COURSE OUTLINE

1. GENERAL INFORMATION

FACULTY/SCHOOL	SCHOOL of PLANT SCIENCES		
DEPARTMENT	CROP SCIENCE		
LEVEL OF STUDY	*Undergraduate*		
COURSE UNIT CODE	**1185**	**Semester:**	9th
COURSE TITLE	URBAN ECOLOGY AND BIOCLIMATOLOGY (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 TEACHNG HOURS**	**ECTS**
	Lectures	3	3
	Laboratory exercises	2	2
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek		
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 scope of the course is to understand the functioning of urban ecosystems, to comprehend the ways that main urban environmental problems are addressed and to understand how human activities affect natural and semi-natural ecosystems. Emphasis is placed on the methods of assessing these effects, as well as on the practical applications of ecological knowledge in the coordination and maintenance of urban and peri-urban parks with the implementation of Green Routes (pathways) in the cities. In addition, the main ways of managing natural resources in the urban ecosystem are presented and described - as an example of Urban Environmental Ecology - its basic principles govern Urban Agriculture.

Furthermore, other subjects of the course include the analysis of the urban climate's special characteristics and of

the city elements that may influence and contribute to its formation. The urban hot and cold island phenomena are underlined. The basic concepts and principles of bioclimatic planning in the urban environment are introduced. The concepts of human thermal sensation (comfort) are analyzed, and the quantification of thermal sensation based on bioclimatic and biometeorological indices is presented. Analysis of the microclimatic and bioclimatic conditions characterizing the urban fabric are highlighted, together with the processes through which these conditions are distributed in outdoor spaces with different types of coverage. Additionally, the course's purpose is to present and analyze techniques aimed at improving the microclimatic conditions in urban centers following analysis of the interactions between urban green and built areas. Finally, atmospheric conditions' modeling techniques in the urban environment are presented in order to record and forecast the bioclimatic/microclimatic regime. Through these processes, the paths for the location of the points of interest are demonstrated along with extensive analysis of the mitigation and prevention techniques concerning the urban heat island and other adverse atmospheric conditions.

Laboratory exercises aim at understanding the Ecological Risk Assessment methodology and at promoting the biomarkers' significance as tools for the measurement of urban pollution.
Also, laboratory exercises' goals include the comprehension of the basic concepts of urban bioclimatology and the acquiring of experience in their analysis. In addition, exercises induce familiarity with the basic principles of bioclimatic planning and the application ability for the improvement of urban environmental conditions.

Upon successful completion of the course, students will be able to:

- analyze atmospheric parameters' spatial distributions in the urban environment
- design and conduct investigations on the microclimatic and bioclimatic conditions within the built areas- apply bioclimatic principles and techniques for the designing of outdoor spaces
- work on simulation applications for the estimation and forecasting of the bioclimatic/microclimatic parameters in order to achieve improvements in the urban environment's conditions
- utilize biomarkers for urban pollution measurements
- estimate the Ecological Risk resulting from various anthropogenic activities

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.)*
	…….

- Search, analysis and synthesis of data and information using the necessary technologies
- Work in an interdisciplinary environment
- Generation of new research ideas
- Project planning and management
- Respect for the natural environment

3. COURSE CONTENT

The course content – in lectures and laboratory exercises – is as follows:

- Ecology - Urban Ecology - Urban Ecosystems - Study methods.
- Definition of the city - Historical evolution of cities – Athens' historical evolution.
- Urbanization - Urbanism – Modern cities - Urban Demography - Ecological footprints (Water Footprint - Carbon Footprint - Ecological Footprint).
- City models - Types of cities - Megacities, Favelas, Garden cities - Soft cities, Smart cities, Future cities.
- Urban pollution - Atmospheric pollution - The "cloud" of Athens. Visual pollution - Aesthetic pollution - Light pollution - Noise pollution. Indoor Pollution - Pollution and Historical Monuments.
- Pollutants' impact limits on human health - Environmental indices/indicators. Urban life and illnesses. Organisms as Bioindicators/Bio indices – Quality Biometers of the Urban environment. Phytoremediation – Rain Gardens.
- Biodiversity of Urban Ecosystems. Urban green areas - Urban enclaves - "Pocket Parks". Ecological Corridors - Green Routes (pathways) in the urban environment.
- Municipal waste management. Urban Agriculture.
- Urban microclimate. The urban heat island and urban cold island phenomena. Urban bioclimatology and bioclimatic design principles in the urban environment.
- Thermal comfort and thermal sensation. Bioclimatic – biometeorological indices.
- Assessment of microclimatic and bioclimatic parameters and study of spatiotemporal distributions in the urban environment with emphasis on vegetated surfaces and open public spaces.
- Investigation of urban green and built areas' relationships and principles of urban microclimatic and bioclimatic simulation models.
- Improving techniques of the microclimate and bioclimate in the urban fabric with emphasis on mitigation and prevention strategies for the urban heat island.

4. TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lecturing, in the Laboratory, in the field (in areas where classic/analogic and automatic weather stations are installed) and in selected Outdoor Spaces in the Urban Fabric of Athens.

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Powerpoint presentations, communication with students through their academic e-mails and meeting with students in small groups for the conduction of assignments.
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	39
Laboratory exercises	26
Individual field or simulation essays/reports/ assignments	15
Self-directed study	45
Course total working hours. (25 hours per credit unit)	**125**

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS A 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. Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students.	**I.** The course's examination is based on the preparation of assignments and/or - in combination - a written final examination. II. The laboratory lectures' examination is based on the elaboration of Field assignments in typical Urban Environmental formations.

5. SUGGESTED BIBLIOGRAPHY:

Greek bibliography

• Andreadaki, E. 2006. Bioclimatic planning. University Studio Press Publications. Thessaloniki.
• Riga-Karandinou A., 2002. Urban Environmental Ecology Issues (University Notes)
• Kosmopoulos, P., Michalopoulou, 2017. *ENVIRONMENTAL DESIGN*-Conditions of comfort in outdoor urban spaces. University Studio Press Publications. Thessaloniki.
• Tsiros, I. 2019. URBAN ENVIRONMENT BIOCLIMATOLOGY AND INTRODUCTION TO BIOCLIMATIC PLANNING. (University Notes, 4th ed.)

English bibliography

• Kevin J. Gaston, Zoe G. Davies, Jill L. Edmondson, Karl L. Evans et all, 2010. Urban Ecology. Editor: Kevin J. Gaston, Cambridge Univ. Press, ISBN: 9780521743495
• Erell, E., Pearlmutter D., Williamson, T. 2011. Urban Microclimate. Designing the spaces between buildings. Earthscan, London and Washington.

6. TEACHERS

THEORETICAL LECTURES:

I. X. Tsiros, Professor (Scientific expertise on "Agricultural Meteorology and Bioclimatology").
K. I. Saitanis, Associate Professor (Scientific expertise on "Quantitative Ecology and Environmental Pollution").

LABORATORY LECTURES:

I.X. Tsiros