

COURSE OUTLINE

1. GENERAL INFORMATION

FACULTY/SCHOOL	PLANT SCIENCES		
DEPARTMENT	CROP SCIENCE		
LEVEL OF STUDY	Pregraduate		
COURSE UNIT CODE	2750	Semester:	5th
COURSE TITLE	PLANT STRESS PHYSIOLOGY		
INDEPENDENT TEACHING ACTIVITIES <i>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</i>	WEEKLY TEACHING HOURS	ECTS	
Lectures	3	5	
Laboratory Exercises	2		
<i>Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4</i>			
COURSE TYPE <i>Background knowledge, Scientific expertise, General Knowledge, Skills Development</i>	Scientific expertise Skills Development		
PREREQUISITE COURSES:	(3530) FUNCTIONAL PLANT ANATOMY, (55) PLANT PHYSIOLOGY, (1280) GENERAL MICROBIOLOGY, (890) GENERAL AND SYSTEMATIC ENTOMOLOGY, (665) BIOCHEMISTRY, as well as an introductory lecture in Molecular Plant Biology.		
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://oeclass.aua.gr/eclass/courses/EFP193/		

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 first section of the course is dedicated to abiotic stress factors, which precede in terms of importance and effects on crop yields. Their effects on the structure and function of plant organisms are examined, with an emphasis on cultivated species, and the mechanisms through which plants cope with adverse conditions. The knowledge of these mechanisms is a prerequisite not only for a series of cultivation interventions, but also for genetic improvement programs or for biotechnological applications. The second section examines anthropogenic stressors in order to build a background of knowledge about the effects of anthropogenic activities and the changes they bring to the planet's flora and crops (and therefore to the survival of the human species). Acquiring this background allows plant organisms to be utilized by experts who respect the planet that hosts them. In the third section, biotic stress factors are examined, their effects on

the structure and function of plant organisms and the mechanisms through which plants defend. Special mention is made of secondary metabolites, molecules that play an important role in coping with biotic stressors, and then preexisting and induced defense mechanisms are examined. The knowledge of defense mechanisms is a prerequisite not only for the understanding of Phytopathology and Pharmacology courses, but also for a number of applications such as the production of biologically active substances, drugs and cosmetics. In the third section, an attempt is made to present the consequences of the coexistence of more than one stress factor on the structure and function of plant species as well as their respective reactions, because the conditions that are formed now resemble field conditions more realistically. Finally some opinions are developed regarding the existing as well as possible biotechnological applications based on the background knowledge acquired.

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,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research*

*Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
.....
(Other.....citizenship, spiritual freedom, social awareness, altruism etc.)
.....*

Environmental awareness
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Development of free, creative and inductive thinking
Working in an interdisciplinary environment
Introduction of innovative research

3. COURSE CONTENT

THEORY

SECTION Ia. Abiotic (non-anthropogenic) stressors

Introduction-definitions

Water stress

Salinity stress

Extreme temperatures

Radiation Stress

Hypoxia and Anoxia

Mechanical stress

Oxidative stress

SECTION Ib. Abiotic (anthropogenic) stressors

Heavy metals

Air pollution

The effects of anthropogenic activities at the planetary level: Climate change

SECTION II. Biotic stress factors

The defense of plants against biotic stress factors - the secondary metabolites

The fundamental pre-existing defense

The induced defense against pathogens

The induced defense against insects

Parasitic plants

Mechanisms of protection of plant tissues from the toxic effect of defense metabolites

Neutralization of defenses against pathogens and herbivores

SECTION III. Interactions of stress factors

In natural ecosystems as well as in crops, plants are subject to more than one stress factor

SECTION IV. Biotechnological approaches

LABORATORY

1. Drought

EXERCISE 1. Effect of water stress on physiological and morphological characteristics of barley plants

2. Salinity

EXERCISE 2. The effect of NaCl on seed germination.

EXERCISE 3. Soil salinity and pachymorphism.

3. Radiation Intensity

EXERCISE 4. Anatomical and Physiological characteristics of shade and sun leaves.

4. Defense against biotic stressors

EXERCISE 5. Qualitative detection of hydrogen cyanide release from bitter almonds' injured endosperm.

EXERCISE 6. Detecting the presence of phenol oxidases in leaves.

4. TEACHING METHODS--ASSESSMENT

<p>MODES OF DELIVERY <i>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</i></p>	In-class lecturing, laboratory exercises																	
<p>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY <i>Use of ICT in teaching, Laboratory Education, Communication with students</i></p>	Use of slide presentation and blackboard. Communication with students. Learning process support by access to e-class asynchronous distance learning platform.																	
<p>COURSE DESIGN <i>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.</i></p> <p><i>The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.</i></p>	<table border="1"> <thead> <tr> <th>Activity/ Method</th> <th>Semester workload</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>39</td> </tr> <tr> <td>Laboratory practice</td> <td>12</td> </tr> <tr> <td>Individual laboratory project (data processing and commenting)</td> <td>6</td> </tr> <tr> <td>Personal study</td> <td>68</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>Total of Course (25 hours of workload per ECTS)</td> <td>125</td> </tr> </tbody> </table>	Activity/ Method	Semester workload	Lectures	39	Laboratory practice	12	Individual laboratory project (data processing and commenting)	6	Personal study	68					Total of Course (25 hours of workload per ECTS)	125	
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<p>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS <i>Detailed description of the evaluation procedures:</i></p> <p><i>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.</i></p> <p><i>Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students.</i></p>	<p>I. Final written exam in the theory of the course including a combination of 10 short-answer questions, open-ended questions and multiple choice questions.</p> <p>II. The written examination in the laboratory part of the course includes 4 short answer, open-ended, problem solving and documentation questions.</p>
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5. SUGGESTED BIBLIOGRAPHY:

Plant Stress Physiology. 2012. G. Karabourniotis, G. Liakopoulos, D. Nikolopoulos. EMBRYO Publications.

6. TEACHERS:

-Theory:

Georgios Karabourniotis, Professor

Georgios Liakopoulos, Associate Professor

Dimosthenis Nikolopoulos, Assistant Professor

Panagiota Bresta, Assistant Professor

-Laboratory:

Georgios Liakopoulos, Associate Professor

Dimosthenis Nikolopoulos, Assistant Professor

Panagiota Bresta, Assistant Professor

Aimilia-Eleni Nikolopoulou, Laboratory Teaching Staff