

COURSE DESCRIPTION

Schimbări climatice globale/Global climate changes

Academic year 2026-2027

1. Programme-related data

1.1. Higher Education Institution	Universitatea Babeș-Bolyai Cluj-Napoca
1.2. Faculty	Știința și Ingineria mediului
1.3. Department	Știința Mediului
1.4. Field	Știința mediului
1.5. Level of study	Master
1.6. Degree programme / Qualification	Sustainable development and environmental management
1.7. Form of education	Full time

2. Course-related data

2.1. Course title	Global climate changes			Course code	NME4112
2.2. Course coordinator	Prof. Calin Baci				
2.3. Seminar coordinator	Prof. Calin Baci				
2.4. Year of study	1	2.5. Semester	II	2.6. Type of assessment	Exam
2.7. Course status	Compulsory			2.8. Course type	Specialisation subject

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

3.1. Number of hours per week	4	of which: 3.2. course	2	3.3. seminar/ laboratory/ project	2
3.4. Total of hours in the curriculum	56	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)					32
Additional research in the library, on subject-specific electronic platforms, and on-site					28
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays					20
Tutoring (professional guidance)					6
Examinations					4
Other activities					4
3.7. Total hours of individual study (IS) and self-taught activities (ST)				90	
3.8. Total hours per semester				150	
3.9. Number of credits				6	

4. Prerequisites (where applicable)

4.1. curriculum-related	
4.2. skills-related	

5. Specific conditions (where applicable)

5.1. course-related	
5.2. seminar/laboratory-related	

6.1. Competencies resulting from the completion of the degree programme (as referred to in the curriculum)¹

¹ The professional and/or transversal skills targeted by the subject for which the course description is prepared will be copied from the curriculum of the degree programme. For each competency, the complete entry, including the competency code, will be copied with the exact wording that appears in the curriculum, without any changes.

Professional competencies	
Competency code	Competency
PC2	Develop environmental policy: Develop an organisational policy on sustainable development and compliance with environmental legislation in line with policy mechanisms used in the field of environmental protection.
PC4	Investigate pollution: Identify the cause of pollution incidents, as well as its nature and the extent of the risks, by performing tests on the site of pollution as well as in a laboratory and performing research.
PC10	Test samples for pollutants: Measure concentrations of pollutants within samples. Calculate air pollution or gas flow in industrial processes. Identify potential safety or health risks such as radiation.
PC11	Manage air quality: Monitoring, audit and management of air quality, including remedial measures.
Transversal competencies	
Competency code	Competency
TC1	Think analytically: Produce thoughts using logic and reasoning in order to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
TC2	Work in teams: Work confidently within a group with each doing their part in the service of the whole.
TC3	Report on environmental issues: Compile environmental reports and communicate on issues. Inform the public or any interested parties in a given context on relevant recent developments in the environment, forecasts on the future of the environment, and any problems and possible solutions.

6.2. Learning outcomes relevant to the degree programme (as referred to in the curriculum)²

Learning outcomes targeted by the subject		
Competency code	Knowledge and comprehension	Specific academic skills
CP4, CP7, CP10, CP11, CP12, CT1	4. The student/graduate identifies and describes advanced analytical techniques for the detection and quantification of chemical pollutants, as well as methods for sampling, preparation and analysis of environmental samples.	4. The student/graduate applies advanced analytical techniques for measuring pollutant concentrations in environmental samples. The student/graduate selects appropriate sampling and analysis methods depending on the type of sample and contaminant. The student/graduate interprets analytical results in the context of environmental quality assessment.
CP2, CP3, CP6, CP8, CP11, CT1, CT3	7. The student/graduate identifies and describes the processes and effects of global climate change, energy sources and their environmental impact, as well as the principles of sustainable use of energy resources.	7. The student/graduate analyses the impact of climate change on the environment and society. The student/graduate evaluates and compares energy sources from the perspective of sustainability and environmental impact.
CP5, CP12, CT1, CT2	12. The student/graduate identifies and describes the ethical and methodological principles of scientific research, including academic and professional integrity standards.	12. The student/graduate applies appropriate ethical norms and research methodologies in professional and scientific activity. The student/graduate formulates research questions, selects appropriate methods and presents results in accordance with scientific standards.

7. Subject-specific learning outcomes

If no competency is copied from either of the two categories, the row corresponding to that category is deleted from the table.

² The learning outcomes relevant for the degree programme and targeted by the subject for which the course description is prepared will be listed. The entries, copied without any changes from the Curriculum by subject type (Core Subject/Specialisation Subject/Complementary Subject), are listed under the corresponding competency.

