University of Gdańsk

Subject card

Subject name and code	Systems biology, PG_00207329		
Field of study	Biology		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	academic	Assessment form	credit
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	dr Agnieszka Kaczmarczyk-Ziemba	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	30.0	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	16.0	50

Subject objectives

1. Acquisition of basic knowledge of high-throughput methods used in molecular biology and screening.
2. To acquire a basic knowledge of the mathematical modelling of dynamic systems and the file formats used in systems biology (including Systems Biology Markup Language).
3. To acquire the ability to use specialist literature in representing the properties of a biological process model.
4. Acquire basic skills in analysing a selected model of an intracellular process using bioinformatics tools.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOLMU2_U05] is able to use statistical methods and IT techniques and tools to describe biological phenomena and analyze specialized data	Student is able to use computer programs to analyse interactions in network systems and to use databases and bioinformatics tools to solve problems in systems biology	[SU3] text preparation/written work [SU5] implementation of a problem task
[BIOLMU2_W07] knows specialized bioinformatics tools, useful in solving problems in the studied speciality of biological sciences	Student knows the principles of using IT tools for data analysis and interpretation of identified system component interactions	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[BIOLMU2_W05] has an in-depth knowledge and understanding of the dynamic development of the biological sciences and is well versed in new research trends and disciplines	Student is familiar with the development and current state of knowledge and the latest trends in high-throughput techniques and systems biology; indicates their relationship with other disciplines in the life sciences or medical sciences and how they can be used in practice	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[BIOLMU2_K07] is ready to systematically update biological knowledge and information on its practical applications	Student is willing to critically self-assess his/her own competence and to update his/her knowledge of systems biology and improve his/her data analysis skills	[SK8] observation of student's independent or team work

<table>
<tr><td>Subject contents</td><td>Systems biology as a new scientific field involving interdisciplinary issues. An omics approach in systems biology. Use of systems biology in medicine, pharmacology and biotechnology. Biomarkers - definition and division. Integration of -omics to select potential biomarkers. Analytical techniques, their optimisation and validation. Properties of model complex networks. Modelling of complex systems, in particular molecular systems as dynamic systems.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>test</td><td>51.0%</td><td>100.0%</td></tr>
</table>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Used in class:

• Widłak W. Molecular biology not only for bioinformaticians. Springer, 2013 [Rozdział: High-throughput technologies in molecular biology.]
• Walhout M., Vidal M., Dekker J. Handbook of Systems Biology. Concepts and insights. Academic Press (2020).

Studied by the student:

• Scientific publications selected by the teacher and made available to students.</td></tr>
<tr><td>Supplementary literature</td><td>Aguda B.D., Friedman A. Models of cellular regulation. Oxford University Press, 2008.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table>
</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Hub nodes:a. are the central nodes of the network, which must be characterised by a high value of the degree k-out b. are the central nodes of the network, which must be characterised by a high value of degree kc. are nodes characterised by a high value of degree k-out, so that it is possible to extract a binary tree based on a hub noded. are the central nodes of the network, which are characterised by a high value of k-in</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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