COURSE SYLLABUS

1. Data about the program

1.1 Higher education institution	Babeș-Bolyai University
1.2 Faculty	Faculty of Biology and Geology
1.3 Doctoral school	The doctoral school of Theoretical and Applied Geology
1.4 Field of study	Geology
1.5 Study cycle	Doctorate
1.6 Study program / Qualification	Doctoral training / Doctor of Geology

2. Course data

2.1 Name of discipline	Environmental Paleoclimatology						
2.2 Teacher responsible for lectures	Prof. Dr. Vlad CODREA						
2.3 Teacher responsible for seminars	Prof. Dr. Vlad CODREA						
2.4 Year of study	1	2.5 Semester	2	2.6. Type of evaluation	E	2.7 Course framework	Opt

3. Estimated total time of teaching activities (hours per semester)

3.1 Hours per week	4	Out of which: 3.2 Lectures	2	3.3 Seminars / Laboratory classes	2
3.4 Total hours in the curriculum	48	Out of which: 3.5 Lectures	24	3.6 Seminars / Laboratory classes	24
Allocation of study time:					
Study supported by textbooks, other course materials, recommended bibliography and personal student notes					40
Additional learning activities in the library, on specialized online platforms and in the field					25
Preparation of seminars / laboratory classes, topics, papers, portfolios and essays					10
Tutoring					5
Examinations					3
Other activities: -					

3.7 Individual study (total hours)	83
3.8 Total hours per semester	135
3.9 Number of credits	20

4. Preconditions (where applicable)

4.1 Curriculum	• Not the case
4.2 Competences	• Organizing the bibliographic references

5. Conditions (where applicable)

5.1 Conducting lectures	• Logistical video support
5.2 Conducting seminars / laboratory classes	• Minimum 80% participation at laboratory work is a condition for participation at exams

6. Specific competences acquired

Professional competences	• Recognizing and understanding the climatic events from the geologic history of the Earth, the mechanisms which generated them, the amplitudes of the climatic variations, the influences over the biosphere, the possibility of a repeat of similar scenarios and the potential effects over the human communities.
Transversal competences	• Developing the capacity to use the notions regarding paleoclimatic evolution • Utilizing the theoretical notions to resolve practical problems

7. Course objectives (based on the acquired competencies grid)

7.1 The general objective of the course	• Recognizing and understanding the climatic events from the geologic history of the Earth, the mechanisms which generated them, the amplitudes of the climatic variations, the influences over the biosphere, the possibility of a repeat of similar scenarios and the potential effects over the human communities.
7.2 Specific objectives	• The study of some climatic events which had repercussions over the evolution of the fauna and flora during the geologic time.

8. Content

8.1 Lectures	Teaching methods	Comments
Introduction. The sources of the paleoclimatic data. The levels of the paleoclimatic data. The levels of the paleoclimatic studies. Shaping of the paleoclimatic research. Observations and models. Dimensions of the geologic times.	Presentation, discussion, case studies, exercises	
Defining the paleoclimatic principles. The causes for climate change. The climate and the nature of the climatic variations. The climatic system. The balance of atmosphere vs terrestrial substrate. The variations of the Earth's orbital parameters.		
Climatic proxies. Dating methods. Radio-isotopic methods: radiocarbon dating, the K-Ar method, dating based on uranium isotopes, the luminescence method, the fission track method.		
Paleomagnetism Dating based on chemical changes. Dating based on biological elements.		
Dating based on ice cores.		
The paleoclimatic message in marine sediments and corals.		
Paleoclimatic proof originating from non-marine deposits: loess, lacustrine sediments, speleothemes. The biological principles of paleoclimatology.		
Proof deriving from paleovegetation: distribution and		

macrofossils. Insects.		
Millennial climatic changes.		
Interanual climatic changes in tropical areas.		
Paleoclimatic events of reference in the geologic time scale: Thermal Maximum at the end of the Paleocene.		
The K/T boundary and the associated paleoclimatic aspects.		
The Eocene/Oligocene boundary and the associated paleoclimatic events.		
The climatic optimum from the Middle Miocene.		

Bibliography:
Bradley R. Paleoclimatology. Reconstructing Climates of the Quaternary. Second edition. Elsevier, International geophysics series, 1999.
Cronin Th. M. Principles of Paleoclimatology. Columbia University Press. 1999
Prothero D. After the Dinosaurs: The Age of Mammals. Indiana University Press, 2006
Bradley R.: Paleoclimatology, 3rd Edition, Academic Press, 2014
Gilles Ramstein, Amaëlle Landais, Nathaelle Bouttes, Pierre Sepulchre, Aline Govin, 2021 : Paleoclimatology. Springer Verlag, 478 p.
https://opengeology.org/historicalgeology/paleoclimatology-earth-systems-change-through-time/

8.2 Seminars / laboratory classes	Teaching methods	Comments
Case studies prepared with the doctoral students, based on their individual doctoral research topics	Presentation, discussion, exercises	
Variations of the Earth's orbital parameters, climate change control factor.		
Dating methods to calibrate paleoclimatic events.		
Biological evidence for the paleoclimatic events.		
Ice cores		
Paleoclimatic changes in the Late Quaternary, based on loess deposits: case study.		
Paleoclimatic events of reference in the geologic time scale: Thermal Maximum at the end of the Paleocene.		
The K/T boundary and the associated paleoclimatic aspects.		
The Eocene/Oligocene boundary and the associated paleoclimatic events.		
The climatic optimum from the Middle Miocene.		
Paleoclimatic degradations which occurred in Europe, during the Pliocene.		
The Messinian crisis and the climatic context.		
The climate of the last glacial and the associated anthropogenic events (I)		
The climate of the last glacial and the associated anthropogenic events (II)		

Bibliography:
Bradley R. Paleoclimatology. Reconstructing Climates of the Quaternary. Second edition. Elsevier, International geophysics series, 1999.
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Prothero D. After the Dinosaurs: The Age of Mammals. Indiana University Press, 2006
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9. Aligning the contents of the discipline with the expectations of the epistemic community representatives, professional associations and standard employers operating in the program field

- The course has a contents similar to the courses of other European universities, it contains current information and it takes into account the different study levels.
- The contents of the course checks the practical and environmental aspects, which are tied to the paleoclimatic data.
- Through the unfolded activities, the students are obligated to and have the ability to provide solutions to certain problems and to propose ideas to better current situations.

10. Examination

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final grade
10.4 Lectures	Assessment of knowledge	Written exam	70%
	Assessment of knowledge	Ongoing tests	
10.5 Seminars / laboratory classes	Activity during seminars	Discussions, answers to questions	
	Assessment of knowledge	Written exam	30%
10.6 Minimum performance standard			
• Knowing 50% of the information contained within the course. • Knowing 60% of the information learned in the lab.			

Date of issue

Signature of the teacher responsible for lectures

Signature of the teacher responsible for seminars

Date of approval by the doctoral school council

Signature of the doctoral school director