# COURSE OUTLINE

## (1) GENERAL

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| SCHOOL | SCHOOL OF SCIENCES | | |
| ACADEMIC UNIT | BIOLOGY | | |
| LEVEL OF STUDIES | Undergraduate | | |
| COURSE CODE | BIO_ΣΤΕ5 | **SEMESTER** | 6 |
| COURSE TITLE | PLANT ECOPHYSIOLOGY | | |

| INDEPENDENT TEACHING ACTIVITIES<br>*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 |
|---|---|---|
| Lectures and Laboratory Exercises | 5 | 6 |
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| *Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).* | | |

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| COURSE TYPE<br>*general background, special background, specialised general knowledge, skills development* | Elective |
| PREREQUISITE COURSES: | There are no prerequisite courses. Students are recommended to have passed examinations in Plant Physiology |
| LANGUAGE OF INSTRUCTION and EXAMINATIONS: | GREEK |
| IS THE COURSE OFFERED TO ERASMUS STUDENTS | NO |
| COURSE WEBSITE (URL) | https://eclass.upatras.gr/courses/BIO215/ |

## (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 is expected: 1. to have understood the basic mechanisms by which the environment affects the physiological functions of plants. 2. to know the main adaptations of plants against the environmental stresses 3. to be trained through the exercises, in the methodology of anatomical, morphological, physiological and biochemical measurements for the practical assessment of the degree of stress as well as the adaptive responses of the plants.
At the end of this course the student will have further developed the ability: 1.to recognize the primary environmental factor that stresses a plant. 2. to use the existing equipment of a familiar laboratory in order to address more effectively an ecophysiological question. 3. to collaborate with team members in order to resolve

research problems. 4. to process (using basic computer programs), evaluate and present in audience the experimental results.

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?*

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| *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…* |
| | *…….* |

- Retrieve, analyze and synthesize data and information, with the use of necessary technologies
- Work autonomously
- Work in teams
- Advance free, creative and causative thinking
- Respect natural environment

(3) SYLLABUS

First Part Environmental factors.
1. The light environment - Light intensity and fluctuations. Effects of light quality on plants. Reception of radiation by leaves and canopies. 2. Photosynthetic responses to light environment - Gas exchange in plants. Specific capacity of net photosynthesis. Specific activity of mitochondrial respiration. The influence of developmental stage on photosynthesis and respiration. The effect of external factors on $CO_2$ exchange. $CO_2$ exchange and water supply. Responses of $CO_2$ exchange to the interplay of external factors. 3. The carbon balance of the whole plant. 4. The carbon balance of plant communities. 5. Temperature as environmental stress - The temperature relations of plants. Plant adaptations and resistance to low temperatures. The characteristic features of cold climates. Adaptations in arctic and alpine regions. Plant resistance to freezing injury.
Second Part Interactions between plants and their biotic environment
1. Plant secondary metabolites - Structure and biosynthesis of phenolic compounds, terpenoids and alkaloids. Interrelations of primary and secondary metabolism. The roles of secondary metabolites in plants. 2. Biochemical interactions among plants - Allelopathy. Allelopathy in desert plants. Allelopathy in Mediterranean ecosystems. 3. Defence against herbivores - Feeding deterrents. Plant toxins: non-protein amino acids, cyanogenic glycosides, alkaloids, cardenolides, saponines. Hormonal interactions between plants and animals: plant-produced estrogens and androgens, hormones of insect metamorphosis in

plants (phytoecdysones). 4. Defence against microbial pathogens - Phytoalexins. Pathotoxins. 5. Attraction of herbivorous insects and pollinators - Insect pheromones produced by plants. The biochemistry of pollination. The role of odor. The role of color. Pollinator reward: pollen and nectar, nutritional value.

## (4) TEACHING and LEARNING METHODS - EVALUATION

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| **DELIVERY**<br>*Face-to-face, Distance learning, etc.* | Lectures in classroom |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY**<br>*Use of ICT in teaching, laboratory education, communication with students* | Lectures using contemporary methods and attempts of improving critical reasoning through dialogue. Compulsory practicals. Complementary usage of the e-class (open class) platform. |
| **TEACHING METHODS**<br>*The manner and methods of teaching are described in detail.*<br>*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.*<br><br>*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*<br>Lectures: 26<br>Laboratory Exercises: 30<br>Reports of Laboratory Exercises: 24<br>Team projects: 40<br>Autonomous study: 30<br>Course total: *150* |
| **STUDENT PERFORMANCE EVALUATION**<br>*Description of the evaluation procedure*<br><br>*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*<br><br>*Specifically-defined evaluation criteria are given, and if and where they are accessible to students.* | Compulsory written examination in both theory and laboratory practical. In addition, during laboratory practical the students (working in groups of three) process the experimental results and present them in audience. |

## (5) ATTACHED BIBLIOGRAPHY

*- Suggested bibliography:*


Physiological Plant Ecology. Larcher W. Springer, 1995.

Plant Ecology E.D Sculze, E.Beck, K.Muller-Hohenstein. Springer, 2005.

Plant Ecophysiology K. Georghiou, C. Thanos, S. Meletiou - Christou, S. Rhizopoulou. Diavlos Publications, Athens, 2010 (in greek)

Stress Physiology of Plants G. Karabourniotis, G. Liakopoulos, D. Nikolopoulos. Embryo Publications. Athens, 2012 (in greek)

- *Related academic journals:*