COURSE DESCRIPTION

Groundwater ecology

Academic year 2026-2027

1. Programme-related data

1.1. Higher Education Institution	University Babeș-Bolyai, Cluj Napoca
1.2. Faculty	Biology and Geology
1.3. Department	Taxonomy and Ecology
1.4. Field	Biology
1.5. Level of study	Master, 4 semesters, with frequency
1.6. Degree programme / Qualification	Sistemic Ecology and Conservation / Master degree
1.7. Form of education	With frequency

2. Course-related data

2.1. Course title	Groundwater ecology			Course code	**BMX3208**
2.2. Course coordinator	Conf. Dr. Sanda IEPURE				
2.3. Seminar coordinator	Conf. Dr. Sanda IEPURE				
2.4. Year of study	I	2.5. Semester	2	2.6. Type of assessment	Exam
2.7. Course status	Optional			2.8. Course type	Specialisation subject

3. Total estimated time (hours per semester of teaching activities)

3.1. Number of hours per week	**2**	of which: 3.2. course	**2**	3.3. seminar/ laboratory/ project	2
3.4. Total of hours in the curriculum	126	of which: 3.5. course	28	3.6. seminar/ laboratory	28
Time allocation for individual study (IS) and self-taught activities (ST)					**hours**
Learning from textbooks, course materials, bibliography, and notes (IS)					40
Additional research in the library, on subject-specific electronic platforms, and on-site					13
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays					10
Tutoring (professional guidance)					5
Examinations					2
Other activities					
3.7. Total hours of individual study (IS) and self-taught activities (ST)				70	
3.8. Total hours per semester				126	
3.9. Number of credits				5	

4. Prerequisites (where applicable)

4.1. curriculum-related	Invertebrate Zoology, Evolutionism, Hydrobiology, General Ecology
4.2 skills-related	Basic digital skills (computer use, common applications, specific mobile and tablet apps; writing bibliographic references and scientific articles

5. Specific conditions (where applicable)

5.1. course-related	Video projector, laptop, course support, powerpoint; online platforms: Microsoft Teams/Zoom Drawings and sketches, drawings on the blackboard/virtual whiteboard, explanations, course outline
5.2. seminar/laboratory-related	Participation in at least 90% of the laboratory work is a condition for participation in the exam

6.1. Competencies resulting from the completion of the degree programme ***(as referred to in the curriculum)***

Professional competencies	
Competency code	**Competency**
PC1	Analyze ecological data, manage habitats, employ habitat survey techniques, conserve natural resources, develop environmental policy, assess environmental impact, conduct ecological surveys, assess contamination, manage the environmental management system, investigate pollution, ensure compliance with environmental legislation, carry out environmental audits, conduct environmental site assessments, develop environmental remediation strategies, implement environmental protection measures, report on environmental issues, write work-related reports
PC3	Collect biological data, apply scientific methods, gather experimental data, perform scientific research, collect samples for analysis, perform field research, perform laboratory tests
Transversal competencies	
Competency code	**Competency**
TC1	Working with numbers and measures: calculate probabilities, carry out calculations, interpret mathematical information, process spatial information, working with digital devices and applications
TC2	Thinking skills and competences: processing information, ideas and concepts, planning and organizing, dealing with problems, thinking creatively and innovatively
TC3	Social and communication skills and competences: communicating, supporting others, collaborating in teams and networks, leading others, following ethical code of conduct

6.2. Learning outcomes relevant to the degree programme (as referred to in the curriculum)

Learning outcomes targeted by the subject		
Competency code	**Knowledge and comprehension**	**Specific academic skills**
PC1	Graduates identify the main theoretical concepts underlying the inventory and management of natural or anthropized ecosystems, analyze the structure, functions and dynamics of different ecological units; and identify the disruptive factors within.	Graduates apply the basic concepts in the field, evaluate the optimal methods for the analysis of the abiotic and biotic environment; and integrates theoretical knowledge with practical skills in interpreting causalities and remedial solutions.
PC3	Graduates apply the theoretical principles of basic biological sciences (such as genetics, anatomy, physiology, histology, etc.) in the field of environmental research.	Graduates integrate the methods of various biological sciences into the analysis of environmental components.
TC2	Graduates demonstrate a solid understanding of critical and analytical thinking processes and their role in problem identification, evaluation, and decision-making	Graduates apply critical and analytical thinking skills to evaluate information, solve complex problems, and support well-reasoned decisions in academic and professional contexts.
TC3	Graduates demonstrate an informed understanding of digital devices and applications and their use in accessing, managing, and communicating academic and professional information.	Graduates use skills of communication, collaboration, collegial support and coordination of team activities, respecting ethical and professional principles

