

SYLLABUS (MODULE-ERASMUS+)

Course/module (as specified in the approved curriculum for the field of study) Molecular aspects of stress tolerance and resistance		ECTS 8	Catalogue number HORT 3.1
Name in Polish Molekularne aspekty tolerancji i odporności na stres			
Head of course/module Dr hab. Iwona Morkunas, Assoc. Prof.			
Unit(-s) providing the course/module (Institute/Department) Department of Plant Physiology			
Field of study Biology and Horticulture	Level	Profile Academic-general	Semester winter
TYPE OF CLASSES/LECTURES AND THE NUMBER OF HOURS (organised classes/lectures and self-study)			
Type of studies: full-time		Type of studies: extramural	
- lectures	25		
- laboratory practical	40		
- other – tutored	5		
- self-study	130		
Total number of hours:		200	
OBJECTIVE OF COURSE/MODULE			
Understanding the physiological and molecular basis of plant resistance to environmental stresses and the relationship between plant and stress factors. Program includes the effect of abiotic and biotic stresses on plants and the mechanism of crosstalk, and the plant acclimation and adaptation to stresses as well as identifying strategies to increase plant tolerance to different types of stresses. Current knowledge about opportunities to improve crop plant resistance.			
TEACHING METHODS			
Lecture supported by multimedia presentation, discussion, laboratory training consisting of performing of experimental tasks independently, observation of the effect of environmental factors on selected plant model under the supervision of a teacher, microscopic observations, written work related to the summary of results (team or individual).			
LEARNING OUTCOMES		Reference to field outcomes	Reference to area outcomes
Knowledge	E1. Student acquires knowledge about the effect of adverse environmental factors on plants	Not applicable	Not applicable
	E2. Student has knowledge concerning physiological and molecular mechanisms of plant resistance to abiotic and biotic stressors		
	E3 Student understands convergence points between biotic and abiotic stress		
	E4. Student has knowledge concerning the plant-microbe interactions at the physiological, biochemical and molecular level		
	E.5. Student has knowledge on a variety of plant responses to abiotic and biotic stresses that enable them to tolerate and survive adverse condition		
Skills	E6. Student identifies main groups of environmental factors affecting plants		
	E7. Student recognises molecular, metabolic and proteomic changes in response of plants to abiotic and biotic stressors		
	E8. Student identifies the responses of acclimation and adaptation of plants to stresses		
	E9. Student recognizes the influence of climate and soil on plants		
Social competences	E10. Student is able to work as a leader and/or as a partner in a group.		
	E11. Student is able to predict the effects of different environmental stressors on food production, understanding economic significance subject in the current time		

Methods to verify learning outcomes: written test and preparation of oral presentation(s)	Outcome Reference Numbers E1-E11
TEACHING CONTENT	
<u>Lectures:</u>	
<ol style="list-style-type: none"> 1. Introduction to plant stress physiology (Prof. Jolanta Floryszak-Wieczorek) (1h) 2. Stress responses of plants at the cellular and molecular level (Dr Iwona Morkunas, Assoc. Prof.) (1h) 3. Plant response to drought stress (Prof. Hanna Bandurska) (4h) 4. Influence of salt stress on plants (Dr Jan Kubiś) (4h) 5. Soil sickness – reasons and effects (Prof. Barbara Politycka) (4h) 6. Mechanisms of plant resistance to trace metals (Dr Tamara Chadzinikolau) (2h) 7. Effect of plant pathogens on the host physiology (Prof. Jolanta Floryszak-Wieczorek) (2h) 8. How plants defend themselves against pathogens (Dr Magda Formela) (2h) 9. Mechanisms of plant defense against insect herbivores (Dr Iwona Morkunas, Assoc. Prof.) (2h) 10. Role of sugars in defense strategy of plants against biotic stressors (Dr Iwona Morkunas, Assoc. Prof.) (2h) 11. The improvement of crop plant resistance to environmental stresses (Prof. Jolanta Floryszak-Wieczorek) (1h) 	
<u>Exercises:</u>	
<ol style="list-style-type: none"> 1. Demonstration of the accumulation of stress metabolites under drought (5h) 2. Estimation of some organ metric and physiological parameters under salt stress (5h) 3. Effect of allelochemical plant extracts and harvest residues on seed germination and seedling growth (5h) 4. Determination of physiological and biochemical indicators of heavy metal response (5h) 5. Physiological and biochemical plant responses to fungal pathogens – determination of secondary metabolites and the activity of response enzymes (15h) 6. Effect of cross-talk interactions of heavy metals and aphid infestation on the level of oxidative stress (5h) 	
Forms and criteria for passing of course/module Written test – passed above 60%	Percentage of final mark 100%
LIST OF LITERATURE	
<u>Basic literature</u>	
<ol style="list-style-type: none"> 1. Plant environment interactions. 2009. Ed. Baluška F., Springer, ISBN 978-3-540-89229-8 2. Physiological mechanisms and adaptation strategies in plants under changing environment. 2014. Eds. Paravaiz A., Mohd Rafiq W. Springer. ISBN 978-1-4614-8599-5 3. Plant-fungal pathogen interaction. A classical and molecular view. 2001. H.H. Prell, Day P.R.. Springer, ISBN 3-540-66727-X 4. Buchanan B.B, Gruissem W. and Russell L.J. Biochemistry & Molecular Biology of Plants. Chapters: <i>Responses to abiotic stresses</i> and <i>Responses to plant pathogens</i> Wiley Blackwell, 2015. 5. Plant Physiology, Fifth Edition. 2017. Eds. Taiz L., Zeiger E. Publisher: Sinauer Associates, Inc. ISBN-13: 978-0878938667 6. Gupta D. K., Corpas F. J. Palma J. M., (Eds.), 2013. Heavy metal stress in plants. Springer Heidelberg New York Dordrecht London, ISBN 978-3-642-38468-4 	