COURSE DESCRIPTION

Seismic, magnetic and gravimetric interpretation

Academic year 2026-2027

1. Programme-related data

1.1. Higher Education Institution	Babeş-Bolyai University
1.2. Faculty	Biology and Geology
1.3. Department	Geology
1.4. Field	Geology
1.5. Level of study	Masters, 2 years
1.6. Degree programme / Qualification	Geology of Energy Resources/ Masters
1.7. Form of education	Full-time study program

2. Course-related data

2.1. Course title	**Seismic, magnetic and gravimetric interpretation**			Course code	**BME1122**
2.2. Course coordinator	Şef lucr. dr. Dan Mircea Tămaş				
2.3. Seminar coordinator	Şef lucr. dr. Dan Mircea Tămaş				
2.4. Year of study	1	2.5. Semester	2	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	154	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)					28
Additional research in the library, on subject-specific electronic platforms, and on-site					23
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays					22
Tutoring (professional guidance)					19
Examinations					4
Other activities					2
3.7. Total hours of individual study (IS) and self-taught activities (ST)				**98**	
3.8. Total hours per semester				**154**	
3.9. Number of credits				**6**	

4. Prerequisites (where applicable)

4.1. curriculum-related	Basic knowledge in geophysics
4.2 skills-related	Computer skills

5. Specific conditions (where applicable)

5.1. course-related	• ***Face-to-face activities*** – Courses are conducted in an interactive format, in classrooms equipped with the necessary infrastructure. The physical presence of students is essential for facilitating discussions and clarifying complex concepts. • ***Video projection system*** – Indispensable for illustrating theoretical and practical content. The projected materials include PowerPoint presentations with diagrams, graphs, and schematics; 3D animations and simulations of hydrocarbon migration processes, trap formation, and

	sedimentary basin evaluation; and industry video examples demonstrating the practical application of theoretical knowledge. • ***Access to digital learning materials*** – Access to educational content through various online platforms (faculty website, BCU website, platforms such as Moodle or Microsoft Teams), including course support materials and basic bibliography. • ***Didactic interaction*** – Encouraging active student participation through methods such as open questions and discussions aimed at stimulating critical thinking, real case study examples for applying theoretical knowledge, and debates on current topics in the hydrocarbon field and energy sector.
5.2. seminar/laboratory-related	• ***Face-to-face activities*** – Laboratory sessions are conducted in an interactive format, in classrooms equipped with the necessary infrastructure. Many of the practical activities will involve written exercises, manual mapping, various experiments, as well as digital exercises. The physical presence of students is mandatory (at least 70%) to facilitate discussions and clarifications of complex concepts. • ***Computers and video projection system*** – The available computers must be suitable for running specialized software packages (e.g., Petrel, OpendTect, PetroMod, etc.). The projection system is essential both for illustrating practical content and for real-time guidance during lab work. • ***Participation in at least 70% of the laboratory sessions*** is a requirement for students to be eligible to take the exam (either during the regular session and/or the resit session).

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

Professional competencies	
Competency code	**Competency**
PC1	Applies geological, geochemical and geophysical knwoledge in order to characterise and evaluate the energetical resources
PC2	Uses information tools and other digital instruments for hydrocarbon and mineral resource exploration
PC4	Analyses complex problems in the field of energetic resource exploration
Transversal competencies	
Competency code	**Competency**
TC2	Works efficiently in multidisciplinary teams in order to achieve the common objectives
TC3	Continuously improves and constantly acquires new working methods in the field of energy resources

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**
TC1	Understands concepts required to analyze complex problems.	Identifies, and analyzes complex problems in energetic resource exploration using scientific and digital methods.
TC3	Knows the principles of teamwork, professional roles, and collaboration dynamics in multidisciplinary teams.	Works effectively in multidisciplinary teams, communicating clearly and actively contributing to the achievement of common goals.

