

## Description of the education module/course (syllabus)

Course name:	<b>Plant functioning under environmental stresses</b>		ECTS	<b>2</b>
Translation of the course name into English:	-			
Study field:	General Horticulture			
Language of lectures:	English		Study level: Master of science	
Study form: <input checked="" type="checkbox"/> stationary <input type="checkbox"/> extramural	Status of lectures: <input type="checkbox"/> primary <input checked="" type="checkbox"/> directional	<input type="checkbox"/> obligatory <input checked="" type="checkbox"/> facultative	Semester number: 1	<input type="checkbox"/> winter semester <input checked="" type="checkbox"/> spring semester
Academic year from which the description applies		<b>2021/2022</b>	Catalogue number:	<b>OGR-O2-S1L01.3 ang</b>
Course coordinator:	Dr inż Arkadiusz Przybysz			
Lecturers:	Dr inż . Robert Popek			
Unit running the course:	Laboratory of Basic Research in Horticulture			
Unit ordering the course:	Faculty of Horticulture			
Assumptions, objectives and description of the course:	<p>One of the main problems currently being encountered in crop production is to counteract the unfavorable environmental factors. Despite the use of most modern agrotechnical methods, the genetic potential of crops is not fully utilized. The negative effects of stresses and growing anthropopressure often make the plant's defense responses inadequate and, as a consequence, lead to a reduction in the yield and a decrease in its quality, and thus its commercial value. Plants have, however, developed mechanisms that allow them to counteract adverse environmental conditions.</p> <p>The aim of the course will be to present students the knowledge of various abiotic and biotic stress (some of them less known), plants responses to stress factors as well as strategies and mechanisms responsible for acclimatization and adaptation processes to adverse environmental conditions. Particular emphasis will be placed on the complex relationships between the environment and the various levels of plant biological organization of plants (from gene to canopy). The following topics will be discussed during lectures: (i) sources of stresses and their impact on natural and horticultural ecosystems, (ii) stress avoidance and tolerance strategies, defense responses, acclimatization and adaptation mechanisms, and (iii) the effects of stresses on different levels of the biological organization (canopy, plant, organ, tissue, cell, gene). During practical laboratory classes the following topics will be covered: (i) the effects of air pollution on plants, (ii) the effects of heavy metals on plants, (iii) the effects of salinity on plants, (iv) the effects of allelopathy on plants (v) the efficiency of the photosynthetic apparatus under conditions stress and (vi) oxidative stress and elements of the antioxidant system. Finally modern methods limiting the negative impact of environmental stressors on plants will be presented.</p>			
Didactic forms, number of hours:	Exercises: number of hours 30			
Teaching methods:	Audiovisual techniques - theoretical background of classes topics will be presented. Greenhouse and laboratory experiments. Collecting data from the experiments and its elaboration, interpretation and presentation. Discussion and problem solving based on the results obtained. Hours of consultation.			
Formal requirements and prerequisites:	The student has basic knowledge of: chemistry, biochemistry, plant physiology, soil cultivation and plant nutrition.			
Learning outcomes:	<b>Knowledge:</b> W_01 – Students know and understand the sources and types of environmental stress. W_02 – Students know and understand the most important mechanisms of acclimatization and adaptation to stress. W_03 – Students know and understand plants responses to stresses.	<b>Skills:</b> U_01 – Students are able to identify stresses based on symptoms. U_02 – Students are able to assess the intensity of the stress factor using modern research techniques and use this information in practice.	<b>Competences:</b> K_01 – Students are ready to make a decision (alone and/or in cooperation) aimed at improving the quality of plant production conducted under stress conditions. K_02 – Students are ready to deepen their knowledge of new research techniques.	
The way of verification of learning outcomes :	Effects W_01, W_02, W_03, U_01, U_02, K_01, K_02 – written exam. Effects U_01, U_02, K_01, K_02 – team written report on experimental work carried out on exercises and individual student activity on exercises.			
Form of documentation of achieved learning outcomes :	Archived written exams. Archived experimental results along with student reports.			
Elements and weights affecting the final grade:	The assessment of learning outcomes consists of: 1 - mark from written exam, 2 - report and activity during classes. The weights of each element: 1 - 80%, 2 - 20%. The condition for passing the subject is obtaining a minimum of 51% from element 1.			
Place of classes:	Laboratory with audiovisual tools.			
Basic and supplementary literature :				
<ol style="list-style-type: none"> <li>1. Kopcewicz J., Lewak S. 2005. Fizjologia roślin, PWN.</li> <li>2. Kozłowska M. 2007. Fizjologia roślin, PWRiL.</li> <li>3. Bartosz G. 1995. Druga twarz tlenu, PWN.</li> <li>4. Gwóźdź E.A. 2004. Odporność na czynniki abiotyczne. W: Biotechnologia roślin pod redakcją Malepszy S., PWN.</li> <li>5. Starck Z., Chołuj, D. Niemyska B.1993. Fizjologiczne reakcje roślin na niekorzystne czynniki środowiska, Wyd. SGGW.</li> <li>6. Materials provided by the teacher.</li> </ol>				
COMMENTS				
The following scale will be used to calculate the final grade: 100-91% points - 5.0; 90-81% points - 4.5; 80-71% points - 4.0; 70-61% points - 3.5; 60-51% points – 3.0.				

Quantitative indicators characterizing the module / object:

Estimated total number of student work hours (contact and own work) necessary to achieve the assumed learning outcomes - on this basis, complete the ECTS field:	<b>60 h</b>
The total number of ECTS points that a student receives in classes requiring direct participation of academic teachers or other lecturers:	<b>1.5 ECTS</b>

Table of compliance of the directional learning outcomes with the effects of the course:

Effect category	Learning outcomes for the course:	Reference to learning outcomes specific for study program on particular study field (direction)	The impact of course on the directional effect <sup>*)</sup>
Knowledge - W_01	Students know and understand the sources and types of environmental stress.	K_W02	2
Knowledge - W_02	Students know and understand the most important mechanisms of acclimatization and adaptation to stress.	K_W01; K_W03	2; 2
Knowledge - W_03	Students know and understand plants responses to stresses.	K_W01	2
Skills - U_01	Students are able to identify stresses based on symptoms.	K_U02	1
Skills - U_02	Students are able to assess the intensity of the stress factor using modern research techniques and use this information in practice.	K_U02; K_U04; K_U06	2; 2; 1
Competences - K_01	Students are ready to make a decision (alone and/or in cooperation) aimed at improving the quality of plant production conducted under stress conditions.	K_K01; K_K03	2; 1
Competences - K_02	Students are ready to deepen their knowledge of new research techniques.	K_K01	2

\*)

3 – meaningfull and detailed,

2 – partial,

1 – basic,