory courses | 2 hours | |
| | | 5 |

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|---|---|
| **COURSE TYPE** | Background, |
| **PREREQUISITES:** | NO |
| **TEACHING & EXAMINATION LANGUAGE:** | Greek |
| **COURSE OFFERED TO ERASMUS STUDENTS:** | NO |
| **COURSE URL:** | https://env.duth.gr/courses/%CE%B1%CE%BD%CE%B1%CE%BB%CF%85%CF%84%CE%B9%CE%BA%CE%AE-%CF%87%CE%B7%CE%BC%CE%B5%CE%AF%CE%B1/ |

## 2. LEARNING OUTCOMES

| **Learning Outcomes** |
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| The aim of the course is to familiarize students with the chemistry and physics of the instrumentation/techniques used in chemical analysis, their training in sampling methods, in analysis techniques and processes and in the analysis of environmental samples.<br>Upon the successful completion of the course, students will have received basic and specialized knowledge in analytical chemistry and will be able to:<br>• Define principles and methods for qualitative and quantitative analysis<br>• Selection of the proper technique and methodology for the analysis of specific environmental samples<br>• Quantitative volumetric analysis<br>• Data analysis and processing<br>• Development of scientific reports |
| **General Skills** |
| The course offers the following theoretical and practical skills:<br>• Develop protocols for the analysis of environmental samples<br>• Develop protocols for environmental quality control<br>• Skills for autonomous work |

- Ability to collaborate at team level
- Development of scientific and technical reports
- Risk assessment analysis
- Design and application of protocols including non-destructive control methods for environmental quality control
- Research in chemical analysis
- Design and perform of chemical studies and research
- Conduct physicochemical analysis
- Promoting free, creative and inductive thinking
- Ability to search and analyze data and information using the necessary technologies

## 3. COURSE CONTENT

1. Environmental samples (solid, gas, liquid); Samples: Concentration - Expressions - Calculations. General methods for qualitative and quantitative analysis
2. Sampling and sample processing
3. Statistical data processing
4. Volumetric method: Sedimentation - Complexation - Oxidation
5. Principles of spectroscopy. Beer-Lambert Law. Its applications in molecular spectroscopy
6. Ultraviolet-visible spectroscopy, infrared spectroscopy, Raman spectroscopy
7. Atomic Absorption Spectroscopy
8. Analytical Methods with X-rays
9. Gas Chromatography
10. Liquid Chromatography
11. Mass spectroscopy
12. Ion Chromatography
13. Techniques to study solid samples
14. Advanced analytical techniques

## 4. LEARNING & TEACHING METHODS - EVALUATION

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|---|---|
| **TEACHING METHOD** | Face to face<br><br>Lectures & laboratory courses |
| **USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT)** | Use of ICT in teaching (lectures and laboratory courses) and in communication with students |
| **TEACHING ORGANIZATION** | |

| *Activity* | *Workload/semester* |
|---|---|
| Lectures | 52 |
| Laboratory courses | 26 |
| Literature study and analysis | 33 |
| Scientific/technical reports | 39 |
| Total | 150 |
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| **STUDENT EVALUATION** | Assessment Language: Greek<br>Assessment/evaluation Methods: |

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|---|---|
| | 1. Written examination - 70%<br>2. Laboratory Report - 30%<br>The brief examination before each laboratory exercise and the evaluation of the laboratory reports after the completion of the laboratory contribute equally to the score of each laboratory exercise.<br>Evaluation process: Problem Solving / questions development<br>The evaluation methods are analyzed at the first course of the semester and are posted in the DUTHNET e-class platform (the electronic course management system of the Foundation) |
| | |

**5. SUGGESTED BIBLIOGRAPHY**

1. Quantitative chemical analysis (HARRIS DANIEL C., ISBN 978-960-524-281-7)
2. Quantitative chemical analysis (Voulgaropoulos, Zachariadis, Stratis, Anthemidid, ISBN 978-960-456-292-3)
3. Instrumental environmental analysis (Deligiannakis, Chela, Konstantinou, ISBN 978-960-418-233-6)
4. Analytical Chemistry (Themelis, Zotou, ISBN: 978-960-456-484-2)

# ANNEX OF THE COURSE OUTLINE

## Alternative ways of examining a course in emergency situations

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|---|---|
| **Teacher (full name):** | Konstantinos Christoforidis |
| **Contact details:** | kochristo@env.duth.gr |
| **Supervisors:** (1) | YES |
| **Evaluation methods:** (2) | Written examination with distance learning methods.<br>Written assignments (the students can choose whether they will submit or not written assignments) |
| **Implementation Instructions:** (3) | Questions are upload in a stepwise manner at the DUTHNET eclass platform (the electronic course management system of the Foundation). The answers are uploaded in pdf format at the eclass platform within the period specified. The duration of the examination is 2 hours. The written exam corresponds to the 100% in the final grade. If the students have chosen to submit written assignments during the semester, the written examination corresponds to 70% of the final grade.<br>Written assignments are uploaded at the eclass platform within the set deadline. Written assignments correspond to 30% of the final grade.<br>Ten different groups of questions are given to the students and every question must be submitted within a specific period. During the course of the exam, cameras and microphones are activated and students are separated in five groups. Every group is monitored by different supervisors via MT. |

**(1)** Please write YES or NO

**(2)** Note down the evaluation methods used by the teacher, e.g.

- *written assignment* or/and exercises
- written or oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured.

**(3)** In the **Implementation Instructions** section, the teacher notes down clear instructions to the students:

a) in case of **written assignment and / or exercises:** the deadline (e.g. the last week of the semester), the means of submission, the grading system, the grade percentage of the assignment in the final grade and any other necessary information.

b) in case of **oral examination with distance learning methods:** the instructions for conducting the examination (e.g. in groups of X people), the way of administration of the questions to be answered, the distance learning platforms to be used, the technical means for the implementation of the examination (microphone, camera, word processor, internet connection, communication platform), the hyperlinks for the examination, the duration of the exam, the grading system, the percentage of the oral exam in the final grade, the ways in which the inviolability and reliability of the exam are ensured and any other necessary information.

c) in case of **written examination with distance learning methods**: the way of administration of the questions to be answered, the way of submitting the answers, the duration of the exam, the grading system, the percentage of the written exam of the exam in the final grade, the ways in which the integrity and reliability of the exam are ensured and any other necessary information.

There should be an attached list with the Student Registration Numbers only of students eligible to participate in the examination.