

Course name: Physiology of stress in plants

ECTS	5
Course status	<i>facultative</i>
Course final assessment /evaluation of outcomes	<i>exam</i>
Prerequisite	<i>knowledge of the basics of plant physiology, plant biochemistry</i>

Main field of study:

Agriculture and Horticulture, Biology and Biotechnology (Erasmus+)

Educational profile	<i>general academic</i>
Code of studies and education level	<i>bachelor/engineer (SI) or master of science (SM)</i>
Semester of studies	<i>winter or summer</i>
Language of instruction	<i>English</i>

Course offered by:

Name of faculty offering the course	Faculty of Biotechnology and Horticulture
Name of department offering the course	Department of Botany, Physiology and Plant Protection
Course coordinator	dr inż. Anna Kołton, prof. URK

Learning outcomes:

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
KNOWLEDGE – student knows and understands:			
PSP_W1	concepts of stress factor, oxidative stress, ROS and plant responses	BIOT2_W01 BIOT2_W03 BIOT2_W10	P,R
PSP_W2	changes in plant metabolism under the influence of stress factors	BIOT2_W12	P,R
PSP_W3	mechanisms of reactions involving ROS	BIOT2_W10	P,R
SKILLS – student is able to:			
PSP_U1	perform laboratory experiments using modern techniques and methods	BIOT2_U01 BIOT2_U16	P,R
PSP_U2	describe and interpret the results of the experiment	BIOT2_U01 BIOT2_U03	P,R
PSP_U3	express themselves verbally and in writing	BIOT2_U02 BIOT2_U05 BIOT2_U06	P,R
SOCIAL COMPETENCIES – student is ready to:			
PSP_K1	formulation of objective assessments regarding stressors and their effects on plants and reaction mechanisms	BIOT2_K06 BIOT2_K01	P,R
PSP_K2	work in a small team	BIOT2_K01	P,R

Teaching contents

Lectures	20 hours
Topics	definition of stress factor, general responses to stress, introduction to the topic, water stress temperature stress radiation stress stress of excess and deficiencies of minerals stress of excess heavy metals mechanical stress salinity stress oxidative stress

	formation and role of ROS plant antioxidant system - enzymes and low molecular weight antioxidants
Accomplished learning outcomes	PSP_W1 PSP_W2 PSP_W3 PSP_K1
Means of verification, rules and criteria of assessment	<i>the written test - essay on a given subject and attendance and activity during lectures are assessed; the final grade is the weighted average calculated from the grades obtained from the classes and the lectures</i>
Classes:	25 hours
Topics	effect of abiotic stress on the biological membranes permeability determination of isocoumarin content in carrot roots proline determination determination of phenols by the Folin reagent method - under mechanical stress determination of chlorophyll a fluorescence in leaves under stress plant respiration under stress determination of anthocyanins under the influence of stress effect of hypoxia stress on plants determination of the ability to neutralize DPPH free radical. determination of ascorbic acid content determination of peroxidase activity determination of catalase activity presentation of project
Accomplished learning outcomes	PSP_U1 PSP_U2 PSP_U3 PSP_K1 PSP_K2
Means of verification, rules and criteria of assessment	<i>students prepare reports on conducted exercises and a presentation on a given topic (project), classes attendance and activity is also assessed; the final grade is the weighted average calculated from the grades obtained from the classes and the lectures</i>

References:

Basic	<i>Khan M.I.R., Khan N.A. (eds) Reactive Oxygen Species and Antioxidant Systems in Plants: Role and Regulation under Abiotic Stress, 2017, Springer</i> <i>Ahmad P., Prasad MNV. (eds) Abiotic stress responses in plant: metabolism, productivity and sustainability, 2012, Springer</i> <i>Shabala S. (ed) Plant stress physiology, 2017, Cabi</i>
Supplementary	<i>Czarnocka W., Karpiński S. Friend or foe? Reactive oxygen species production, scavenging and signaling in plant response to environmental stresses, 2018 Free Radical Biology and Medicine 122 (2018) 4–20</i> <i>Mittler R. ROS Are Good, Trends in Plant Science, January 2017, Vol. 22, No. 1</i> <i>Smirnoff N. (ed.) Antioxidants and Reactive Oxygen Species in Plants 2005, Blackwell Publishing</i>

Structure of learning outcomes

Area of academic study: agriculture and horticulture	2.0 ECTS**
Area of academic study: biological sciences	3.0 ECTS**

Structure of student activity

Contact hours	50	hrs.	2.0 ECTS**
Including:			
lectures	20	hrs.	
classes and seminars	25	hrs.	
consultations	3	hrs.	
participation in research	...	hrs.	
obligatory traineeships	...	hrs.	
participation in examination	2	hrs.	
e-learning	...	hrs.	... ECTS**

student own work	75	hrs.	3.0 ECTS**
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*areas of academic study in the fields of: P – biological sciences; R – agriculture and horticulture

** stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25 - 30 hours of classes