COURSE DESCRIPTION

Geochemical processes in mineralogy and palaeontology

Academic year 2025-2026

1. Programme-related data

1.1. Higher Education Institution	**Babeş-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. Level of study	**Doctoral**

2. Course-related data

2.1. Course title	Geochemical processes in mineralogy and palaeontology			Course code	**SDG05**
2.2. Course coordinator		Conf. dr. habil. ing. Ferenc L. Forray			
2.3. Seminar coordinator		Conf. dr. habil. ing. Ferenc L. Forray			
2.4. Year of study	1	2.5. Semester	II	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	**4**	of which: 3.2. course	**2**	3.3. seminar/ laboratory/ project	**2**
3.4. Total of hours in the curriculum	48	of which: 3.5. course	24	3.6. seminar/ laboratory	**24**
Time allocation for individual study (IS) and self-taught activities (ST)					**hours**
Learning from textbooks, course materials, bibliography, and notes (ST)					60
Additional research in the library, on subject-specific electronic platforms, and on-site					70
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays					46
Tutoring (professional guidance)					10
Examinations					4
Other activities (two-way communication with the course coordinator/tutor)					12
3.7. Total hours of individual study (IS) and self-taught activities (ST)				**202**	
3.8. Total hours per semester				**250**	
3.9. Number of credits				**10**	

4. Prerequisites (where applicable)

4.1. curriculum-related	Undergraduate courses: Geochemistry, Mineralogy
4.2 skills-related	Using spreadsheets (e.g., Excel)

5. Specific conditions (where applicable)

5.1. course-related	
5.2. seminar/laboratory-related	Using the CRDS H_2O and CO_2 ± Aurora TIC/TOC instruments

6. Subject-specific learning outcomes

Knowledge
1. Know the concepts, theories and advanced models in the field.
2. Identify the frontier literature in the field.

3. Knows methods and techniques for identifying and formulating problems.
4. Understand the criteria of relevance and originality of scientific problems.
5. Know statistical methods and algorithms for data analysis.
6. Understand the functionality of software dedicated to the field.
7. Know the concepts of critical thinking and logical reasoning.
8. Understand methods of data analysis and interpretation.
Skills
1. Apply knowledge to the analysis of complex problems.
2. Integrates theoretical and practical concepts for innovative solutions.
3. Formulate original problems and propose creative solutions.
4. Apply innovative methods to solve the identified problems.
5. Process and interpret complex data with advanced tools.
6. Produce relevant analytical visualizations and reports.
7. Analyze and interpret complex problems.
8. Formulate logical and reasoned reasoning.
Responsibility and autonomy
1. Works autonomously in investigating and expanding knowledge.
2. Takes responsibility for the validity of the conclusions.
3. Takes responsibility for the quality and impact of solutions.
4. Works autonomously in defining research directions.
5. Ensures the accuracy of the processed data.
6. Works autonomously in the selection of data processing methodologies.
7. Works autonomously in the critical evaluation of the results.
8. Assumes responsibility for reasoning decisions.

7. Contents

7.1. Course	**Teaching and learning methods**	**Remarks[1]**
Introductory course. Basic knowledges, principles and fundamental equations.	presentation combined with active-participatory methods; debate	2 hours
Thermodynamics	presentation combined with active-participatory methods; debate	4 hours
Redox processes	presentation combined with active-participatory methods; debate	2 hours
Geochemical processes in sediments	presentation combined with active-participatory methods; debate	4 hours
Applications of stable isotopes in mineralogy	presentation combined with active-participatory methods; debate	4 hours

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

Hydrogen and oxygen stable isotopes	presentation combined with active-participatory methods; debate	4 hours
Carbon stable isotopes	presentation combined with active-participatory methods; debate	4 hours

