

**Subject card**

<b>Subject name and code</b>	Modern research techniques in biology and medicine, PG_00147786						
<b>Field of study</b>	Nowoczesne techniki badawcze w biologii i medycynie - wykład (Wykład)						
<b>Date of commencement of studies</b>	October 2024	<b>Academic year of realisation of subject</b>			2024/2025		
<b>Education level</b>	Master's studies	<b>Subject group</b>			Obligatory subject group in the field of study Optional subject group		
<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>	1	<b>ECTS credits</b>			3.0		
<b>Learning profile</b>	academic	<b>Assessment form</b>			exam		
<b>Conducting unit</b>	Faculty of Biology -> Rector						
<b>Name and surname of lecturer (lecturers)</b>	<b>Subject supervisor</b>		prof. dr hab. Małgorzata Kozieradzka-Kiszkurno				
	<b>Teachers</b>		prof. dr hab. Małgorzata Kozieradzka-Kiszkurno				
<b>Lesson types</b>	<b>Lesson type</b>	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	<b>Number of study hours</b>	30.0	0.0	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		8.0		37.0	75
<b>Subject objectives</b>	<p>1. Learning about the structure and operation of light and electron microscopes and the latest devices used in biological and medical sciences.</p> <p>2. Ability to theoretically plan experiments using research tools.</p> <p>3. Learning about the application possibilities of the latest research techniques in biology and medicine.</p>						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BIOLMU2_K07] the graduate is ready to systematically update biological knowledge and information on its practical applications	- The graduate updates knowledge of modern research techniques and knows their practical applications in various fields of biology and medicine.	[SK1] wypowiedź ustna/rozmowa/dyskusja [SK8] obserwacja samodzielnej lub zespołowej pracy studenta
	[BIOLMU2_W04] the graduate has an in-depth knowledge of the chosen specialisation in the biological sciences	- The graduate knows the use of modern research techniques in biology and medicine.	[SW4] test/egzamin - ustny lub pisemny
	[BIOLMU2_U01] the graduate is able to select and apply research techniques and tools appropriate to the problems of the biological sciences specialisation studied	- The graduate selects and uses microscopic techniques (at the level of light and electron microscopy) and research tools adequate to the problems of the studied biological and medical sciences.	[SU1] wypowiedź ustna/rozmowa/dyskusja [SU4] test/egzamin - ustny lub pisemny [SU8] obserwacja samodzielnej lub zespołowej pracy studenta
[BIOLMU2_W08] the graduate has an in-depth knowledge and understanding of the wealth of contemporary experimental approaches and techniques in the biological sciences and their use to solve the tasks at hand	-The graduate recognizes digital data and administrative tools in the biological sciences and transfers them to use for basic tasks.	[SW4] test/egzamin - ustny lub pisemny	
Subject contents	Microscope theory,-characteristics and selection of microscope elements depending on the specificity of research. Types of microscopes. Contrast in microscopy. Fluorescence, confocal and high-resolution microscopy - similarities and differences. Light microscopy and electron microscopy (transmission and scanning): advantages and limitations. A modern solution in the field of microscopy - virtual microscopy. Computer image analysis. Preparing material for research in various types of microscopes. Freezing technique. Basics of cyto- and histochemistry. Immunocytochemistry. Autoradiography. Techniques used in molecular biology include: laser microdissection, fluorescence in situ hybridization (FISH), genomic in situ hybridization (GISH), comparative genomic hybridization (CGH). Types of diagnostic imaging techniques (including magnetic resonance tomography, positron emission tomography, ultrasonography, X-ray diagnostics, scintigraphy).		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test	51.0%	100.0%

Recommended reading	Basic literature	<p>Burry R.W. 2010. Immunocytochemistry - A practical guide for biomedical research. Springer, Cambridge.</p> <p>Hakat M.A.. 2000. Principles and Techniques of Electron Microscopy. Biological Applications.I, wyd. Cambridge University Press.</p> <p>Lidish H. i inni. 2007. Student Solutions Manual for Molecular Cell Biology. 6 th edition, wyd. Palgrave Macmillan.</p> <p>Litwin JA. 2011. Podstawy technik mikroskopowych. Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków</p> <p>Maluszynska J. 2002. In situ hybridization in plants methods and application. Molecular techniques in crop improvement. Jain M.S., Brar D.S., Ahloowalia B.S. (ed.) Kluwer Academic Publisher, Dordrecht, 299-326.</p> <p>Vecchiotti C., Spaltro G., Bloise D., Brunetti E., Sciacchitano S. 2004. Demonstration of a Gastric Biopic Specimen Mix-up by Laser Capture</p> <p>Microdissection (LCM) and DNA Fingerprinting, American Journal of Forensic Medicine &amp; Pathology 25 (2): 113.</p> <p>Pruszyński B. 2014. Diagnostyka obrazowa. Podstawy teoretyczne i metody badań. Warszawa.</p> <p>Skuza L., Słomińska-Walkowiak R., Filip E., Achrem M., Kalinka A. 2008. Wybrane metody biologii i cytogenetyki molekularnej, Wydawnictwo Uniwersytetu Szczecińskiego, Szczecin</p> <p>Wang, Zhong Lin. 2006. Scanning Microscopy for Nanotechnology, Springer New York</p> <p>Wróbel B., Zienkiewicz K., Smoliński D.J., Niedojadło J., Świdziński M. 2005. Podstawy mikroskopii elektronowej - skrypt dla studentów</p> <p>Skuza L., Słomińska-Walkowiak R., Filip E., Achrem M., Kalinka A. 2008. Wybrane metody biologii i cytogenetyki molekularnej, Wydawnictwo Uniwersytetu Szczecińskiego, Szczecin</p>
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	Supplementary literature	<p>Bozzola J. J., Russell L. D. 1992. Electron Microscopy (Principles and Techniques for Biologists). Jones and Barlett Publishers, Boston.</p> <p>Celis J. E. 1994. Cell Biology, A Laboratory Handbook. Academic Press, San Diego, New York, Boston, Sydney, Tokyo, Toronto.</p> <p>Gabriel B. L. 1982. Biological Scanning Electron Microscopy. Van Nostrand Reinhold Company, New York, Cincinnati, Toronto, London, Melbourne.</p> <p>- the latest scientific publications in the field of modern techniques used in biological sciences:</p> <p>Brzezicka E, Kozieradzka-Kiszkurno M. 2024 Callose deposition analysis with special emphasis on plasmodesmata ultrastructure during megasporogenesis in <i>Sedum</i> (Crassulaceae). <i>Protoplasma</i> 261(1): 31-41.</p> <p>Kozieradzka-Kiszkurno M, Majcher D, Brzezicka E, Rojek J, Wróbel-Marek J and Kurczyńska 2020: Development of Embryo Suspensors for Five Genera of Crassulaceae with Special Emphasis on Plasmodesmata Distribution and Ultrastructure. <i>Plants</i> 9,320</p>
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Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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