



## Module syllabus: *Abiotic stress in plants*

### 1. Overall information

Module coordinator	dr hab. Eugeniusz Małkowski
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ECTS	3
Method for the verification of learning outcomes	The final grade for the module is weighted on the average of the final report from the laboratory (0.5) and the final exam (0.5). The evaluation of the lab is issued based on the submitted report. The rating of the lectures is determined on the basis of the final exam. Grades: below 51% – fail (F); 52-60% – with minimum academic criteria (E); 61-65% – satisfactory (D); 66-75% – good (C); 76-85% – very good (B), ≥ 85% – excellent (A)

### 2. Description of student activity and work

Lecture/discussion sessions	
Responsible instructor	dr hab. Eugeniusz Małkowski
Content	<b>The main objective of this module</b> is to acquaint students with the impact of various abiotic factors on plant physiology with particular emphasis on oxidative stress and photosynthesis. <b>Lectures/discussion sessions</b> comprise of core subjects in plant physiology. <b>Lecture/discussion session content:</b> 1. Abiotic stress – definition. Types of stress. Phase course of stress. Types of stress tolerance. 2. Examples of adaptation – the mechanisms of uptake of iron, proteoid roots. 3. Oxidative stress in plants – the effects and mechanisms of defence. 4. Morphological and anatomical changes in roots in response to the stress caused by heavy metals. 5. Water stress in plants – the effects and mechanisms of resistance (the role of abscisic acid).
Number of didactic hours (contact hours)	<b>10</b>
Literature	L. Taiz and E. Zeiger (eds.). 2002. Plant Physiology. 3rd edition, Sinauer Associates, USA.

Laboratory	
Responsible	Krzysztof Sitko, MSc





instructor	
Laboratory projects	Project 1: Preparation of reagents and hydroponic culture of plants. Selection of abiotic stress factors. Project 2: The effect of abiotic stressors on H <sub>2</sub> O <sub>2</sub> , MDA and IAA content in the leaves of treated plants. Project 3: The effect of abiotic stressors on enzyme activity (CAT, SOD). Project 4: The effect of abiotic stressors on changes in chlorophyll fluorescence and the content of pigments.
Methodology of laboratory classes	Experiments will be performed in small groups under the instructor's supervision and will include: <ul style="list-style-type: none"><li>• Designing and accomplishing the procedure</li><li>• Measuring, calculating and presenting the results</li><li>• Commitment and presentation of the protocols</li></ul>
Number of didactic hours (contact hours)	25
Literature	L. Taiz and E. Zeiger (eds.). 2002. Plant Physiology. 3rd edition, Sinauer Associates, USA.

Sformatowano: Angielski (Stany Zjednoczone)

### 3. Forms of verification

Continuous evaluation of knowledge, activity and practical skills	
Grades	Grades are awarded on a scale of A-F, where A is the best and F is a fail. <u>An excellent performance (A)</u> – the student actively participates in the laboratory work, demonstrates an excellent understanding of the experimental procedures (their aims, sequence and outcomes) and is engaged and creative in solving current problems and in the assessment and presentation of the experimental results. <u>A good performance (C)</u> – the student demonstrates good judgment and knowledge, correctly performs an experiment, correctly exhibits a sense of the experimental procedure, properly provides an assessment and presentation of the experimental results. <u>A satisfactory performance (E)</u> – the student demonstrates satisfactory judgment and knowledge, is poorly engaged and needs additional help to finish an experiment and the final assessment of the experimental results correctly, presents a satisfactory presentation of experimental results. <u>A performance that does not meet the minimum academic criteria (F)</u> – the student is not engaged in the experiment, did not exhibit sense of experimental procedures, poorly interprets and presents the experimental results.

Reports from realised laboratory projects	
Evaluation	Evaluation is comprised of the judgment and knowledge related to the sense and methods of the laboratory project, engagement in its realisation, the quality of the assessment and presentation of the experimental results, use of reference materials. Grades for reports are awarded on a scale of A-F, where A is the best and F is a





	fail. An excellent report (A) – without any essential errors Fail (F) – no report
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<b>Final exam</b>	
Grades	Grades are awarded on a scale of A-F, where A is the highest and F is failing. Excellent (A) – the student presents a fluent knowledge of the mechanisms of oxidative stress and the resistance of plants to stressors. Good (C) – the student presents a good knowledge of the mechanisms of oxidative stress and the resistance of plants to stressors, makes rare but subtle errors. Satisfactory (E) – the student exhibits a satisfactory knowledge, but with a poor understanding of the mechanisms of oxidative stress and the resistance of plants to stressors, and makes subtle errors. Fail (F) – the student does not present a satisfactory knowledge of the mechanisms of oxidative stress and the resistance of plants to stressors, and makes many substantial errors, which disqualify their presentation.

