University of Gdańsk

Subject card

Subject name and code	Systems biology, PG_00203480						
Field of study	Medical Biology						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2027/2028			
Education level	Master's studies		Subject group	Obligatory subject group 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	3		ECTS credits	3.0			
Learning profile	academic		Assessment form	exam			
Conducting unit	Department of Evolutionary Genetics and Biosystematics -> Faculty of Biology -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Agnieszka Kaczmarczyk-Ziemba				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	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	30		4.0		41.0	75
Subject objectives	1. Learning about the diversity and complexity of the organism, and the scientific disciplines and methods needed to analyse them. 2. Education towards a holistic view of the human body.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOLMEDMU2_W02] is familiar with current issues in medical biology and related disciplines	Is familiar with currently debated issues in the field of systems biology and personalised medicine	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[BIOLMEDMU2_W01] has an in-depth knowledge of scientific fields and disciplines relevant to medical biology and the studied specialty and knows their main development trends	Has an in-depth knowledge of scientific fields and disciplines relevant to systems biology and is familiar with its main developments	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[BIOLMEDMU2_K02] is ready to recognize the importance of knowledge in solving cognitive and practical problems and to seek expert advice when having difficulty solving a problem on his own	Recognises the importance of knowledge in solving cognitive and practical problems and consults experts when having difficulty solving a problem independently	[SK8] observation of student's independent or team work
[BIOLMEDMU2_U03] is able to formulate and solve problems on the basis of the known laws and methods, including - using computer tools and statistical methods	The student is able to formulate and solve problems based on known issues concerning systems biology	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written [SU5] implementation of a problem task
[BIOLMEDMU2_W04] knows in-depth understanding the principles of planning research based on the achievements of biological and medical sciences, the principles of operation of equipment and apparatus used in medical biology research, and the principle of interpreting biological phenomena and processes based on empirical data in research work and practical activities	Knows the common techniques used to analyse proteins, genes and metabolites, knows how to assign a research task to an appropriate omics (proteomics, metabolomics or genomics)	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[BIOLMEDMU2_U01] is able to use, fluently yet critically, the academic literature and databases required for work in the field of medical biology and related disciplines, and to prepare and present academic papers in the field of medical biology and related sciences	Can make proficient, but critical use of scientific literature, both in Polish and English language, necessary in the field of systems biology	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written [SU5] implementation of a problem task
[BIOLMEDMU2_K07] is able to form opinions on various aspects of professional practice and is also able to foster entrepreneurship and innovation in their professional work	Is prepared to form opinions on various aspects of the professional activities	[SK8] observation of student's independent or team work
[BIOLMEDMU2_U02] is able to plan and conduct experiments and measurements based on advanced research techniques and tools, is able to interpret the obtained results and draw conclusions, communicate on specialized topics with diverse audiences and engage in debate	The student is able to plan experiments based on advanced techniques and research tools, is able to interpret the obtained results and draw conclusions	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written [SU5] implementation of a problem task

Subject contents

Cellular theory. Holistic-systemic medicine and personalized therapies. Properties of model complex networks. Systems biology as a new scientific field encompassing interdisciplinary issues. Omics approaches in systems biology (e.g. genomics, epigenomics, nutrigenomics, transcriptomics, proteomics). Biomarkers - definition and division. Integration of omics issues to select potential biomarkers. Analytical techniques, their optimisation and validation. State-of-the-art diagnostic workflows with examples of selected conditions (including cancer and neurodegenerative diseases).

Prerequisites and co-requisites

Completion of courses covering human genetics and basic molecular biology.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
exam	51.0%	100.0%

<table>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. used during the classes:

• Kraj A., Drabik A., Silberring J. Proteomika i metabolomika, Wydawnictwa Uniwersytetu Warszawskiego (2010).
• Nalepa G. Genetyka. Wydanie III, Helion (2005). 3. Juś M. Spór o redukcjonizm w medycynie. Studium filozoficzne i metodologiczne, Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika (2014).

2. studied independently by the student:

• Szczepaniak W. Metody instrumentalne w analizie chemicznej, Wydawnictwo Naukowe PWN (2008).
• Atta-ur-Rahman et al. Recent advances in analytical techniques, v. 1, Sharjah : Bentham Science Publishers Ltd. (2017).
• Walhout M., Vidal M., Dekker J. Handbook of Systems Biology. Concepts and insights. Academic Press (2020).</td></tr>
<tr><td>Supplementary literature</td><td>Current publications in Polish and English indicated by the instructor and/or retrieved independently by the student from the PubMed database</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">When sequencing on the Illumina platform:

1. we obtain raw sequence reads of at least 1,000 nucleotides in length
2. use current changes measured in the pore channel at the bottom of the reaction plate
3. we use adaptor fragments that allow binding of the sequenced fragments to the reaction plate
4. we use adaptor fragments that allow binding of the sequenced fragments to a bead at the bottom of the reaction plate</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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