Bibliography

1. Holland H.D. (2004) Treatise on Geochemistry. Vol. 1-10. Elsevier Pergamon. Geology library, Number: 12831
2. Clark, I.D., Fritz, P., (1997) Environmental isotopes in hydrogeology. CRC Press, Boca Raton, 352 pp. Geology library, Number: 11091
3. Hoefs, J., 2018. Stable isotope geochemistry. Springer, 437 pp.
4. Pier A. de Groot, editor (2004), Handbook of stable isotope analytical techniques (Vol. 1). Elsevier, 1234 p, Geology library, Number: 12745
5. Pier A. de Groot, editor (2009), Handbook of stable isotope analytical techniques (Vol. 2). Elsevier, 1372 p, Geology library, Number: 12745.

7.2. Seminar/ laboratory	**Teaching and learning methods**	**Remarks**
Case studies prepared with doctoral students, based on their individual doctoral research topics	Presentations, discussions, exercises	12 hours
Measurement and interpretation of stable hydrogen and oxygen isotopes	Practical work, isotopic measurements	6 hours
Measurement and interpretation of carbon stable isotopes	Practical work, isotopic measurements	6 hours

Bibliography

1. Holland H.D. (2004) Treatise on Geochemistry. Vol. 1-10. Elsevier Pergamon. Geology library, Number: 12831
2. Clark, I.D., Fritz, P., (1997) Environmental isotopes in hydrogeology. CRC Press, Boca Raton, 352 pp. Geology library, Number: 11091
3. Hoefs, J., 2018. Stable isotope geochemistry. Springer, 437 pp.
4. Pier A. de Groot, editor (2004), Handbook of stable isotope analytical techniques (Vol. 1). Elsevier, 1234 p, Geology library, Number: 12745
5. Pier A. de Groot, editor (2009), Handbook of stable isotope analytical techniques (Vol. 2). Elsevier, 1372 p, Geology library, Number: 12745.

8. Evaluation

Type of activity	8.1 Evaluation criteria[2]	8.2 Evaluation methods[3]	8.3 Percentage in the final grade
8.4. Course	Know geochemical concepts, theories and processes.	Exam	25%
	Knows calibration methods for data analysis	Exam	25%
8.5. Seminar/ laboratory	Apply complex methods to investigate problems (sample preparation, isotopic measurements)	Evaluation during the laboratory stages	25%
	Produces analytical reports for data presentation and interpretation	Evaluation during the laboratory stages	25%
8.6 Minimum standard for passing			
Grade 5 for exam. Grade 5 for seminar/laboratory work.			

[2] 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.

[3] Both final evaluation methods and ongoing evaluation strategies should be established.

9. SDG labels (Sustainable Development Goals)[4]

	X	Sustainable Development Generic Label						
1 FĂRĂ SĂRĂCIE	2 FOAMETE „ZERO"	3 SĂNĂTATE ȘI BUNĂSTARE	4 EDUCAȚIE DE CALITATE	5 EGALITATE DE GEN	6 APĂ CURATĂ ȘI SANITAȚIE	7 ENERGIE CURATĂ ȘI LA PREȚURI ACCESIBILE	8 MUNCĂ DECENTĂ ȘI CREȘTERE ECONOMICĂ	9 INDUSTRIE, INOVAȚIE ȘI INFRASTRUCTURĂ
10 INEGALITĂȚI REDUSE	11 ORAȘE ȘI COMUNITĂȚI DURABILE	12 CONSUM ȘI PRODUCȚIE RESPONSABILE	13 ACȚIUNE CLIMATICĂ	14 VIAȚA ACVATICĂ	15 VIAȚA TERESTRĂ	16 PACE, JUSTIȚIE ȘI INSTITUȚII EFICIENTE	17 PARTENERIATE PENTRU REALIZAREA OBIECTIVELOR	No label applies
			X					

Date of entry:
10.05.2025

Signature of course coordinator

.....

Signature of seminar coordinator

.....

Date of approval in the department:
16.05.2025

Signature of the head of department

.....

[4] 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."*