COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Science		
ACADEMIC UNIT	Physics		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**10EKA03**	**SEMESTER**	**4**
COURSE TITLE	**Introduction to Atmospheric 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**
Lectures (theory and laboratory)	6	7

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialised knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (only in the Greek language)
COURSE WEBSITE (URL)	*https://eclass.uoa.gr/courses/PHYS232/*

(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 provides to the students, knowledge for comprehending the mechanisms which are related to the Physics of the Atmosphere. In particular, upon the successful completion of the course, the student will be able to:

- to describe the composition and structure of the Earth's atmosphere as well as of planets,
- to describe the physical and dynamic processes in the atmosphere,
- to define the interaction between the above processes as well as of the parameters which influence the above said interaction,
- to comprehend and describe thermodynamic processes in the atmosphere,
- to calculate the apparent temperature of the system Earth-Atmosphere,
- to describe the main mechanisms which control the system Earth – Atmosphere,
- to know the characteristics of solar, earth and atmosphere radiation
- to define the mechanisms and parameters which refer to radiative transfer,
- to calculate the radiative budget at the top of the atmosphere and at the surface of the earth
- to describe the climatic system of planet Earth,
- to describe the greenhouse effect and estimate change in the radiation and energy budgets,
- to define and describe large scale (planetary) circulation patterns in the atmosphere,
- to define the forces which are exerted on an air mass and to describe the geostrophic balance,
- to explain the thermal wind and design forces applied on air mass,
- to analyze the forces on a rotating air mass,
- to describe and combine the physical, dynamic and chemical mechanisms which control the concentration of ozone in the stratosphere.

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…*
	…….

The course aims at the following general competences

Search for, analysis and synthesis of data and information, with the use of the necessary science knowledge
Decision-making
Independent work
Respect for the natural environment
Production of free, creative and inductive thinking

Analytical and synthetic thinking
Critical thinking
Problem solving

(3) SYLLABUS

- Composition and structure of the atmosphere.
- Atmospheric thermodynamics. Application of the laws of ideal gases in the atmosphere. Thermodynamic laws and application in the atmosphere. Clausius–Clapeyron equation. Thermodynamic variations of air masses.
- Physical and chemical processes in the atmosphere. Depletion of stratospheric ozone.
- Balance of four cycles: Radiation balance, water vapour balance, energy balance, atmospheric motion. Equations of motion. Continuity equation. Energy equation.
- Nature and characteristics of solar radiation, Earth radiation and atmospheric radiation. Spectrum signature.
- Basic principles and transmission mechanisms of electromagnetic radiation in the atmosphere. Reflection, absorption, scattering, emission.
- Radiation budget at the top of the atmosphere and the Earth's surface. Green house phenomenon.
- Forces exerted on an air mass. Winds.
- Planetary scale motion: Hadley cell, Ferrel cell, polar cell.
- Laboratory experiments: Long- and short-wavelength radiation. Air temperature and humidity. Surface wind. Vertical thermal and moisture profile of the atmosphere and static stability. Thermodynamic diagrams.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Yes

The e-class platform is used to provide lecture notes, exercises, information and to communicate with students.

Computer-aided lectures</td></tr>
<tr><td>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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>65</td></tr>
<tr><td>Laboratory</td><td>13</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Individual Study/ Study and Analysis of bibliography / Preparation</td><td>97</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total</td><td>175</td></tr>
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</td></tr>
<tr><td>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.</td><td>Final written exams at the end of the semester

Four problems/ subjects of equal weight. The subjects are both theory and comprehension-judgment questions as well as problem-solving.
Laboratory Work.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Atmosphere, C. Varotsos, Athanasopoulos Editions, 2008
- Introductory courses in Atmospheric Physics, Ch. Zerefos, PAPASOTIRIOU Editions, 2009.
- Introduction to Atmospheric Physics, C. Chaldoupis, KALLIPOS Editions, 2016.

Relevant scientific journals:

- ATMOSPHERIC ENVIRONMENT
- ATMOSPHERE
- METEOROLOGY AND ATMOSPHERIC PHYSICS
- THEORETICAL AND APPLIED CLIMATOLOGY
- JOURNAL OF ATMOSPHERIC SCIENCES