COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_OR461	**SEMESTER OF STUDIES**	7th
COURSE TITLE	ATMOSPHERIC PHYSICS I - METEOROLOGY I		

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*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures and Tutorials	4	6
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*	Elective course
PREREQUISITE COURSES:	Recommended prerequisite knowledge: CALCULUS I and II, INTRODUCTION TO COMPUTERS AND PROGRAMMING WITH FORTAN
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/PHY1923/

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*

At the end of this course the student should be able to

- identify the basic characteristics of the atmospheric environment and the principal laws that apply to it.
- apply these laws of physics in order to explain common weather and climatic phenomena and up-to-date issues in atmospheric physics, meteorology and climatology.
- know and understand the basic theories and principles that are related with the atmosphere, its components and the phenomena that take place into it.
- apply this knowledge for the quantitative and qualitative solutions of problems related with the contents of this course.
- acquire the needed knowledge and experience to follow relevant courses that deal in depth with atmospheric physics, meteorology, climatology and atmospheric pollution.
- interact with others on atmospheric physics and on inter or multidisciplinary problems.

General Abilities

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	*Others…*
Production of new research ideas	

- Search, analysis and synthesis, as well as a critical understanding of data and information using appropriate technologies.
- Decision making.
- Working in an interdisciplinary environment.
- Autonomous work.
- Teamwork.
- Production of new research ideas.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

1 Earth's atmosphere

- General notions, magnitude of the atmosphere, composition of lower atmosphere
- Solar and terrestrial radiation, atmospheric temperature and pressure, geopotential, simple atmospheric models
- Water vapor in the atmosphere

2 Atmospheric Thermodynamics

- State equation, laws of thermodynamics, thermodynamic processes in the atmosphere
- Atmospheric Stability, Criteria of instability (Vertical temperature gradient, potential temperature, energy)

3 Cloud Physics

- Water vapor condensation, cloud classification, rain formation theory

4 Atmospheric Dynamics

- Forces defining the air motion, equations of motion, synoptic scale winds, air motion in the atmospheric boundarylayer, thermal circulation
- General atmospheric circulation, planetary winds, troposhperic winds – Hadley cells, tropospheric long (Rossby)waves

5 Air Masses

- Air masses, fronts, low pressure centers, high pressure centers
- Cyclogenesis

6 Climate Dynamics

- Climate Classification, Climate Variability, Climate Equilibria, Sensitivity and Feedbacks
- Climate Change – climatic models

4. TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD *Face-to-face, Distance learning, etc*	Lectures (face to face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, laboratory education, communication with students*	Lectures using power-point presentations. Problem-solving seminars for the instructive solution of synthetic problems. Solving of critical questions by the students during the lecture time. Laboratory experiments. Digital content in the *eClass* platform.
TEACHING ORGANIZATION *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*	

Activity	***Semester workload***
Lectures	39
Problem-solving seminars	13
Solution of recommended exercises	26
Hours for private study of the student and preparation of home-work	69
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***150***

STUDENT ASSESSEMNT *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*	**Assessment Language:** Greek **Assessment Language for Erasmus students:** English **Assessment methods** ✓ Written final examination (90% of the final mark) including: o Evaluation of elements from theory o Exercises and problem solving ✓ weekly short-answer tests of 10' duration with comprehension questions (10% of the final mark) Minimum passing grade: 5 Μαximum passing grade: 10

5. RECOMMENDED LITERATURE

- **General Meteorology**, C. S. Sahsamanoglou, T. I. Makrogiannis, Ziti Editions, Thessaloniki, Greece, 1998.
- **Courses in General Meteorology**, T. I. Makrogiannis, C. S. Sahsamanoglou, Charis Editions, Thessaloniki, Greece, 2004.
- **Courses of Meteorology and Climatology**, A. A. Flocas, Ziti Editions, Thessaloniki, Greece, 1994.
- **Introduction to Atmospheric Physics and Climate Change**, P. Katsafados, E. Mavromatidis, Kallipos Editions, 2015.
- **Atmospheric Science: An Introductory Survey**, J.M. Wallace, P.V. Hobbs, Academic Press, London, 2006.
- **Meteorology for Scientists and Engineers**, R. Stull, University of British Columbia, 2011.