7. Subject-specific learning outcomes

Knowledge and comprehension
1. Knowledge and understanding of general principles regarding underground aquatic ecosystems
2. Knowledge of groundwater habitats and the connection between them; Knowledge of the main groups of organisms present in groundwater ecosystems
3. Knowledge of the factors that influence the colonization of the groundwater ecosystems
4. Highlighting the scientific and practical importance of underground aquatic ecosystems

Specific academic skills
1. Developing the ability to use concepts regarding groundwater ecosystems
2. Using concepts in new contexts, understanding the intrinsic relationship between the characteristics of the groundwater ecosystems and species
3. Using theoretical concepts in solving practical problems; preparing and oral presentation of a topic/report on groundwater ecosystems in compliance with the principles of professional ethics

8. Contents

8.1. Course	**Teaching and learning methods**	**Remarks**
I. Introduction in groundwater ecology	Video projector, laptop, course support, powerpoint; online platforms: Microsoft Teams/Zoom Drawings and sketches, drawings on the blackboard/virtual whiteboard, explanations, course outline	Invited experts in the field on specific topics
II. Classification of groundwater ecosystems		
III. Physical and biochemical processes in groundwater: the hyporheic zone		
IV. Ecology of the groundwater environment		
V. Biodiversity and factors influencing biodiversity in groundwater		
VI. The role of organisms in groundwater ecosystems		
VII. The role of invertebrates in groundwater processes and ecosystem services		
VIII. Physiological tolerance and ecotoxicological constraints of groundwater fauna		
IX. Characteristics of groundwater fauna		
X. Biodiversity and management of ecosystems ecosystems		
XI. Legislation regarding the conservation and sustainable management of groundwater ecosystems		
XII. Recent concepts and approaches for the conservation of groundwater biodiversity. Groundwater ecosystems: conclusions and perspectives		
XIV. Examination		

Bibliography

Malard, F., C. Griebler, S. Retaux, 2023. Groundwater Ecology and Evolution. 2nd edition. Elsevier, ISBN: 9780128191194.

The bibliography can be accessed at the Zoology Library, Clinicilor Street, no. 5-7, Cluj-Napoca, or in electronic format (PDF): bibliographical material posted on Microsoft Teams and on the website of the Central University Library of Cluj.

8.2. Seminar/ laboratory	**Teaching and learning methods**	**Remarks**
Seminars 1-13	Individual practical work; Power point presentation of a project with specific selected topic	Field trips on sites; Participation in at least 90% of the seminars is a condition for participation in the exam

Bibliography

Malard, F., C. Griebler, S. Retaux, 2023. Groundwater Ecology and Evolution. 2nd edition. Elsevier, ISBN: 9780128191194.

Garcia-Valdecasas, A., Aboal, M., Cirujano, S., Iepure, S., Jaume, D., Proctor H., Velasco, J. L. 2010. Sampling continental freshwaters. 10 (8): 210-269. In: Manual on Field Recording Techniques and Protocols for All Taxa Biodiversity Inventories. Abc Taxa. *Ed. Jutta Eymann, Jérôme Degreef, Christoph Häuser, Juan Carlos Monje, Yves Samyn & Didier VandenSpiegel.*

9. Evaluation

Type of activity	9.1 Evaluation criteria	9.2 Evaluation methods	9.3 Percentage in the final grade
9.4. Course	Knowledge of information content; appropriate use of specialized terms and their explanation	Written exam on site; ongoing evaluations on course discussions	100%
	Ability to use information in a new context		
9.5. Seminar/ laboratory	Knowledge of information content;	Individual project presentation on site; ongoing evaluations on seminars discussions	Admitted/ rejected
	Appropriate use of specialized terms and their explanation		
9.6 Minimum standard for passing			
Knowledge of 90% of the information contained in the course Knowledge of the information from the seminars and correctly carrying out seminars tasks			

10. SDG labels (Sustainable Development Goals)

		Sustainable Development Generic Label

14 VIAȚA ACVATICĂ								

Date of entry:
6.04.2026

Signature of course coordinator

Conf. Dr. Sanda Iepure

Signature of seminar coordinator

Conf. Dr. Sanda Iepure

Date of approval in the department:

9.04.206

Signature of the head of department

Lecturer Dr. Florin Crișan