University of Gdańsk

Subject card

Subject name and code	Basis of Biotechnology - Introduction Methodology (M01_B1), PG_00153656		
Field of study	Biotechnology		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	undergraduate studies	Subject group	
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	academic	Assessment form	
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Stanisław Ołdziej	
	Teachers	dr Alicja Chmielewska prof. dr hab. Aleksandra Królicka dr Magdalena Rajewska dr n. med. Dorota Pomorska dr hab. Krzysztof Hinc dr hab. Dorota Krzyżanowska	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	14.0	9.0	0.0	0.0	23
	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	23	19.0	26.0	68

Subject objectives	The purpose of this class is to familiarize the student with the theoretical aspects of the philosophy of science and the art of critical (scientific) thinking, the idea and application of model organisms in scientific research with particular emphasis on the application of model organisms in biotechnology, the organization of the research laboratory, the ethics of scientific research

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOTECHL3_U08] The graduate is able to learn independently in a targeted manner	The student knows selected aspects of the philosophy of science and the art of critical (scientific) thinking	[SU4] test/exam - oral or written
[BIOTECHL3_U04] The graduate is able to use scientific information, including English-language information, on biotechnology in the fields of exact and natural sciences, as well as medical sciences and health sciences; use electronic sources; use appropriate databases	The student is familiar with the idea and application of model organisms in scientific research with particular emphasis on the application of model organisms in biotechnology	[SU4] test/exam - oral or written
[BIOTECHL3_K04] The graduate is willing to understand the importance of work safety rules, in particular laboratory work; apply the principles of work safety; be responsible for his/her own safety and that of others; be able to act in emergency situations.	The student knows the organization of the research laboratory	[SK2] presentation/project/paper/ report
[BIOTECHL3_K01] The graduate is willing to know the limitations of his/her own knowledge and skills; constantly improve, update knowledge, and raise qualifications in biotechnology in the sicience and natural sciences, as well as medical sciences and health sciences	The student knows selected aspects of the philosophy of science and the art of critical (scientific) thinking	[SK2] presentation/project/paper/ report
[BIOTECHL3_K03] The graduate is willing to understand risks and dilemmas, including ethical dilemmas related to conducting scientific research and introducing advanced technologies using the achievements of biotechnology; understand and appreciate the importance of intellectual property; behave ethically.	The student is aware of the moral and ethical dilemmas associated with the use of living organisms in scientific research.	[SK2] presentation/project/paper/ report

Subject contents	M1. Art of critical thinking (14h)Finding arguments, distinguishing arguments from explanations, descriptions, instructions or assertions, formal correctness of an argument, substantive correctness of an argument, basic argumentative fallacies, premises, conclusions, propositional arguments, categorical arguments, arguments from analogy, statistical arguments, causal arguments. M2. Model organisms and their applications in science (3x3h) Bacterial model organisms (Escherichia coli and Bacillus subtilis)preparation and basics of work in microbiology laboratory (sterile work, sterilization, health and safety rules), - basics of work with E. coli and B. subtilis, growth of bacteria on solid medium (demonstration), - microbiological media and media used for work with E. coli and B. subtilis, - division into Gram(+) and Gram(-) bacteria and staining of cells of E. coli and B. subtilis, staining of B. subtilis spores, - morphology of E. coli and B. subtilis on different microbiological media and including spores, - survival of bacteria and sensitivity of E. coli and B. subtilis to chemotherapeutics (demonstration) Mammalian cells HEK293 lines, cancer lines (e.g., HeLa, MOLT-4 suspension), recombinant lines with fluorescent proteins (GFP, mCherry): - Getting acquainted with materials, reagents and apparatus used during cell culture (laminar chamber, culture plastics, culture media, dewar). Learning how to work under sterile conditions. Health and safety in working with mammalian cells, - microscopic observations of mammalian cells in in vitro culture: comparison of cell morphology; observation of fluorescence (GFP, mCherry); fluorescence staining of vivo (mitotracker, lysotracker, DNA stain) and observation of stained cell organelles; staining of the actin cytoskeleton of the cell, - trypsinization and passage of cells, counting of cells with assessment of their viability in the presence of trypan blue and neutral red, seeding of cells, - cryopreservation and banking of cells, thawing of cells. Plants: observation and discussion of types of plant in vitro cultures (plant cultures, transformed root cultures, callus cultures, cell suspension), - encircling plant explants - pseudo-artificial seeds, - observation of biologically active compounds contained in plant tissues using thin-layer chromatography, - Arabidopsis thaliana mutants - comparison of hydroponic, in-ground and in vitro culture, - study of the effect of plant extracts on the growth of Escherichia coli, - isolation of chlorophyll-protein complexes from thylakoid membranes. Nematode Caenorabditis elegans: discussion of the principle of culture of the nematode Caenorabditis elegans, - isolation of nematode eggs from culture, - observation of nematode culture on solid medium using a stereomicroscope, - determination of nematode survival in liquid culture. Yeast S. cerevisiae and P. pastoris: During the course of the course, laboratory work performed by students and demonstrations conducted by the instructor will be implemented. Students will independently prepare microscopic preparations of yeast and conduct their observation (diploid cells, sporulation bags, fluorescently stained organelles). In addition, students will measure enzymatic activity in a suspension of cells. A demonstration of tetrad separation using a micromanipulator will also be performed. Other eukaryotic expression systems LEXSY-Leischmania tarentolae protozoa, insect cells/baculovirus system: - microscopic observation of insect and protozoan cells, - learning to work in sterile conditions, health and safety of working with viruses, - cell counting and passage, infection with fluorescent baculovirus; observation of fluorescent markers of recombinant gene expression, - discussion of differences in prokaryotic and eukaryotic gene expression systems.
Prerequisites and co-requisites	

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Part M1	0.0%	65.0%
	Part M2	0.0%	35.0%
Recommended reading	Basic literature	1. George W. Rainbolt, Sandra L. Dwyer, Critical Thinking. The Art of Argument, Wadsworth 2012 2. R, A. Ankeny, S. Leonelli (2011) Whats so special about model organisms? Studies in History and Philosophy of Science 42; 313323 (DOI: 10.1016/j.shpsa.2010.11.039) 3. S. Leonelli and R. A. Ankeny (2013). What makes a model organism? Endeavour 37; 209-212 (DOI: http://dx.doi.org/10.1016/j.endeavour.2013.06.001) 4. B. Tang, Y. Wang, J. Zhu, W. Zhao (2015). Web resources for model organism studies. Genomics, Proteomics and Bioinformatics 13; 64-68 (DOI: 10.1016/j.gpb.2015.01.003) 5. J. Górska-Andrzejak, P. Grzmil, M. Labocha-Derkowska, J. Rutkowska, W. Strzałka, K. Tomala, D. Włoch-Salamon (2016) Poczet modelowych organizmów badawczych. Wszechświat 117 nr 7-9/2016	
	Supplementary literature	none	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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