

COURSE OUTLINE

1. GENERAL

SCHOOL	FACULTY OF ENGINEERING		
DEPARTMENT	ENVIRONMENTAL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	15ΘΕ6N - K1	SEMESTER	8 ^ο
COURSE TITLE	Chemical processes in the atmosphere		
TEACHING ACTIVITIES <i>If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.</i>	TEACHING HOURS PER WEEK	ECTS CREDITS	
	3	5	
<i>Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.</i>			
COURSE TYPE <i>Background, General Knowledge, Scientific Area, Skill Development</i>	SCIENTIFIC AREA SKILL DEVELOPMENT		
PREREQUISITES:	MATHEMATICS, ATMOSPHERIC CHEMISTRY, ATMOSPHERIC POLLUTION		
TEACHING & EXAMINATION LANGUAGE:	GREEK		
COURSE OFFERED TO ERASMUS STUDENTS:	NO		
COURSE URL:	https://eclass.duth.gr/courses/TMC382/		

2. LEARNING OUTCOMES

Learning Outcomes <i>Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.</i>																
The aim of the course is to understand the chemical processes of the atmospheric pollution, the interaction of the atmosphere with other parts of the biosphere, the modification of these chemical processes due to climate change and the consequences of this modification. Specifically: <ul style="list-style-type: none"> • The importance of the chemical cycles and pollutants in the atmosphere. • Review of the fundamental principles of chemical kinetics, thermodynamics, and spectroscopy in the context of chemical processes in the atmosphere. • Models that simulate chemical processes in the atmosphere. Usage of a free software for the simulation of the atmospheric reaction's kinetics of and a free software for the simulation of the chemical reactions in the atmosphere. • The chemical processes in the clean and polluted troposphere. Implications. 																
General Skills <i>Name the desirable general skills upon successful completion of the module</i>																
<table border="0"> <tr> <td><i>Search, analysis and synthesis of data and information, ICT Use</i></td> <td><i>Project design and management Equity and Inclusion</i></td> </tr> <tr> <td><i>Adaptation to new situations</i></td> <td><i>Respect for the natural environment</i></td> </tr> <tr> <td><i>Decision making</i></td> <td><i>Sustainability</i></td> </tr> <tr> <td><i>Autonomous work</i></td> <td><i>Demonstration of social, professional and moral responsibility and sensitivity to gender issues</i></td> </tr> <tr> <td><i>Teamwork</i></td> <td><i>Critical thinking</i></td> </tr> <tr> <td><i>Working in an international environment</i></td> <td><i>Promoting free, creative and inductive reasoning</i></td> </tr> <tr> <td><i>Working in an interdisciplinary environment</i></td> <td></td> </tr> <tr> <td><i>Production of new research ideas</i></td> <td></td> </tr> </table>	<i>Search, analysis and synthesis of data and information, ICT Use</i>	<i>Project design and management Equity and Inclusion</i>	<i>Adaptation to new situations</i>	<i>Respect for the natural environment</i>	<i>Decision making</i>	<i>Sustainability</i>	<i>Autonomous work</i>	<i>Demonstration of social, professional and moral responsibility and sensitivity to gender issues</i>	<i>Teamwork</i>	<i>Critical thinking</i>	<i>Working in an international environment</i>	<i>Promoting free, creative and inductive reasoning</i>	<i>Working in an interdisciplinary environment</i>		<i>Production of new research ideas</i>	
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Decision making
Autonomous work
Respect for the natural environment

3. COURSE CONTENT

1. Overview of the clean and polluted atmospheric environment
2. Chemistry/Photochemistry of the troposphere
3. Chemical cycles
4. Chemical kinetics, thermodynamics and dispersion of pollutants
5. Software for simulating the chemical kinetics of atmospheric reactions
6. Chemistry of atmospheric organic compounds with free radicals
7. Chemistry of atmospheric inorganic compounds with free radicals
8. Chemical reaction simulation software
9. Ways of observing and monitoring chemical processes in the atmosphere
10. Chemical processes and climate change
11. Chemistry of clouds
12. Stratospheric chemistry

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD <i>Face to face, Distance learning, etc.</i>	Face to face	
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with students</i>	Use of ICT in teaching and laboratory education, usage of board	
TEACHING ORGANIZATION <i>The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.</i> <i>The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.</i>	Activity	Workload/semester
	Lectures	60
	Bibliographic research and analysis	50
	Individual project creation	40
	Total	150
STUDENT EVALUATION <i>Description of the evaluation process</i> <i>Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others</i> <i>Please indicate all relevant information about the course assessment and how students are informed</i>	Formative Written exam, individual semester project	

5. SUGGESTED BIBLIOGRAPHY

1. Πανεπιστημιακές σημειώσεις: «Χημικές Διεργασίες στην Ατμόσφαιρα» Σπυρίδων Ραφσομανίκης, διαθέσιμο στο e-class.
2. «ATMOSPHERIC CHEMISTRY AND PHYSICS», J. Seinfeld, S. N. Pandis. Wiley Interscience, Second Edition 2006, Στην βιβλιοθήκη του ΔΠΘ με αριθμό καταχώρησης QC 879.6.S45 2006

ANNEX OF THE COURSE OUTLINE

Alternative ways of examining a course in emergency situations

Teacher (full name):	Evangelia Kostenidou
Contact details:	ekosteni@env.duth.gr
Supervisors: (1)	YES
Evaluation methods: (2)	Written examination with distance learning methods
Implementation Instructions: (3)	The exams will take place in zoom. All the students will be connected through their university account, otherwise they will not have access. During the examination the webcam and the microphone will be on. At the beginning of the examination each student will show their ID on the webcam for the verification of his/her identification. The examination will have a total duration of 3 hours. The exercises will be sent to the email account of each student, and they will be a combination of multiple-choice test and problem solving. The answers will be scanned (with a scanner or a camera) and they will be sent to an email account (that the professor will give in advance) before the end of the exams.

(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.