

**Subject card**

<b>Subject name and code</b>	Development and differentiation of the cells and organisms, PG_00189397						
<b>Field of study</b>	Biology						
<b>Date of commencement of studies</b>	October 2025	<b>Academic year of realisation of subject</b>			2025/2026		
<b>Education level</b>	Master's studies	<b>Subject group</b>			Obligatory subject group in the field of study Optional subject group Subject group related to scientific research in the field of study		
<b>Mode of study</b>	full-time studies	<b>Mode of delivery</b>			at the university		
<b>Year of study</b>	1	<b>Language of instruction</b>			Polish		
<b>Semester of study</b>	2	<b>ECTS credits</b>			2.0		
<b>Learning profile</b>	academic	<b>Assessment form</b>			credit		
<b>Conducting unit</b>							
<b>Name and surname of lecturer (lecturers)</b>	<b>Subject supervisor</b>		dr Joanna Rojek				
	<b>Teachers</b>						
<b>Lesson types</b>	<b>Lesson type</b>	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	<b>Number of study hours</b>	0.0	30.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
<b>Learning activity and number of study hours</b>	<b>Learning activity</b>	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	<b>Number of study hours</b>	30		4.0		16.0	50
<b>Subject objectives</b>	<p>- Gain knowledge of the molecular and cellular mechanisms of reproduction and development of plant organisms,- Knowledge of the processes leading to the proper development and differentiation of plant and animal cells and tissues,- The ability to correlate knowledge of the regulation of developmental processes at the molecular [(epi-) genetic] and cellular levels.</p>						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BIOLMU2_K05] the graduate is prepared to use recognised sources of scientific and popular information in the biological sciences to further his or her knowledge	The graduate understands the need to use recognized sources of scientific and popular science information in the field of biological sciences in order to deepen knowledge.	[SK4] test/exam - oral or written
	[BIOLMU2_U02] the graduate is able to make proficient use of the scientific literature of the biological speciality studied	The graduate is proficient in the use of scientific literature on the development and differentiation of cells and organisms B2_U0	[SU4] test/exam - oral or written
	[BIOLMU2_W04] the graduate has an in-depth knowledge of the chosen specialisation in the biological sciences	The graduate has an in-depth knowledge of the development and differentiation of cells and plant and animal organisms B2_W04	[SW4] test/exam - oral or written
	[BIOLMU2_W01] the graduate has an in-depth knowledge and understanding of natural phenomena and processes at different levels of complexity	The graduate understands the phenomena and processes of development and differentiation of cells and organisms at different levels of complexity B2_W01	[SW4] test/exam - oral or written
[BIOLMU2_U07] the graduate is able to critically confront biological information from a variety of sources and, on this basis, draw valid conclusions	The graduate critically confronts biological information from various sources and builds justified conclusions on this basis.	[SU4] test/exam - oral or written	
Subject contents	<p>Plant part: Molecular and cellular mechanisms of formation and differentiation of main meristems, lateral meristems and plant tissues. Molecular mechanisms of formation and differentiation of gametophytes, gametes, zygote. Genetic regulation of embryogenesis and seed development. The use of mutants and transgenic plants to explain the regulation of processes in plant development.</p> <p>Animal part: Basic mechanisms of reproduction of animal organisms. Molecular and cellular mechanisms of oogenesis; spermatogenesis and the process of fertilization; Genetic regulation of early embryonic development of <i>Drosophila melanogaster</i>; homeotic genes, homeoboxes and homeodomains; genetic regulation of <i>Caenorhabditis elegans</i> development; regulation of the formation of various tissues and organs; development of the vertebrate nervous system; genetic basis of tumorigenesis and developmental disorders. Selected examples of induction of animal cell differentiation in vitro, molecular markers of tissues and cell lines.</p>		
Prerequisites and co-requisites	Passing the compulsory subjects of the bachelor's degree		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Class participation, written test	51.0%	100.0%
Recommended reading	Basic literature	The lecture is an original study of the issues of molecular biology of development and differentiation of plant and animal cells based on many years of study of source literature and own research. Recommended literature: Literature - primarily in the form of published review and experimental papers - will be suggested on an ongoing basis.- Scott F. Gilbert 2014, <i>Developmental Biology</i> , 10th Edition, Sinauer Associates, Inc., Sunderland, MA- Lodish H., Berk A, Kaiser C., Krieger M., Scott M, Bretscher A, 2007. <i>Molecular Cell Biology</i> . Scientific American Books, Washington, DC.- Krzanowska H, Sokół-Misiak W, 2002, <i>Molekularne mechanizmy rozwoju zarodkowego</i> . Wydawnictwo Naukowe PWN, Warszawa- Bielańska-Osuchowska Z, 2004, <i>Zarys organogenezy</i> . Wydawnictwo Naukowe PWN, Warszawa	
	Supplementary literature	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 <i>Arabidopsis thaliana</i> . <i>International Journal of Molecular Sciences</i> . 22(15):7907. <a href="https://doi.org/10.3390/ijms22157907">https://doi.org/10.3390/ijms22157907</a> Rojek J, Tucker MR, Pinto SC, Rychłowski M, Lichočka M, Soukupova H, Nowakowska J, Bohdanowicz J, Surmacz G, Gutkowska M. 2021. Rab-dependent vesicular traffic affects female gametophyte development in <i>Arabidopsis</i> . <i>Journal of Experimental Botany</i> . 72(2):320-340. doi:10.1093/jxb/eraa430 Rajewsky N, Jurga S, Barciszewski J. 2017. <i>Plant Epigenetics</i> . Springer	
	eResources addresses		
Example issues/example questions/tasks being completed	The written test covers the lecture material in the form of closed questions.		
Work placement	Not applicable		

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