University of Gdańsk

Subject card

Subject name and code	Principles of biotechnology - Introduction Foundations (M01_B1), PG_00193182		
Field of study	Biotechnology		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study Humanistic-social subject group 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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	academic	Assessment form	exam
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Stanisław Ołdziej, prof. UG	
	Teachers	dr hab. Stanisław Ołdziej, prof. UG dr hab. Artur Szutta, prof. UG	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	48.0	0.0	0.0	0.0	0.0	48
	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	48	0.0	30.0	78

Subject objectives	The aim of the course is to familiarize students with: theoretical aspects of the philosophy of science and critical (scientific) thinking; the history of scientific discoveries in biotechnology and related fields: the idea and application of model organisms in scientific research, with particular emphasis on the use of model organisms in biotechnology; the organization of a research laboratory; the ethics of scientific research; the circulation of scientific information; methods of obtaining scientific information; the benefits and threats associated with the use of large language models (so-called artificial intelligence) in learning and scientific work; opportunities for further professional career development in the field of biotechnology.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOTECHL3_U08] The graduate is able to learn independently and in a targeted manner, develop his or her competences and plan their improvement.	The student knows the possible career paths in biotechnology and life sciences	[SU4] test/exam - oral or written
[BIOTECHL3_U04] The graduate is able to search for, analyse and use scientific information, also in English, in the field of biotechnology in the fields of exact and natural sciences and medical and health sciences; uses electronic sources; has advanced skills in using appropriate databases.	The student knows methods of gathering scientific information and is able to select it critically.	[SU4] test/exam - oral or written
[BIOTECHL3_K04] The graduate is aware of the importance of occupational safety rules, is able to apply them and react in hazardous situations, ensuring their own safety and the safety of others.	Has knowledge of the philosophy of science and the art of critical (scientific) thinking.	[SK4] test/exam - oral or written
[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 knows and understands the concept and application of model organisms in scientific research with special emphasis on the application of model organisms in biotechnology.	[SK4] test/exam - oral or written
[BIOTECHL3_K01] The graduate is aware of the scope of their own knowledge and skills; demonstrates a willingness to continuously update them and pursue professional development.	The student knows the possible career paths in biotechnology and life sciences after obtaining bachelor's, master's and doctoral degrees.	[SK4] test/exam - oral or written
[BIOTECHL3_W08] The graduate knows the principles of occupational health and safety, understands the risks associated with laboratory work, including infectious materials, GMOs and GMMs, and knows the legal regulations relating to these areas.	The student knows the organization of a research biotechnology laboratory	[SW4] test/exam - oral or written
[BIOTECHL3_W09] The graduate possesses structured and advanced knowledge of the terminology and concepts used in biological and medical sciences and related disciplines.	Knows the history of scientific discovery in biotechnology and related fields	[SW4] test/exam - oral or written
[BIOTECHL3_W10] The graduate possesses knowledge of the social sciences and humanities that fosters entrepreneurship, professional responsibility and proper functioning in society; understands ethical principles and responsibility in conducting scientific research.	Has knowledge of the philosophy of science and the art of critical (scientific) thinking.	[SW4] test/exam - oral or written

Subject contents	F1. Philosophy of science with emphasis on the philosophy of life sciences 8h The concept of science, the problem of induction, falsificationism (critical rationalism), scientific progress, the scientific method, the structure of scientific theories, hypotheses, observation, explanation, paradigms and scientific revolutions, physicalism, reductionism, the limits of knowledge, the mystery of causality F2. The art of critical thinking 6 hours structure of statements, form of statements, way of formulating thoughts, reasoning, justification of statements, structure of statements, logical inference F3. Basic concepts of the scientific method 2 hours Includes: theory, observation, experiment, hypothesis, research questions, scientific method, falsification, reductionism, empiricism, logical positivism, controlled experiment, resultfulness, deductive reasoning, pseudoscience and the problem of demarcation, logical fallacies F4. Ethics of scientific research 2h good research practice, principles and rules of good laboratory practice, diligence and conscientiousness in conducting experiments, scientific dishonesty, falsification of results, plagiarism, data fabrication, the Belmont Report legal document from the 1970s [respect for participants, concern for welfare, justice, risk and benefit as universal ethical principles], animal welfare, genetic modification and religious, spiritual and cultural values, social evaluation of scientific research, ethical aspects of tissue engineering [reversible and irreversible modifications], patenting and commercialization of living organisms F5. Organization of a research laboratory 2h safety rules (health and safety) in a chemical and biological laboratory laboratory safety classes laboratories dedicated to the cultivation and research of plants, quarantine microorganisms and microorganisms, and genetically modified organisms (GMM, GMO) F6. Basic classification of organisms 2h classification, cataloguing and description of living organisms phylogenetic tree (tree of life) historical and scientific perspective in the 21st century Carolus Linnaeus and binomial nomenclature (species name, genus name) systematic categories of organisms genetic methods of classifying organisms (genes encoding basic metabolic proteins (housekeeping genes, conserved proteins) F7. Milestones in scientific discoveries 14h DNA replication, transposons, reverse transcription microorganisms and antibiotics (penicillin) cloning and genetic modification of organisms fluorescent proteins heat shock proteins and prions cancer immunotherapy and personalized medicine F8. Model organisms and their applications in science 2h definition and examples of model organisms presentation of selected model organisms F9. Basic possible career paths in biotechnology and life sciences 1h F10. Scientific information circulation, application of large language models in science and study 9h Scientific literature, literature databases, data repositories, forms of research results presentation, peer review as an assessment of scientific achievements, scientific misconduct, benefits and threats related to

	the application of large language models **The content of F1-F4 represents social sciences and humanities (18h + 6h of student's own work = 24h 1 ECTS)**
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Parts F1, F2	0.0%	20.0%
Parts F3-F10	0.0%	40.0%
Integration exam	50.0%	40.0%

Recommended reading

Basic literature	1. A. Bird, Philosophy of Science, Routledge 1998; 2. A. Rosenberg, Philosophy of Science. A Contemporary Introduction, Routledge 2000; 3. S. S. Carey, Beginners Guide to Scientific Method, 4th ed., Wadworth 2011 4. George W. Rainbolt, Sandra L. Dwyer, Critical Thinking. The Art of Argument, Wadsworth 2012 5. Źródła literaturowe podane w materiałach wykładowych. Samodzielnie wyszukana i wyselekcjonowane materiały dotyczące zajęć z wykorzystaniem zasobów bibliotecznych i elektronicznych źródeł informacj 6. Dz.U. 2015 poz. 266 Ustawa z dnia 15 stycznia 2015 r. o ochronie zwierząt wykorzystywanych do celów naukowych lub edukacyjnych 7. Dyrektywa 2010/63/UE w sprawie ochrony zwierząt wykorzystywanych w celach naukowych Opieka nad zwierzętami - dążenie do lepszego podejścia naukowego https://publications.europa.eu/en/publication-detail/-/publication/fca9ae7f-2554-11e9-8d04-01aa75ed71a1/language-pl 8. . Hannah B. Baker, John P. McQuilling Nancy M.P. King (2016) Ethical considerations in tissue engineering research: Case studies in translation, Methods 99; 135144 9. . Cracraft J., Donoghue M.J. Assembling the Tree of Life. Oxford University Press. 2004 10. 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)
Supplementary literature	none
eResources addresses	
Example issues/ example questions/ tasks being completed	
Work placement	Not applicable

Document generated electronically. Does not require a seal or signature.