216. Environmental Chemistry

Instructor: Galanopoulou Stavroula

1. GENERAL

FACULTY	PLANT SCIENCES		
SECTION	FORESTRY AND NATURAL ENVIRONMENT MANAGEMENT		
LEVEL OF STUDY	Undergraduate		
COURSE CODE	**216**	**SEMESTER OF STUDY**	**2nd**
COURSE TITLE	ENVIRONMENTAL CHEMISTRY		

INDEPENDENT TEACHING ACTIVITIES	**TEACHING WEEKS**	**CREDITS**
Lectures	2	5
Laboratory exercises	2	
Total Course	4	

COURSE TYPE	General background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION AND EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://oeclass.aua.gr/eclass/courses/572/

2. LEARNING OUTCOMES

Learning Outcomes

The subject of the course is the study of environmental pollution and the effects of various pollutants on it. The chemical processes in the atmosphere, hydrosphere and soil surface, the concentrations, distribution and movement of chemical elements on earth as well as the laws that determine this distribution are studied. Emphasis is placed on the study of the main pollutants, due to both anthropogenic and natural activities, in the atmosphere, hydrosphere and soil, their impact on the natural environment and their interaction with the forest.

Course objective:

Theoretical part

To provide the student with the theoretical background required to be able to understand various environmental problems, their impact on the natural environment and humans and contribute to their rehabilitation.

Laboratory part

To familiarize the student with the techniques for determining pollutants as well as with the evaluation of pollution problems and ways to protect the environment.

Upon successful completion of the course, the student is able to study and analyze problems related to environmental pollution, evaluate them, prepare studies, contribute to their management, as well as to decision-making in order to protect the natural environment.

General Competencies
— Search, analyze and synthesize data and information, using the necessary technologies — Making complex decisions — Autonomous work — Teamwork — Working in an interdisciplinary environment — Respect for the natural environment — Promoting free, creative and inductive thinking — Utilization of new technologies in data gathering and analysis and decision making.

3. COURSE CONTENT

The material per week of the course - in theory and corresponding laboratory exercises -

reads as follows:

Theory

- Introductory concepts in Chemistry
- Chemical processes in the atmosphere, hydrosphere and soil surface
- Study of concentrations, distribution and movement of chemical elements in the earth and the laws that determine this distribution. Geochemical cycle - Biogeochemical cycles
- Introductory concepts to environmental pollution
- Air pollution: main air pollutants (carbon monoxide, nitrogen oxides, particulate matter, sulphur compounds, hydrocarbons – volatile organic compounds, ozone)
- Air pollution: clouds, acid rain, ozone hole, greenhouse effect, car exhaust pollution
- Pollution of surface water and groundwater
- Parameters of organic water pollution, eutrophication
- Organic pollutants (pesticides, polychlorinated biphenyls)
- Organic pollutants (dioxins, polycyclic aromatic hydrocarbons, phenols)
- Heavy metals
- Liquid waste, solid waste. Environmental protection measures
- Repetitions, clarifications

Laboratory

- Familiarity with the laboratory
- General principles of laboratory safety
- Use of laboratory devices and instruments. Repetitive exercises in Chemistry (background)
- Sediment sampling
- Preparation of samples for analysis
- Introduction to instrumental chemical analysis. Calculation of data concentration in geological samples
- Calculation of data concentration in a solubilised sample
- Geochemistry of river sediments
- Geochemical maps
- Water quality: Determination of solids
- Water quality: pH determination
- Water quality: Determination of hardness
- Repetitions, clarifications

4. TEACHING AND LEARNING METHODS - ASSESSMENT

<table>
<tr><td>DELIVERY METHOD</td><td>In the classroom and in the laboratory.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES</td><td>Use of Powerpoint slides, communication with students via video conferences, eclass and e-mail. Meetings with students in small groups or individually to resolve questions.</td></tr>
<tr><td>TEACHING ORGANIZATION</td><td><table><tr><th>Activity</th><th>Semester Workload</th></tr><tr><td>Lectures</td><td>39</td></tr><tr><td>Laboratory exercises</td><td>30</td></tr><tr><td>Individual work</td><td>8</td></tr><tr><td>Study personal</td><td>48</td></tr><tr><td>Total Course</td><td>125</td></tr></table></td></tr>
<tr><td>STUDENT EVALUATION</td><td>I. Written final examination in the theory of the course (development or multiple choice issues).
II. Final written exam in the laboratory part of the course. At the same time, individual assignments are offered, the grade of which is taken into account with the score of the written examination.</td></tr>
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5. RECOMMENDED-BIBLIOGRAPHY

- Suggested Bibliography:

- *Environmental chemistry, 2009. Fytianos K., Samara - Konstantinou K. University Studio Press - Graphic Arts and Publishing Company S.A.*
- *Makridis C. and Leontopoulos, S. 2013. Pollution mechanisms & environmental protection measures Management of plant and animal waste. Embryo Publications.*
- *Ibanez G. Jorge, Hernandez-Esparza Margarita, Doria-Serrano Carmen, Fregoso-Infante Arturo, Singh Mono Mohan, 2016. Environmental Chemistry. Foundation for Research & Technology Hellas - University Press of Crete.*
- *Skoullos M., Siskos P., 2010. Environmental Chemistry. Symmetry Publications.*
- *Andrews J., Brimblecombe P., Jickells T., Liss P., Reid B., 2004. An Introduction to Environmental Chemistry. Blackwell Publishing.*

- Related scientific journals:

- *Environmental Geosciences: https://pubs.geoscienceworld.org/eg*
- *Geochemistry: https://pubs.geoscienceworld.org/geea*