Knowledge and comprehension
1. The student knows and understands the functioning and the variability of the climate system
2. The student knows and understands the anthropogenic influence on the climate system
3. The student knows and understands the various current theories on climate change
4. The student knows and understands the action plans for preventing climate change and mitigating its effects
Specific academic skills
1. Aggregation of experimental data into a complex model
2. Team work for the analysis of complex phenomena
3. Analyse different models of development and compare the climatic effects

8. Contents

8.1. Course	Teaching and learning methods	Remarks ³
Climate: definitions, variability, sensitivity, transitions, feed-back	Interactive lecture	
The climate system and its components	Interactive lecture	
The atmosphere: processes and radiations, energy balance	Interactive lecture	
The importance of oceans for the climate system	Interactive lecture	
The role of the biosphere in the climate change	Interactive lecture	
Cryosphere and geosphere, influence on the climate	Interactive lecture	
The reasons of climate change – forcing	Interactive lecture	
Paleoclimate change, paleoclimatological investigations	Interactive lecture	
Natural variability of climate in the geological history	Interactive lecture	
Climate change during the industrial era	Interactive lecture	
Anthropogenic and natural causes of climate change	Interactive lecture	
Future climate change assessment and implications on the natural and social systems	Interactive lecture	
Reducing the negative effects of climate change, diminishing the societal impact	Interactive lecture	
Future research directions, final messages	Interactive lecture	

³ For example, organisational aspects, recommendations for students, specific aspects relating to the course/seminar, such as inviting experts in the field, etc.

Bibliography

Baltea D., Serban M. (2005) Modificarile globale ale mediului – O evaluare interdisciplinara a incertitudinilor. Ed. Coresi, 231 p.

Busuioc A. Et al. (2010) Variabilitatea si schimbarea climei in Romania. Ed. ProUniversitaria, 226 p, Bucuresti.

IPCC (2013) Intergovernmental Panel on Climate Change <http://www.ipcc.ch/> AR5

National Academy of Sciences. 2020. Climate Change: Evidence and Causes: Update 2020. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25733>

*** (2012) Climate Change: Evidence, Impacts, and Choices, Division on Earth and Life Studies; National Research Council, 36 p.

*** (2012) America's Climate Choices, National Research Council, 144 p.

*** (2001) Climate Change Science: An analysis of some key questions. Committee on the Science of Climate Change. National Academy Press.

*** (2010) Advancing the Science of Climate Change. National Research Council, 528 p.

*** (2010) Adapting to the Impacts of Climate Change. National Research Council, 292 p.

NRC (2021) Global Change Research Needs and Opportunities for 2022-2031, <http://nap.edu/26055>

NAS (2019) Climate change and ecosystems, <http://nap.edu/25504>

NAS (2019) Negative emissions technologies and reliable sequestration, <http://nap.edu/25259>

8.2. Seminary/ laboratory**Teaching and learning methods****Remarks**

Climate change tendencies at a european and regional level

Dialogue with the students

Components of the climate system

Dialogue with the students

Assessment of the amplitude of climate change at different scales

Applications solving

Investigating the climate change in the geological past

Dialogue with the students

Causes of climate change

Dialogue with the students

Property loss and ecosystems degradation generated by climate change

Applications solving

Climate change effects – application to a defined region

Individual or team project

Bibliography

National Academy of Sciences. 2020. Climate Change: Evidence and Causes: Update 2020. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25733>

IPCC (2013) Intergovernmental Panel on Climate Change <http://www.ipcc.ch/> AR5

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9. Evaluation



















Type of activity	9.1 Evaluation criteria ⁴	9.2 Evaluation methods ⁵	9.3 Percentage in the final grade
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⁴ The evaluation criteria must directly reflect the learning outcomes targeted at the level of the degree programme respectively at the level of the subject. More specifically, the learning outcomes set out in the expected learning outcomes are assessed.

⁵ Both final evaluation methods and ongoing evaluation strategies should be established.

9.4. Course	Understanding the notions that have been discussed, capacity to use them in practical cases.	Exam	25%
	Synthesis of the acquired knowledge	Exam	25%
9.5. Seminar/ laboratory	Solving the practical themes that have been proposed, and the reliability of the results	Ongoing verification	25%
	The capacity to solve concrete applications.	Ongoing verification	25%
9.6 Minimum standard for passing			
<ul style="list-style-type: none"> Understanding the main notions that have been discussed The ability to synthesize data in order to obtain a coherent view on the study topics 			

10. SDG labels (Sustainable Development Goals)⁶

	<input type="radio"/>	Sustainable Development Generic Label						
								
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
								No label applies
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Date of entry:
20/04/2026.

Signature of course coordinator



Signature of seminar coordinator



Date of approval in the department:

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Signature of the head of department

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⁶ Select a single label which, according to the [Implementation of SDG labels in the academic process](#), best matches the subject. If the subject addresses sustainable development in a generic manner (i.e. by presenting/introducing the general framework of sustainable development, etc.), then the Sustainable Development generic label may be applied. If none of the labels describe the subject, select the last option: "No label applies."