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	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	Geochemical processes in mineralogy and palaeontology						
2.2 Teacher responsible for lectures	Conf. dr. habil. Ferenc L. Forray						
2.3 Teacher responsible for seminars	Conf. dr. habil. Ferenc L. Forray						
2.4 Year of study	1	2.5 Semester	2	2.6. Type of evaluation	E	2.7 Course framework	Op

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:					h
Study supported by textbooks, other course materials, recommended bibliography and personal student notes					30
Additional learning activities in the library, on specialized online platforms and in the field					20
Preparation of seminars / laboratory classes, topics, papers, portfolios and essays					15
Tutoring					2
Examinations					2
Other activities: -					
3.7 Individual study (total hours)					65
3.8 Total hours per semester					117
3.9 Number of credits					10

4. Preconditions (where applicable)

4.1 Curriculum	• Geochemistry, Mineralogy, Chemistry and Mathematics
4.2 Competences	• Handling laboratory equipment/labware and sample preparation • References handling (database search, use of reference manager)

5. Conditions (where applicable)

5.1 Conducting lectures	• Lectures format (pdf) • Conference room with computer/laptop, video projector and software (PowerPoint, Word, multimedia, Internet browsers)
5.2 Conducting seminars / laboratory classes	• Instrument use: CRDS H_2O and CO_2 ± Aurora TIC/TOC, ICP-MS/XRD/SEM

	• Thermodynamic calculations using various software • Minimal 80% attendance required

6. Specific competences acquired

Professional competences	• Recognition of geochemical processes • Modelling geochemical processes
Transversal competences	• Participation in research groups; • Solving problems and making decisions; • Organizing teamwork.

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

7.1 The general objective of the course	• Understanding geochemical processes • The geochemical significance of the elements in water, soil and minerals. • Creation of phase diagrams, Eh-pH diagrams, representation and interpretation of isotopic analyses • Application of geochemistry in environmental studies (soil and water pollution, climate change, etc.)
7.2 Specific objectives	• Geochemical classification of elements, their frequency in the lithosphere and hydrosphere • General concepts of chemical equilibrium, acid-base reactions, solubility of minerals in aqueous solutions, thermodynamic principles and construction of mineral stability fields in specific diagrams • Emphasis will be placed on redox processes and the construction of Eh-pH diagrams • Isotopic fractionation of the most important elements (C, O, S, H, etc.), as well as their importance in geochemical, hydrogeological, paleo medium and paleoclimate processes.

8. Content

8.1 Lectures	Teaching methods	Comments
1. Introduction	Presentation, discussions, case studies	
2. Distribution of elements in nature		
3. Thermodynamics I		
4. Thermodynamics II		
5. Mineral solubility		
6. Thermodynamics of the mineral-water interface		
7. Colloids		
8. Redox processes		

9. Oceans geochemistry		
10. Geochemical processes in sediments		
11. Stable carbon isotopes		
12. Stable nitrogen isotopes		
13. Stable oxygen and hydrogen isotopes		
14. Stable sulphur isotopes		
8.2 Seminars / laboratory classes	Teaching methods	Comments
Case studies prepared with the doctoral students, based on their individual doctoral research topics	Presentation, case studies, discussions, exercises	
References: 1. Holland H.D. (2004) Treatise on Geochemistry. Vol. 1-10. Elsevier Pergamon. Geology library, UBB, Cota: 12831 2. Clark, I.D., Fritz, P., (1997) Environmental isotopes in hydrogeology. CRC Press, Boca Raton, 352 pp. Geology library, UBB, Cota: 11091 3. Hoefs, J., 2018. Stable isotope geochemistry. Springer, 437 pp.		

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 lectures and lab activities are designed and updated to give the students the necessary scientific knowledge and practical abilities required by the professional environment.

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	50%
10.5 Seminars / laboratory classes	Activity during seminars	Discussions	10%
	Assessment of knowledge	Practical tests	40%
10.6 Minimum performance standard			
• 50% of the subjects required by the written exam • 50% of the practical test			

Date of issue
10.02.2023

Signature of the teacher responsible for lectures

Signature of the teacher responsible for seminars

Date of approval by the doctoral school council
24.02.2023

Signature of the doctoral school director