

1.	Field of study	Biology
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		Scaling in biology
Module code		1BL_23_73
Number of the ECTS credits		3
Language of instruction		
Purpose and description of the content of education		The subject enables students to acquire practical skills including comparing the scale of biological objects/structures observed at different levels of organization, understanding the related size hierarchy and its impact on the construction and functioning of structures from subcellular to organisms. During the course, the student is to realize the consequences for the functioning of organisms at every level of their organization, have shape, size and mutual relations of surface and volume. The aim of the course is for the student to obtain: (1) knowledge of the importance of size to the functioning of biological objects; (2) practical skills allowing to (a) determine the real dimensions of biological objects observed at various scales (from macro to nano) using optical and electron microscopes; (b) the use of linear and logarithmic scales as a tool to represent a wide range of measurement data; (c) the use of units and sub-units in sizing an object and assigning an appropriate scale; (3) competencies for independent and critical analysis of the obtained measurement results and discussion of the results in a group.
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 competence (scale 1-5)	
K_01	He understands the importance of knowledge in solving problems, is able to critically assess his knowledge and is ready to consult experts in case of difficulties with independent problem solving.	1BL_K01	4	
U_01	He can use the basic techniques and research tools of experimental biology to determine the relationship shape, size and surface as well as the consequences of size relationships for the functioning of living organisms and mathematical and statistical methods to describe and analyze data.	1BL_U12	4	
U_02	Is able to plan and perform simple physical, biological and chemical measurements in the laboratory and make the appropriate ones observation.	1BL_U12	4	
W_01	Has knowledge of the basic laws of physics and chemistry necessary to understand natural processes and phenomena in terms of scaling various elements of the cell structure, organ tissues and nanostructures.	1BL_W01	4	
W_02	Knows and understands the methodology of biological experimental research allowing to determine the actual dimensions biological objects and nanostructures.	1BL_W09	4	

9. Methods of conducting classes		
Code	Category	Name (description)
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>
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>
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>

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
K_01	discussion classes	10	course work	U_02, W_01, W_02	b04, b09
L_01	laboratory classes	20	course work	K_01, U_01, U_02, W_01, W_02	e01

11. The student's work, apart from participation in classes, includes in particular:			
Code	Category	Name (description)	Is it part of the BUNA?
a03	Preparation for classes	Developing practical skills <i>activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)</i>	No
d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes <i>reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes</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>.