COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF ENVIRONMENT & AGRICULTURAL ENGINEERING		
ACADEMIC UNIT	Department of Natural Resources Management & Agricultural Engineering		
LEVEL OF STUDIES	Postgraduate Study Program		
COURSE CODE	**630009**	**SEMESTER**	**A**
COURSE TITLE	APPLICATIONS TO MICROMETEOROLOGY-BIOCLIMATOLOGY		

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**
	2	5
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*	Scientific field
PREREQUISITE COURSES:	Physics, Computers
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	English
COURSE WEBSITE (URL)	https://oeclass.aua.gr/eclass/courses/5388/

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 lectures focus on observing and analyzing the relationships between the natural environment and the form and function of living organisms. With the advancement of technology today, the latest measurement and analysis techniques are used to develop various bioclimatic relationships that help optimize plant and animal production.

One of the main goals of this lecture series is to bridge the gap in the cognitive domains of the postgraduate participants (graduates from different Departments) by offering a shared venue for individuals seeking an authoritative perspective on the most recent advancements in Bioclimatology and Micrometeorology.

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…*

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Micrometeorology focuses on the study of small-scale atmospheric processes near the Earth's surface. Its objectives include understanding and characterizing the exchange of energy, water vapor, and momentum between the Earth's surface and the atmosphere at a very local scale. This field often explores phenomena like turbulence, heat fluxes, and microclimates in specific environments. Bioclimatology, on the other hand, is concerned with the impact of climate on living organisms, including humans. Its objectives involve studying how climate factors such as temperature, humidity, and solar radiation influence the distribution, behavior, and physiology of organisms. Bioclimatology aims to understand the relationships between climate and biological processes, helping to predict and mitigate the effects of climate on ecosystems and human health. In essence, micrometeorology delves into the small-scale atmospheric interactions, while bioclimatology explores the connections between climate and living organisms.

Understanding local airflow patterns, heat fluxes, and microclimates is crucial for designing sustainable and efficient rural areas. Agricultural micrometeorology helps optimize the placement of extensive crops, parks, and other agricultural infrastructures. Also, Micrometeorological data is essential for optimizing crop management. It helps in understanding factors like temperature, humidity, and wind patterns at the crop level, which can influence growth and yield. Micrometeorology plays an important role in studying atmospheric dispersion of pollutants at a local scale. This information is crucial for managing and mitigating air pollution in rural, suburban, and urban areas. Understanding local wind patterns and solar radiation is vital for maximizing energy output. Generally, micrometeorology is applied to study the microclimates within natural fields and forests, helping in the management and conservation of biodiversity. It also aids in understanding factors like fire behavior.

Applications to Bioclimatology helps in assessing the suitability of different crops for specific climates. It provides information on temperature and precipitation patterns, assisting farmers in making informed decisions about crop selection and planting times as well as, contributes to the study of how climate influences the distribution and behavior of plant and animal species.

In summary, micrometeorology and bioclimatology contribute valuable insights to diverse fields, ranging from urban planning and agriculture to public health and biodiversity balance.

3. SYLLABUS

01. Introduction of Earth Climate (Solar Activity and climate system, Earth Temperature, Global Water and Latent Heat flux, Carbon fluxes)

02. Microclimate (Energy Fluxes at an Ideal Surface, Energy Balance Equations, Some Examples of Energy Budget, Automatic Meteorological Stations)

03. Solar Energy And Its Role in Plants Growth (Extraterrestrial Radiation, Shortwave Radiation, Albedo, Net Radiation, Photosynthetic active Radiation)

04. Infrared Temperature (Atmospheric window, Temperature Canopy)

05. Atmospheric vapor and its Important - Part 1 (Expressing Water Vapor Content in the atmosphere, Psychrometric diagram)

06. Atmospheric vapor and its Important - Part 2 (The vertical profile of the atmosphere, Atmospheric Stability, Temperature inversion)

07. Evapotranspiration (Soil-Plant-Atmosphere Continuum [SPAC], The effect of the surface characteristics on the Reference Evapotranspiration estimates, Evapotranspiration models)

08. Wind and vapor fluxes near the ground (Sonic anemometer, Eddy covariance system)

09. Soil Heat flux (Thermal Conductivity, Thermal diffusivity, Heat capacity and heat storage)

11. Bowen ratio and Energy Balance (BREB method)

12. Micrometeorological Observations in the field. Reference evapotranspiration and spatial homogeneity. Errors and adaptation techniques to reference conditions.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with 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 work (60%) Final written exam (40%)

Activity	*Semester workload*
Lectures	26
Seminars	5
Field applications	30
Personal study	35
Literature study & analysis	15
	10
Course total	125

5. ATTACHED BIBLIOGRAPHY

Greek language books:

Alexandris, S. Lecture Notes on Agricultural Micrometeorology.

Foreign language books:

• Foken T., 2008. Micrometeorology. Springer, Berlin

• Lee X., Massman W. and L., Beverly, 2004. Handbook of Micrometeorology. Kluwer Academic Publishers, New York.

• Monteith, J., & Unsworth, M. (2013). Principles of environmental physics: plants, animals, and the atmosphere. Academic Press.

• Allen R., L. Pereira, D. Raes, and M. Smith. 1998. Crop Evapotranspiration – Guidelines for computing crop water requirements. Irrigation and Drainage Paper Nr. 56, FAO, Rome, Italy. 300 pages.