Air Pollution and Climate Change

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GENERAL

SCHOOL	School of Environment		
ACADEMIC UNIT	Department of Environment		
LEVEL OF STUDIES	Postgraduate		
COURSE CODE	ENV511	SEMESTER	Spring
COURSE TITLE	Air Pollution and Climate Change		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures	4	
Laboratory exercises		
Course Total		3
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE	special background
PREREQUISITE COURSES:	-
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes
• *Understanding of the basic air pollutants, their sources and interaction in the atmosphere* • *Understanding of the sources of atmospheric particles, their influence on health and climate* • *Basic understanding of the complexity of the climate system* • *Understanding of why climate has changed in the past and how these changes are related to current ones* • *Understanding of the natural and anthropogenic influences on the climate system for various time-scales*
General Competences
• Production of free, creative and inductive thinking • Production of new research ideas • Working in an interdisciplinary environment • Team work • Analysis and synthesis of data and information, with the use of the necessary technology

SYLLABUS

The course aims to provide knowledge and understanding of the physical and chemical processes that drive atmospheric pollution, greenhouse gases concentration increases, and climate change. Because of the interdisciplinary background of students, these processes will be examined on the introductory level. The scope of the course will cover all ground from local to planetary problems. The course will

span 8 weeks. During the first half we will focus on local and regional air quality, while during the second on climate change, its physico-chemical mechanisms, timescales and impact based on various scenarios.
By the end of the 2nd week, the class will be divided in teams of 4 students (or as close as possible). Each 4-student team will select a controversial subject of their choice, after approval by the instructors. For each team, two students will select a pro and the other two a con position. By the end of the 7th week, 4-student teams will submit a ~5000-word essay, presenting their supporting pro and con arguments (40% of the grade). The arguments for the pro and con positions will also be presented to class by each 2-student smaller team at the end of the 8th week (20% of the grade). Moreover, at the start of the 8th week, the students will take a written examination (40% of the grade), based on multiple choice questions.

The following subjects will be covered in the lectures:
1. Properties and History of the Atmosphere
2. Air Pollutants and Greenhouse Gases-Sources and chemical reactions
3. Atmospheric particles -Size distributions, chemical and optical properties of atmospheric aerosols
4. Meteorology and Air pollution interactions. Inversion, winds, fronts, stability
5. Atmospheric dispersion in the atmosphere - Gauss equations
6. Exercises on atmospheric dispersion and Air pollution control
7. In situ and remote sensing climate observations. Reconstructions of paleoclimate and Milankovic theory.
8. Planetary radiation energy balance. Greenhouse effect and warming potentials. Aerosols and climate.
9. General circulation of the atmosphere and the ocean conveyor belt. Feedbacks
10. Carbon cycle and planetary budget. Temporal scales of processes.
11. Global climate model projections. Emission scenarios and climate change impacts

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	*Face-to Face*
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	The distribution of course material uses the electronic platform moodle (aegeanmoodle.aegean.gr).
TEACHING METHODS	

Activity	*Semester workload*
Lectures	20
Study and analysis of bibliography	25
Essay preparation	20
Presentation preparation	10
Course total	**75**

STUDENT PERFORMANCE EVALUATION	Final examination: 40% (individual) Written essay: 40% (teamwork, common for four persons) Presentation: 20% (individual)

ATTACHED BIBLIOGRAPHY

- *John H. Seinfeld and Spyros N. Pandis (2016), Atmospheric Chemistry and Physics: From Air Pollution to Climate Change, 3rd Edition,, ISBN: 978-1-118-94740-1, Wiley, New Jersey*
- *C. David Cooper and F. C. Alley (2011), Air Pollution Control: A Design Approach 4th Edition, by, ISBN-13: 978-1577666783, Waveland Press Inc. Long Grove IL*
- *Dessler A. E., (2015), Introduction to modern climate change, 2nd edition, Cambridge University Press*

- *Houghton J. (2015), Global warming: The complete briefing, 5th edition, Cambridge University*
- *Burroughs, William James, (2007), Climate change: a multidisciplinary approach, 2nd ed., Cambridge University Press*