

1.	Field of study	Biotechnology
2.	Faculty	Faculty of Natural Sciences
3.	Academic year of entry	2025/2026 (winter term)
4.	Level of qualifications/degree	first-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module	
Module name		Principles of bioinformatics
Module code		1BT_23_41
Number of the ECTS credits		2
Language of instruction		
Purpose and description of the content of education		This course provides students with an introduction to the foundational knowledge in bioinformatics. The course curriculum includes a discussion of key algorithms used for aligning two or more sequences, the basics of phylogenetic analyses, an introduction to comparative three-dimensional protein structure modeling (also with the use of artificial intelligence tools), and methods for predicting the in silico impact of mutations on protein structure. Students gain skills in acquiring data for bioinformatic analyses from publicly available genomic data repositories. The course ensures an understanding of techniques and methods used in bioinformatic analyses and introduces the basic algorithms employed in these analyses. Practical exercises focus on the bioinformatic data analysis, enabling students to interpret results and understand how to solve problems using model animal and plant organisms.
List of modules that must be completed before starting this module (if necessary)		not applicable

8.	Learning outcomes of the module			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)	
1BT_23_1	Klasyfikuje i stosuje techniki informatyczne i statystyczne wykorzystywane w analizach sekwencji DNA i białek	1BT_K01	5	
		1BT_K02	5	
		1BT_U03	4	
		1BT_U05	5	
		1BT_U06	5	
		1BT_W07	5	
1BT_23_2	Dobiera adekwatne metody bioinformatyczne i statystyczne do opisu zjawisk oraz gromadzenia i analizy danych pochodzących z eksperymentów biologicznych	1BT_K03	5	
		1BT_U01	5	
		1BT_W07	5	
1BT_23_3	Samodzielnie planuje i przeprowadza analizy bioinformatyczne związane z rozwiązywaniem problemów badawczych z zakresu biotechnologii i biologii	1BT_K02	5	
		1BT_K03	5	

		1BT_K05 1BT_U01 1BT_W07	5 5 5
1BT_23_4	Docenia wagę stosowania narzędzi bioinformatycznych i statystycznych przy opisie zjawisk i procesów zachodzących w przyrodzie oraz w rozwiązywaniu problemów badawczych z zakresu biotechnologii i biologii	1BT_K02 1BT_K05 1BT_U06 1BT_W07	4 5 5 5
1BT_23_5	Wykazuje kreatywność i samodzielność w analizach bioinformatycznych i ma nawyk aktualizowania wiedzy z zakresu przedmiotu	1BT_K03 1BT_K05 1BT_U06 1BT_U07 1BT_W07	5 5 5 5 5

9. Methods of conducting classes		
Code	Category	Name (description)
a05	Lecture methods / expository methods	Explanation/clarification <i>explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course</i>
b01	Problem-solving methods	Problem-based lecture <i>an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution to the issues presented in the lecture as well as the indication of the consequences of the proposed solution</i>
b02	Problem-solving methods	Lecture-discussion <i>transmission of content involving interaction with the lecture audience; discussion of lecture-related issues is one of its elements or constitutes its follow-up</i>
b03	Problem-solving methods	Activating method – educational games <i>learning content in the guise of a rule- and/or principle-based game; conducted in a deliberately arranged situation based on the description of relevant facts and processes; learners compete with one another within the framework of rules laid down by the academic teacher; varieties include simulation games – involving a simulation of real situations; decision games – based on the decision-making process and the recognition of the consequences of the decisions made (e.g., a decision tree); psychological games – increasing the emotional-volitional component of the participants' attitudes</i>
b04	Problem-solving methods	Activating method – discussion / debate <i>an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem</i>
b07	Problem-solving methods	Activating methods: a case study <i>a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon</i>

b09	Problem-solving methods	Activating method – flipped classroom <i>anticipatory learning; work in class is based on previously studied material indicated by the person teaching the course; preparation outside the classroom serves the purpose of getting familiar with the issues whose knowledge is necessary for participating in the in-class discussion and the training in the related practical skills; the activity is based on the work of students under the guidance of the person teaching the course</i>
c02	Demonstration methods	Video show <i>reproducing a film or video material in its entirety or in fragments in order to illustrate the content taught in class, to submit it to analysis and evaluation or to use it as an exercise in image perception; a film/video can be a work of art, an illustration (also technical illustration) of a content/phenomenon/object, a private record of an action, a media image, etc.</i>
c05	Demonstration methods	Poster presentation <i>a visual presentation of a problem and its proposed solutions, created by the person teaching the course or by a student on a poster board showing one major element or a collection of several elements in a coherent graphic form</i>
c07	Demonstration methods	Screen presentation <i>a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image</i>
d01	Programmed learning methods	Working with a computer <i>e.g., Webquest; implementation of educational tasks using electronic and digital devices, computer programs and Internet applications; the academic teacher acts as a consultant; students' work is carried out step by step according to the plan laid own by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d03	Programmed learning methods	Working with another teaching tool <i>e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools</i>
d04	Programmed learning methods	Reconstruction / reproduction <i>proceeding according to the indicated/displayed pattern/model; e.g., the reconstruction of a structure, model, image, etc.</i>
e01	Practical methods	Laboratory exercise / experiment <i>[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment</i>
e04	Practical methods	Project scheduling <i>proceeding according to the steps proposed within a specific methodology for the completion of a task; e.g., identifying project objectives, determining the result, identifying strengths, limitations, opportunities and threats (SWOT), establishing a schedule of activities, assessing resources, establishing an implementation plan; the initial diagnosis; the reassessment of assumptions; the process of preparing the practical implementation of a project</i>
e07	Practical methods	Simulation <i>an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on "replacement" material</i>
e08	Practical methods	Practice-as-research <i>also conducted as fieldwork; an activity aimed at confronting the acquired theory with practice through its practical application; students situate themselves in the reality they observe, study and transform through the prism of the theory; the method of practical classes is dominated by the application of knowledge to solving practical tasks</i>
f01	Methods of self-learning	Self-education

		<i>a method which involves independent acquisition of knowledge, skills and social competences, extending their scope and quality; complementary to the learning process taking place in class; taking on the task of developing and adjusting qualifications on one's own; self-study</i>
f02	Methods of self-learning	Individual work with a text <i>searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue</i>
f03	Methods of self-learning	Conceptual work <i>a (mainly intellectual) activity carried out independently (or in a selected group) resulting in the creation of a concept, idea or project; creating a plan based on a vision; developing a general outline of a project; producing a simplified sketch of the variant versions of a procedure/product/work</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
1BT_23_41_K	discussion classes	10	course work	1BT_23_1, 1BT_23_2, 1BT_23_3, 1BT_23_4, 1BT_23_5	a05, b01, b02, b03, b04, b07, b09, c02, c07
1BT_23_41_L	laboratory classes	20	course work	1BT_23_1, 1BT_23_2, 1BT_23_3, 1BT_23_4, 1BT_23_5	a05, b03, b04, b07, b09, c05, c07, d01, d03, d04, e01, e04, e07, e08, f01, f02, f03

11. The student's work, apart from participation in classes, includes in particular:			
Code	Category	Name (description)	Is it part of the BUNA?
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	Yes
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content <i>reading through the syllabus and getting acquainted with its content</i>	Yes
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.</i>	Yes
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion <i>a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.