7. Subject-specific learning outcomes

Knowledge and comprehension
1. The student will be able to explain the physical principles underlying seismic, gravity, and magnetic methods, including their applicability in subsurface investigations.
2. The student will be able to describe the properties and behavior of seismic waves and their relationship to geological structures and stratigraphy.
3. The student will be able to summarize the key stages of seismic data acquisition, processing, and calibration, including their impact on data quality and interpretation reliability....
4. The student will be able to interpret the significance of seismic reflections and attributes in identifying structural and stratigraphic features in 2D and 3D datasets....
5. The student will be able to explain the principles of gravity and magnetic data interpretation and their role in detecting subsurface anomalies.
6.The student will be able to describe methods for integrating multiple geophysical datasets to construct coherent geological and basin models.
7. The student will be able to discuss the role of geophysical interpretation in basin analysis and hydrocarbon exploration, including the use of specialized software tools.
Specific academic skills
1. The student will be able to interpret 2D and 3D seismic data, both manually and using specialized software (e.g., Petrel, OpendTect), including fault and horizon mapping.
2. The student will be able to generate and analyze seismic attributes and apply inversion techniques to improve subsurface characterization.
3. The student will be able to integrate seismic, gravity, and magnetic data to develop consistent geological maps and 3D subsurface models.
4. The student will be able to evaluate and communicate geophysical interpretation results, through technical reports, visualizations, and structured scientific arguments.

8. Contents

8.1. Course	**Teaching and learning methods**	**Remarks**
Intro to subsurface geophysics	Presentation, discussions, case studies	
Seismic waves and data acquisition and processing		
Calibration of seismic data		
Seismic attributes and inversion		
Seismic interpretation tools		
Seismic interpretation in a structural context		
Seismic interpretation in a stratigraphic context		
Gravity and magnetic geophysical methods in hydrocarbon exploration		
Integrating gravity and magnetics with seismic interpretation		
Bibliography Chopra, S. and Marfurt, K.J. 2008. Seismic Attributes for Prospect Identification and Reservoir Characterization. SEG Geophysical Developments Series No. 11, 464 p., Society of Exploration Geophysicists. Kearey, P., Brooks, M., and Hill, I. 2002. An Introduction to Geophysical Exploration. 3rd edition, 268 p. Blackwell Science Ltd. Veeken, P.C.H. 2007. Seismic Stratigraphy, Basin Analysis And Reservoir Characterisation. Handbook of Geophysical Exploration – Seismic Exploration, v. 37, 509 p., Elsevier.		
8.2. Seminar/ laboratory	**Teaching and learning methods**	**Remarks**
Case studies prepared for the students, where they learn to use hand-based and	Presentation, case studies, discussions, exercises	

computer-based (Petrel, Opendtect) methods to use and interpret seismic, magnetic and gravimetric data		

Bibliography

Chopra, S. and Marfurt, K.J. 2008. Seismic Attributes for Prospect Identification and Reservoir Characterization. SEG Geophysical Developments Series No. 11, 464 p., Society of Exploration Geophysicists.
Kearey, P., Brooks, M., and Hill, I. 2002. An Introduction to Geophysical Exploration. 3rd edition, 268 p. Blackwell Science Ltd.
Veeken, P.C.H. 2007. Seismic Stratigraphy, Basin Analysis And Reservoir Characterisation. Handbook of Geophysical Exploration – Seismic Exploration, v. 37, 509 p., Elsevier.

9. Evaluation

Type of activity	9.1 Evaluation criteria	9.2 Evaluation methods	9.3 Percentage in the final grade
9.4. Course	Theoretical: open-ended or multiple-choice questions for assessing fundamental knowledge. Practical: solving a case study or interpreting a data set.	Written assessment of theoretical and practical knowledge (multiple-choice questions, open-ended questions, interpretation exercises, calculations).	60%
9.5. Seminar/ laboratory	Active participation in discussions, case studies, and group activities, as well as completion of assignments or practical exercises based on real or simulated data, with scores awarded for accuracy, creativity, and application of learned techniques.	Grading of individual projects completed during lab sessions.	40%
9.6 Minimum standard for passing			
• Participation in at least 70% of the practical laboratory sessions; • Understanding at least 50% of the information presented during the lectures; • Understanding at least 60% of the information presented during the laboratory sessions.			

10. SDG labels (Sustainable Development Goals)

	○	Sustainable Development Generic Label

								
○	○	○	○	○	○	○	○	●
								No label applies
○	○	○	○	○	○	○	○	○

Date of entry: 08.04.2026	Signature of course coordinator Şef lucr. dr. habil. Dan Mircea Tămaş	Signature of seminar coordinator Şef lucr. dr. habil. Dan Mircea Tămaş

Date of approval in the department: 20.04.2026	Signature of the head of department Conf. dr. Nicolae Har