Nazwa zajęć/*Course title*:	**Fizjomika roślin I**	**ECTS**	**1**
Nazwa zajęć w j. angielskim/ *Course title in English*:	**Physiomics**		
Zajęcia dla kierunku studiów/ *Degree program name*:	Biotechnology		

Język kursu/ *Course language*: English			Poziom studiów/*Study level:* I		
Typ studiów/ *Form of studies*:	x intramural ¨ extramural	Status zajęć/ *Course status*	podstawowe/ *Basic* x kierunkowe/ *major*	X obowiązkowe/ *mandatory* do wyboru/ *elective*	Semestr/*Semester:* 5	X semestr zimowy/ *winter semester* ¨semestr letni/ *summer semester*
Rok akademicki/*Academic year:*			**2022/2023**	Numer katalogowy/ *Catalogue number:*	**BBT_BTa-1S-5Z-38**	

Koordynator zajęć/Course coordinator:	Prof. dr hab. Stanisław Karpiński			
Prowadzący zajęcia/ *Teachers responsible for the c*ourse:	Prof. dr hab. Stanisław Karpiński			
Założenia, cele i opis zajęć/ *Aims, objectives and description of the course:*	The course is based on basic knowledge of subjects such as plant physiology, biochemistry, molecular biology and bioinformatics. The aim of the course is to provide students with a comprehensive (holistic) approach to the functioning of the plant organism, along with paying attention to the adaptation of plant life strategies to changing environmental conditions resulting from evolutionary processes. During the course, students will learn about specialist terminology used in plant physiomics. The course program includes: 1. Differences in structure and function between plant and animal cells. 2.Photynthesis, structure and function of the photosynthetic apparatus, mechanism of action and regulation of the photosynthetic electron transport chain, extinction and dissipation of excess excitation energy (NPQ). 3. Breathing and the respiratory electron transport chain. Interdependence between breathing and photosynthesis. 4. Regulation of plant temperature and NPQ, the role of NPQ in the mechanism of light cell memory and plant acclimatization, regulation of growth and yielding. 5. The role of retrosignals from chloroplasts in the coordination of plant responses to environmental stresses and regulation of gene expression, the role of cis and trans regulatory elements. 7. Molecular physiology of biotic and abiotic stress in plants. 9. Cellular automaton and intelligent signal network in plants, regulation of transpiration and water consumption efficiency. 10. Electrical signals in plants and their role.			
Formy dydaktyczne, liczba godzin/ *Teaching forms, number of hours*:	a) Lectures number of hours 15			
Metody dydaktyczne/*Teaching methods:*	lecture, problem solving, consultations, the possibility of using distance learning when necessary			
Wymagania formalne i założenia wstępne/ *Formal requirements and prerequisites*	Basic knowledge of biochemistry, molecular biology and plant physiology. Before starting the course, the student should have knowledge of plant physiology and cell structure. basic molecular mechanisms.			
Efekty uczenia się/*Learning outcomes:*		treść efektu przypisanego do zajęć/*the content of the effect assigned to the course:*	Odniesienie do efektu kierunkowego /*Relation to the course outcomes*	Siła dla ef. kier* /*Impact on the course outcomes **
Wiedza (absolwent zna i rozumie) /*Knowledge*: *(the graduate knows and understands)*	W1	has knowledge about the structure of plant and animal cells and about the physiological processes taking place in them	K_W04 K_W05 K_W06	2 2 2
	W2	understands that the physiomic approach integrates the entire plant metabolism at all levels of its organization into one network of mutual dependencies	K_W04 K_W05 K_W06 K_W07 K_W08 K_W10 K_W12	2 3 3 2 2 3 1
	W3	fully understands the importance of a holistic and systemic approach to the functioning of plants, starting from the molecular level, through cells, tissues and organs, and ending with the entire plant organism	K_W03 K_W04 K_W05 K_W06 K_W07 K_W08 K_W09 K_W10 K_W12 K_W13	2 2 3 3 3 2 2 3 1 2

