COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	PHYSICS DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**406**	**SEMESTER**	**5/7**
COURSE TITLE	PHYSICAL CLIMATOLOGY		

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	4
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, specialised general knowledge*
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=492

(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 advanced knowledge of the Earth's climate. More specifically, it aims to teach the causes and factors driving the climate and its changes and to provide them a deep understanding of the physical processes that determine the climate of the earth. The student who has successfully completed this course is expected to:

- know how the climate is defined, to what exactly it consists in, the climate parameters and patterns, the difference between climate/climatology and weather/meteorology and the importance of climate for human.
- be informed about the recent changes of climate as well as climate changes that occurred in the near and far past of the Earth's history.
- have acquired basic knowledge about the components of the Earth's energy and radiation budget .
- know the black body theory and its applications to the Earth-atmosphere system.

- have a detailed knowledge of the regime of solar radiation and its role for the Earth's climate. More specifically, the student is expected to know what are the driving factors, both externals and internals (i.e. terrestrial ones), of the solar energy budget, as well as the parameters determining the geometry of solar radiation transfer and its pathways into the terrestrial atmosphere as well as the spatial and temporal distribution and variation of solar radiation.
- have learnt simple (empirical) methods of calculation of the incoming solar radiation at the Earth's surface.
- have acquired a detailed knowledge of the regime of terrestrial longwave radiation and its role for the Earth's climate. More specifically, to know what are the factors that determine the longwave radiation budget and its spatial and temporal distribution, as well as the differences between the terrestrial longwave and solar shortwave radiation.
- have an essential and in depth knowledge and understanding of the natural and anthropogenic greenhouse effects and the differences between them.
- know what is the regime and balance of the net allwave radiation within the Earth-atmosphere system, its spatial and temporal distribution and the role for the Earth's climate.
- have a basic knowledge about the main actinometric instruments and their operation.

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.
Respect for the natural environment.
Working independently.
Criticism and self-criticism.
Production of free, creative and inductive thinking.

(3) SYLLABUS

The scope of Physical Climatology. Basic characteristics and patterns of climate, main climatic parameters and their units of measurements. The Earth's climate and its present and near and far past changes. Parameters determining the climate and its changes. The solar radiation budget. Changes of solar radiation in the past and their role for climate changes. Distribution of solar radiation within the Earth-atmosphere system. Penetration of solar radiation to the surface, water and ice/snow. Empirical formulas for computation of surface solar radiation. The terrestrial radiation budget. Black body theory and laws. Distribution of longwave radiation within the Earth-atmosphere system. Spatial and temporal variation of the longwave terrestrial

radiation budget. Natural and anthropogenic greenhouse effect and their role for the Earth's climate. The net all-wave radiation budget and its role for the Earth's climate. Measurements and instruments for solar and terrestrial radiation.

Visit to the actinometric (meteorological) station of the University of Ioannina.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face learning
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of ICT Moodle remote teaching platform for distributing and exchanging course notes, exercises and practice activities with students and for informing and communicating with them.
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 examinations at the end of the semester, in greek language, including open-ended questions, short-answer questions, multiple-choice questionnaires and problem solving. In addition, during the semester, project works are assigned to the students, on a volunteer basis, including bibliographic search, internet based search, acquisition and analysis of data on a small to medium scale. The project score has a small contribution to the final mark, to which adds as a bonus, provided that the student's mark of the final written exams is 5/10.

Activity	***Semester workload***
Lectures	39
Tutorials	13
Educational visits	2
Study and analysis of bibliography	33
Non guided study	10
Examinations	3
Course total	***100***

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Physical Climatology (in greek), H. S. Sahsamanoglou and A. A. Bloutsos, Zitis Publications, Thessaloniki, Greece (1998).
- Meteorology and Climatology courses, A. Flocas, Zitis Publications, Thessaloniki, Greece (1997).
- Electronic notes, N. Hatzianastassiou (yearly updated).