COURSE OUTLINE

1. GENERAL INFORMATION

FACULTY/SCHOOL	SCHOOL OF PLANT SCIENCES		
DEPARTMENT	DEPARTMENT OF CROP SCIENCE		
LEVEL OF STUDY	*Undergraduate*		
COURSE UNIT CODE	1250	**Semester:**	2
COURSE TITLE	Agricultural Meteorology (compulsory)		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**ECTS**
Lectures		2	2
Laboratory Exersices		2	2
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Scientific expertise*		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (In English)		
COURSE WEBSITE (URL)			

2. LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

The aim of the course is to familiarize students, at a theoretical and applied level, with issues related to the modulation of conditions in the lower layers of the atmosphere (atmospheric boundary layer), with emphasis on the lower layer (surface boundary layer) and on small spatial and temporal scales of interest to agriculture. In the context of the course, the Earth-Sun motion is analysed in relation to the formation of atmospheric conditions and, in particular, the radiation balance. The atmospheric circulation and its consequent horizontal motions are examined with particular emphasis on the wind parameter in relation to topographic relief, land/sea coexistence and the modulation of the wind speed distribution over and within the crop rotation. Atmospheric disturbances and the associated weather are analysed, particularly in relation to farms and the possibilities and measures to protect agricultural crops from adverse weather events. The radiation and energy balance at typical spatial and temporal scales and under different land covers, orientations and slopes, as well as

the resulting micro-meteorological-microclimatic conditions within typical crops, are analysed. Precipitation is analysed in terms of its spatial and temporal distribution in combination with evapotranspiration (potential and actual), which shape the water balance in the field. Finally, the micro-meteorological conditions that shape the levels of air pollution, and pollution sources in agricultural areas are analysed.

The laboratory exercises are designed to help students understand and familiarise themselves with the concepts, processes and atmospheric phenomena affecting agriculture. Through these practical exercises, they will be able to perform calculations and manage atmospheric parameter data to be able to provide service in the field or in agricultural research.

Upon successful completion of this course, the student will be able to:
- Have an understanding of the phenomena that occur in the lower atmospheric layer, the mechanisms that govern them and their importance to crop growth and development
- have an understanding of the particular flow conditions near the soil surface and the phenomena of momentum, heat, water vapour and mass transfer over bare and vegetated soil necessary for knowledge of the functioning of atmospheric conditions and the creation of micro-meteorological and micro-climatic conditions above and within the crop
- has an understanding of energy and water balances at field and watershed scales to be able to use knowledge of micro-meteorological and microclimatic conditions to select appropriate crops, crop location and cultural practices in a given area given meso-climatic or macro-climatic conditions
- determine - using qualitative and quantitative criteria - the pollution of the atmospheric environment of agricultural areas by point and non-point sources of air pollution
- understand the particular meteorological conditions which may be harmful to crops, be able to predict and propose methods of dealing with them and effective measures for their protection

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Environmental awareness*
Individual/Independent work	*Social, professional and ethical responsibility and sensitivity to gender issues*
Group/Team work	*Critical thinking*
Working in an international environment	*Development of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Introduction of innovative research	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
	…….

-Research, analysis and synthesis of data and information using the necessary technologies
- Projects design and management
-Respect for the natural environment

3. COURSE CONTENT

The syllabus of the course is the following:
- Spatio-temporal scales in Agricultural Meteorology and Micrometeorology. Earth and Sun, Elements of Solar Geometry, Seasons of the Year. Earth and Atmosphere interaction.
- Radiation, sensible and latent heat, Energy Balance in the Earth and the Atmosphere.
- Temperature and Pressure in the Atmosphere.
- Atmospheric Humidity. Large and Small Scale Condensations.
- Atmospheric Circulation. Horizontal atmospheric motions. Winds. Effect of land and sea on winds.
- Air masses, fronts and weather in agricultural areas. Elements of Weather Forecasting.
- Hail and Hail Protection in Agricultural Areas.
- Wind near the ground surface. Flow over natural surfaces (laminar, turbulent flow and equations of motion). Wind speed distribution over the bare and vegetated ground.
- Vertical transport of momentum, heat and water vapour in vegetation. Eddy transport coefficients. Eddy flow method. Effect of stability-instability conditions of the atmosphere. Heat transfer in soil.

- Variation of radiation regime, air temperature, soil temperature, soil heat flux and energy balance in areas with different land cover, slope and orientation. Micrometeorology of typical crops.
- Field microclimate modification and crop protection. Anti-freezing protection. Windbreaks and windbreaks.
- Rainfall in agricultural areas. Point precipitation and average rainfall. Estimation of maximum point rainfall events.
- Agro-meteorological forecasts. Soil temperature. Potential and actual evapotranspiration. Water balance at field and catchment scale. Water balance data for microclimate assessment of agricultural areas. Point and non-point pollution of agricultural areas.

4. TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-classroom lecturing, lectures and tasks in the laboratory classroom, field trips and field measurements.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of slide presentation and blackboard. Communication with students with email. Learning process support by access to e-class asynchronous distance learning platform and Microsoft Teams platform.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.*	

Activity/ Method	Semester workload
Lectures	26
Laboratory practice	26
Individual laboratory project (data processing and commenting)	10
Personal study	12
Field trips	4
Sources and references study	12
Total of Course (25 hours of workload per ECTS)	100

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation*, *assessment methods*, *formative or summative (conclusive)*, *multiple choice tests*, *short- answer questions*, *open-ended questions*, *problem solving*, *written work*, *essay/report*, *oral exam*, *presentation*, *laboratory work*, *other……etc.* *Specifically defined evaluation criteria are stated*, *as well as if and where they are accessible by the students.*	I. Written final examination on the theory of the course II. The examination in the laboratory part of the course is composed of: 1. Identification of characteristics of meteorological and micro-meteorological instruments in the laboratory and the field 2. Laboratory exercise involving measurement and calculation of values of characteristic agrometeorological parameters and solving related problems (e.g. seasonal energy balance in plant cultivation) 3. Final written examination (short answer or multiple choice questions or a combination of both)

5. SUGGESTED BIBLIOGRAPHY:

Greek textbooks

- Στάθης, Δ. 2015. Μαθήματα Δασικής Μετεωρολογίας και Κλιματολογίας. Αποθετήριο Κάλλιπος.
- Τσίρος, Ι. Ξ. 2020. Γεωργική Μετεωρολογία με Στοιχεία Περιβαλλοντικής Μικρομετεωρολογίας. Πανεπιστημιακές Σημειώσεις.
- Χρονοπούλου-Σερέλη Α. και Φλόκας Α., 2010. Μαθήματα Γεωργικής Μετεωρολογίας και Κλιματολογίας. Εκδόσεις Ζήτη, Θεσσαλονίκη.

Textbooks in English

- Geiger R., Aron R. and P. Todhunder, 2003. The climate near the ground. Rowman & Littlefield Publishers INC, Maryland USA
- Arya, P. 2002. Introduction to Micrometeorology. Second Edition. Academic Press.

6. TEACHERS:

-Theory:
Ioannis X.Tsiros, Professor

-Laboratory:
Ioannis X.Tsiros, Professor
Athanasios Kamoutsis, Assistant Professor
Fotoula Droulia, Laboratory Teaching Staff
Aristidis Matsoukis, Laboratory Teaching Staff
Ioannis Charalampopoulos, Laboratory Teaching Staff