COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	1		
COURSE CODE	**M213**	**SEMESTER**	**5, 7**
COURSE TITLE	ENVIRONMENTAL PHYSICS		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	8
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=177

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course offers an overview of the phenomena treated by environmental physics and deals with the basic principles and laws of physics underlying these phenomena. Upon completion of the course the students will be able to:

- Choose between the various scales of Environment (atmospheric, water, soil).
- Know the sinks and sources of pollutants released in the atmosphere as a result of anthropogenic and natural procedures.
- Calculate the thermodynamic procedures in the atmosphere creating the ventilation and stability conditions of a vertically moving air parcel.
- Know and calculate the effect of water vapor in the atmospheric processes and the radiation budget
- Understand the time and space evolution of Atmospheric Boundary Layer (ABL) and the way that this affect the dispersion and diffusion of air pollutants
- Understand first and second closures and the effect of turbulence in the ABL (Prandtl theory).
- Know the energy conversions caused by turbulence in the ABL and the transport of mass and heat.

- Calculate the various scales of motion in the atmosphere and specifically the mesoscale.
- Calculate the horizontal and vertical extent of a sea, lake, urban etc breeze cell
- Calculate the motions of other mesoscale circulations (anabatic/katabatic, valley/mountain winds).
- Understand other mesoscale circulations as the circulation during a wild fire, low level, jets etc.
- Calculate the dispersion conditions using Gauss, Euler and Langrange approximations.
- Calculate the water budget in the earth
- Calculate the water circulations
- Calculate the penetration of water and pollutants in the soil
- Study the soil pollution

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology. Working independently. Criticism and self-criticism. Production of free, creative and inductive thinking. Respect for the natural environment.

(3) SYLLABUS

The motion in the Atmosphere. Equations of Motion. Conservation of Energy in the Atmosphere. Compressive and incompressive fluid. Physics of the Atmospheric Boundary layer. Mean and disturbance of meteorological parameters. Parameterizations. K-theory and parameterizations. Scales of Motion. Mesoscale. Classical and non-classical mesoscale circulations. Breezes. Inland breezes. Slope motions. Urban heat islands. Air pollution. Gas and particulate pollutants. Classical air pollutants (NOx, O3, SO2, CO). Non-classical air pollutants (hydrocarbons, PANs, PPNs, dioxins, furans). Sources and sinks of air pollutants. Chemical transformation. Dispersion diffusion equations of air pollutants in the atmosphere. The motion of particulates. Particulates according to their size and the origin. Natural and anthropogenic particulates. Dust and salt particulates. Pollen.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of Moodle on-line learning platform for the dissemination of notes, problem sets as well as contacting the students
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Written exam at the end of the course containing theory and problem solving

Activity	***Semester workload***
Lectures	39
Tutorials	13
Bibliography study	50
Non-guided study	20
Exams	3
Course total	***125***

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

Suggested bibliography :

Neil. C. Wells, 2012. The Atmosphere and Ocean. A Physical Introduction, Third Edition. John Wiley and Sons, Ltd.

David G. Andrews, 2010. An Introduction to Atmospheric Physics, Second Edition. Cambridge University Press.

C. Donald Ahrens, 2000. Essentials of Meteorology. An invitation to the Atmosphere. Third Edition, Thomson Brooks/Cole.

Sverre Petterssen, 1941. Introduction to Meteorology, McGraw Hill Book Company Inc.

John A. Dutton, 1986. The Ceaseless Wind. An Introduction to the theory of Atmospheric Motion. Dover Pubns.