	W4	knows the basic mechanisms of gene expression.	K_W08 K_W10	2 2
Umiejętności (absolwent potrafi) /*Skills*: *(the graduate is able to)*	U1	is able to comprehensively assess the complexity of biochemical signals occurring in plants	K_U01 K_U02 K_U03 K_U04 K_U05 K_U06 K_U07 K_U08 K_U09 K_U10 K_U11 K_U12 K_U13 K_U14 K_U15 K_U16 K_U17 K_U19 K_U21 K_U22	2 1 2 2 2 1 2 2 2 2 2 2 3 3 1 1 2 2 2 1
Kompetencje (absolwent jest gotów do) /Competences: (The graduate is ready to)	K1	is ready to identify significant mechanisms influencing the physiology of plants, which should be analyzed in more detail in the systems studied	K_K02 K_K06 K_K07	2 2 2
	K2	is prepared to recognize the complexities of signal conduction mechanisms in plants	K_K01	2
Treści programowe zapewniające uzyskanie efektów uczenia się: */Program contents ensuring the achievement of the learning outcomes:*		Developing a comprehensive (holistic) approach to the functioning of the plant organism in students, along with paying attention to the adaptation of plant life strategies to changing environmental conditions resulting from evolutionary processes. Specialist terminology used in plant physiomics. Issues such as: Differences in structure and function between plant and animal cells. Photosynthesis, structure and function of the photosynthetic apparatus, mechanism of action and regulation of the photosynthetic electron transport chain, extinction and dissipation of excess excitation energy (NPQ). Breathing and the respiratory electron transport chain. Interrelationship between respiration and photosynthesis. Regulation of plant temperature and NPQ, the role of NPQ in the mechanism of light cell memory and plant acclimatization, regulation of growth and yield. The role of chloroplast retrosignals in the coordination of plant responses to environmental stresses and the regulation of gene expression, the role of cis and trans regulatory elements. Molecular physiology of biotic and abiotic stress in plants. Cellular automaton and intelligent signal network in plants, regulation of transpiration and water consumption efficiency. Electrical signals in plants and their role.		
Sposób weryfikacji efektów uczenia się/ *Methods of the verification of the learning outcomes:*		written exam of lectures		
Szczegóły dotyczące sposobów weryfikacji i form dokumentacji osiąganych efektów uczenia się /Details on the verification methods and of the ways of documenting the learning outcomes:		the content of the examination questions with the assessment, the possibility of using distance learning when necessary		
Elementy i wagi mające wpływ na ocenę końcową/*Elements and weights influencing the final grade:*		lecture credit grade - 100%		
Miejsce realizacji zajęć/ *Teaching place:*		classroom		

Literatura/Literature:

„Biotechnologia roślin” 2001, pod red. S. Malepszego, Wydawnictwo Naukowe PWN, ISBN 83 – 01 – 13566 – 2 oraz „Biotechnologia roślin” 2009 wydanie nowe, ISBN 978-83-01-159474

„Fizjologia roślin” 2002, pod red. J. Kopcewicza i S. Lewaka, Wydawnictwo Naukowe PWN, ISBN 83 – 01 – 13753 – 3

Baker, N.R. (2008). Chlorophyll fluorescence: a probe of photosynthesis in vivo. Annu. Rev. Plant Biol 59: 89-113.

Mullineaux, P.M., Karpinski, S. (2002). Signal transduction in response to excess light: getting out of the chloroplast. Curr. Opin. Plant Biol. 5: 43-48.

Peak, D., West, J.D., Messinger, S.M., and Mott, K.A. (2004). Evidence for complex, collective dynamics and emergent, distributed computation in plants. Proc. Natl. Acad. Sci. USA 101: 918-22.

Szechyńska-Hebda, M., Kruk, J., Górecka, M., Karpińska, B., Karpiński, S. (2010). Evidence for light wavelength-specific photoelectrophysiological signaling and memory of excess light episodes in *Arabidopsis*. Plant Cell 22: 2201-2218.

Ślesak, I., Karpiński, S. (2010). Biologiczne bazy danych i ich zastosowanie w funkcjonalnej analizie porównawczej organizmów – wybrane zagadnienia. Biotechnologia, **4:** 39-52.

Taiz, L., Zeiger, E. (2002) Plant Physiology. Third edition. Sinauer Associates Inc., pp. 700.

Wóycicki R., Witkowicz J., Gawroński P., Dąbrowska J., Lomsadze A., Pawełkowicz M., Siedlecka E., Yagi K., Pląder W., Seroczyńska A., Śmiech M., Gutman W., Niemirowicz-Szczytt K., Bartoszewski G., Tagashira N., Hoshi Y., Borodovsky M., Karpiński S., Malepszy S., Przybecki Z. (2011). The genome sequence of the North-European cucumber (*Cucumis sativus* L.) unravels evolutionary adaptation mechanisms in plants. PLoS ONE **6(7)**: e22728.

UWAGI/*ANNOTATIONS*

The following scale is used to calculate the final score: 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

*) 3 – zaawansowany i szczegółowy, 2 – znaczący, 1 – podstawowy/ *3 – significant and detailed, 2 – considerable, 1 – basic,*

Wskaźniki ilościowe charakteryzujące moduł/przedmiot/*Quantitative summary of the course:*

Szacunkowa sumaryczna liczba godzin pracy studenta (kontaktowych i pracy własnej) niezbędna dla osiągnięcia zakładanych dla zajęć efektów uczenia się - na tej podstawie należy wypełnić pole ECTS /*Estimated number of work hours per student (contact and self-study) essential to achieve the presumed learning outcomes - basis for the calculation of ECTS credits:*	35 h
Łączna liczba punktów ECTS, którą student uzyskuje na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich lub innych osób prowadzących zajęcia/ *Total number of ECTS credits accumulated by the student during contact learning:*	0.6 ECTS