INDBIOT-E09:	**PLANT STRESS BIOLOGY AND BIOTECHNOLOGY**
GENERAL INFORMATION	
Course Coordinator	Tihana Marček, PhD, assist. prof.
Associate(s)	Maja Ižaković, assistant
Study Programme	Interdisciplinary Graduate Study Programme in English: Biotechnology
Course Status	Elective
Year of Study, Semester	2nd Year / 4th Semester
Credits (ECTS)	**4**
Teaching Method (number of classes)	Lectures 20; seminars 10; exercises 15
Expected Number of Students in the Course	25-30

COURSE DESCRIPTION

Course Aims

The course aim is to introduce the students with the importance of plant involvement in the biotechnology since the environmental factors can seriously endanger the potential and yield of crops, industrial and medical plants.

Prerequisites for Enrolment and the Entry Competencies Required for the Course

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Learning Outcomes at the Course Level

INDBIOT-1; INDBIOT-4

Learning Outcomes at the Course Level

After successful completion of this course students are expected to be able to:

1. Provide a fundamental knowledge of biochemical, molecular, physiological and morphological plant stress response and explain the interaction among them;
2. Present the signal transduction under stress;
3. Distinguish the terms tolerance, resistance, avoidance, acclimation and adaption to stress;
4. Predict the effect of stress on primary metabolism;
5. Connect the stress impact with a synthesis of secondary metabolites and production of biological active substances;
6. Compare the methods for stress detection in plants.

Course Content

Lectures. Abiotic and biotic stress factors in plants. Stress detection, signal molecules and signal transduction network. Gene expression and stress protein detection. Antioxidative response. The stress impact on the photosynthesis. Hypersensitive reaction. Specific and non-specific resistance. Compatible and incompatible response. Role of primary and secondary metabolism in stress detection. Stress adaptive and avoiding mechanisms. Phytohormones synergistic and antagonistic stress regulation. Ecological aspects in tolerance improvement.
Seminars. Plant response to one type of stress (*by choice*). Define specific changes on cellular, physiological and biochemical level. Define the specific stress important for biotechnology.
Exercises. Tissue extraction for the biochemical analyses (determination of antioxidative enzymes activity, determination of stress markers- membrane damage indicators, hydrogen peroxide and proline concentration). The application of physical treatment in the improvement of seed viability under stress.

Teaching Methods

Lectures, seminars, exercises

Students' Obligations

Attendance at all forms of classes is mandatory and the students are obligated to attend all

knowledge tests. The students may be absent from 30% (full-time students) and 50% (part-time students) of each of the forms of classes, provided that the absence is justified. An exercise or a seminar which has not been completed must be made up through a midterm exam.

Monitoring the Activity of the Students *(Connecting Learning Outcomes, Teaching Methods, and Grading)*

Class-related activity	ECTS	Learning outcome	Student activity	Evaluation method	Grade points	
					Min.	Max.
Attending lectures	0.25	1-6	Class presence	Keeping records	5	10
Seminar	1.5	3-4	Seminar work	Presentation of seminar work	10	30
Exercises	0.25	6	Practical work	Laboratory exercises report	5	10
Final exam	2	1-6	Studying for the final exam	Written exam	30	50
Total	**4**				**50**	**100**

Evaluation of the written part of the final exam

Percentage of correct answers (%)	Grade
>95.00	50
90.00-94.99	47
85.00-89.99	45
80.00-84.99	40
75.00-79.99	38
70.00-74.99	35
65.00-69.99	33
60.00-64.99	30

Forming the final grade:
The grade points accumulated during the classes will be added to the points achieved from the final exam. The grading will be done by absolute distribution, i.e. on the basis of the final results, and it will be compared to the numerical system in the following manner:
A – Excellent (5): 90-100 grade points; B – Very Good (4): 80-89.99 grade points; C – Good (3): 65-79.99 grade points; D – sufficient (2): 50-64.99 grade points

Mandatory Literature (available in the library and via other media)

Title	Number of copies in the library	Availability via other media
Ramakrishna A, Gill SS, Metabolic Adaptations in Plants During Abiotic Stress. Boca Raton; CRC Press, 2019		No
Shabala S, Plant Stress Physiology. CABI, Oxfordshire, UK, 2012.		No

Additional course literature

1. Rao KVM, Raghavendra AS, Reddy KJ: Physiology and Molecular Biology of Stress Tolerance in

Plants. Springer Science & Business Media, 2006. 2. Scientific Papers (available on-line).
Quality Assurance Procedures Designed to Ensure the Acquisition of Outcomes and Competencies
Anonymous, quantitative, standardised student survey on the course and the teacher's work implemented by the Quality improvement office of the Faculty of Food Technology Osijek and/or the Faculty of Medicine Osijek.
Note
E-learning is not included in the class quota, but it is used in teaching and it contains links to various sites and video and audio materials available on websites.