

Subject card

Subject name and code	Biotechnology of plants and algae, PG_00198347						
Field of study	Genetics and Experimental Biology						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		1.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Department of Experimental Biology and Plant Biotechnology -> Faculty of Biology -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Joanna Rojek				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	15		3.0		7.0	25
Subject objectives	To acquire knowledge in the field of biotechnology of higher plants and algae. To understand the contribution of genetically modified plants and plant biotechnology techniques to the development of biological sciences and the emergence of new research directions and disciplines.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[GBEL3_W05] A graduate has an advanced knowledge and understanding of: principles for planning research based on the achievements of biological sciences and related disciplines and the possibility of putting their results into practice, principles for the operation of equipment and apparatus used in molecular genetics research, and the principle of interpreting biological phenomena and processes based on empirical data in research work and practical action, taking into account the sustainable use of biodiversity.		Graduates will be familiar with the principles of planning research based on the achievements of the biological sciences and the possibilities of using their results in practice, the principles of functioning of the equipment and apparatus used in research in the field of plant and algal biotechnology and the principle of interpreting biological phenomena and processes based on empirical data in research work and practical action, taking into account the sustainable use of biodiversity		[SW4] test/exam - oral or written		
	[GBEL3_W04] A graduate has an advanced knowledge and understanding of: knowledge applied to microbial and plant biotechnology.		Graduates have a basic knowledge applied to microbial and plant biotechnology		[SW4] test/exam - oral or written		

Subject contents	The role of plants in meeting human needs. Developmental processes in plant in vitro cultures. Techniques for growing plants and algae in in vitro cultures. Production, extraction and purification of primary and secondary plant metabolites. Methods of obtaining species with new traits: crossing, somatic hybridisation, haploidisation and diploidisation, transformation and gene editing. Creation of gene constructs of genes for plant modification. Genetic transformation of plant cells. Genetically modified plants. Cytogenetic and molecular diagnosis of plants with new traits. Social and legal aspects of plant biotechnology.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	51.0%	100.0%
Recommended reading	Basic literature	Malepszy S. (red.). 2009. Biotechnologia Roślin, PWN, Warszawa. Michalik B. (red.). 2009. Hodowla roślin z elementami genetyki i biotechnologii. PWRiL Naukowe publikacje przeglądowe z zakresu biologii eksperymentalnej i biotechnologii roślin	
	Supplementary literature	Cole C. [Ed]. 2014-2020. Compendium of Plant Genomes. Springer Loyola-Vargas V.M., Vázquez-Flota F. (red.). 2006. Plant Culture Protocols. W: Methods in molecular Biology. Humana Press, Totowa, New Jersey. Pokora, W., Aksmann, A., Baścik-Remisiewicz, A., Dettlaff-Pokora, A., Rykaczewski, M., Gappa, M., Tukaj, Z. Changes in nitric oxide/hydrogen peroxide content and cell cycle progression: Study with synchronized cultures of green alga Chlamydomonas reinhardtii. Journal of Plant Physiology (2017) 208, 8493. Rojek J, Tucker MR, Rychłowski M, Nowakowska J, Gutkowska M. 2021. The Rab Geranylgeranyl Transferase Beta Subunit Is Essential for Embryo and Seed Development in Arabidopsis thaliana. International Journal of Molecular Sciences. 22(15):7907. https://doi.org/10.3390/ijms22157907 Rojek J, Tucker MR, Pinto SC, Rychłowski M, Lichocka M, Soukupova H, Nowakowska J, Bohdanowicz J, Surmacz G, Gutkowska M. 2021. Rab dependent vesicular traffic affects female gametophyte development in Arabidopsis. Journal of Experimental Botany. 72(2): 320-340. doi: 10.1093/jxb/eraa430 Chincinska I.A., Kapusta M., Zielińska E., Miklaszewska M., Błażejewska K., Tukaj Z. Production of recombinant human deoxyribonuclease I in Lua cylindrica L. and Nicotiana tabacum L.: evidence for protein secretion to the leaf intercellular space. Plant Cell, Tissue and Organ Culture (2019) 136 (1), 5163. Miklaszewska M., Banaś A., Królicka A. Metabolic engineering of fatty alcohol production in transgenic hairy roots of Crambe abyssinica. Biotechnology and Bioengineering (2017) 114(6), 1275-1282. Chincinska, Izabela Anna. "Leaf infiltration in plant science: old method, new possibilities." Plant Methods 17.1 (2021): 1-21	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Test question: In horticulture, somatic hybridization is used to transfer the trait of cytoplasmic male sterility (CMS; mitochondrially inherited). Species A- <i>Brassica campestris</i> -is characterized by resistance to triazines, encoded in the plastid genome; species B- <i>B. oleracea</i> - exhibits the CMS trait. For the heterokaryon formed via protoplast fusion to be a cybrid and to possess both CMS and triazine resistance, it must inherit: a. the nuclei of protoplasts A and B and the cytoplasm from both protoplasts (A and B) b. only the nucleus from protoplast A and only the cytoplasm from protoplast B c. the nucleus from protoplast A or B and the cytoplasm from both protoplasts (A and B) d. only the nucleus from protoplast B and only the cytoplasm from protoplast A		
Work placement	Not applicable		

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