COURSE DESCRIPTION

Structural geology in hydrocarbon exploration

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	**Structural geology in hydrocarbon exploration**			Course code	**BME1112**
2.2. Course coordinator	Şef lucr. dr. Alexandra Tămaş				
2.3. Seminar coordinator	Şef lucr. dr. Alexandra Tămaş				
2.4. Year of study	1	2.5. Semester	1	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 knowlege of structural geology, hydrocarbon geology, sedimentary basins.
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 to facilitate discussions and clarify 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. 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 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 (minimum 70%) to facilitate discussions and clarifications related to complex concepts. Computers and video projection system – The available computers must be suitable for running specialized software packages (e.g., Petrel, Move, 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 knowledge 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**
PC1	Understands geological, geochemical, and geophysical concepts and methods used for energy resource assessment.	Applies geological, geochemical, and geophysical methods and techniques to characterize and evaluate energy resources.
PC2	Knows the principles of information systems and digital tools applied in hydrocarbon and mineral resource exploration.	Uses specialized software and digital tools for analysing geological and geophysical data.

7. Subject-specific learning outcomes

Knowledge and comprehension
1. The student will be able to explain the significance of structural geology in subsurface exploration, particularly in relation to hydrocarbon systems and resource evaluation.
2. The student will be able to describe the main types of structural elements (folds, faults, fractures) and their geometric and genetic relationships.
3. The student will be able to differentiate structural styles across various tectonic settings, including extensional, compressional, strike-slip, and complex systems (e.g., inversion, salt tectonics).

4. The student will be able to explain the kinematic evolution of geological structures, including the timing and sequence of deformation events.
5. The student will be able to describe the principles of structural interpretation using subsurface data, including seismic sections, cross-sections, and geological maps.
6.The student will be able to explain methods for structural validation and restoration, including balancing techniques and the use of analog models.
7. The student will be able to discuss the role of faults in fluid flow systems, including concepts of sealing capacity, permeability, and trap integrity.
Specific academic skills
1. The student will be able to interpret structural features from subsurface datasets, integrating seismic, well, and analog information to define structural frameworks.
2. The student will be able to construct and test structural models, using balancing, restoration, and forward modeling techniques.
3. The student will be able to assess structural traps and fault behavior, including evaluating seal potential and fluid migration pathways.
4. The student will be able to develop and communicate structural interpretations, through professional-quality reports, cross-sections, and visual representations.

8. Contents

8.1. Course	**Teaching and learning methods**	**Remarks**
Introduction: Course objectives and learning outcomes. Link between structural geology and subsurface resources. The role of structural geologist and a structural model in subsurface exploration.	Presentation, discussions, case studies	
Principles, tools, and data used in structural interpretation.		
Structural families and styles. Folds, faults and fracture.		
Variability in timing and spatial distribution of structures.		
Kinematic evolution of structures.		
Analysis of structural traps in extensional settings		
Analysis of structural traps in compressional settings		
Analysis of structural traps in strike-slip settings		
Analysis of structural traps in passive margins		
Analysis of structural traps in complex settings: Multirift, Inversion, etc.		
Analysis of structural traps in complex settings: Salt and shale tectonics		
Predicting, validating and documenting structural evolution. Surface analogues. Physical models.		
Predicting, validating and documenting structural evolution. Balancing, restoration and forward modelling		
Faults as conduits or traps. Trap integrity and fault seal analysis. Fluid migration pathways.		
Bibliography – same for course and seminar/laboratory.		

8.2. Seminar/ laboratory	Teaching and learning methods	Remarks
Case studies prepared for the students, where they gain hands-on experience in developing structural interpretation skills. Individual or group projects.	Presentation, case studies, discussions, exercises on paper and using specialized software (e.g. MOVE, Petrel)	

Bibliography
Clichici O., 1975, Geologie structurala si cartografie, (curs litografiat), 340p., Universitatea "Babes-Bolyai" Cluj-Napoca
Dinu C., Pauliuc Ş., Barus T., 1988, Geologie structurala - Lucrari practice, 208p. Universitatea din BucurestiDavis, G.H., Reynolds, S.J., Kluth, C.F. 2011. Structural Geology of Rocks and Regions, 3rd Edition. Wiley, 864 p.
Fossen, H. 2012. Structural Geology. Cambridge University Press, 463 p.
Grasu C., 1997, Geologie structurală, Ed.Tehnică, Bucureşti, 244p.
Hobbs B.E., Means W.D., Williams P.F., 1988. Principii de geologie structurala, Ed. Stiintifica si Enciclopedica, Bucuresti, 477p.
McClay, K. 1992. The Mapping of Geological Structures. Wiley, 174 p.
Pauliuc, S., 1968. Cartografie Geologică. Ed. Didactică şi Pedagogică Bucureşti, 176 p.

9. Evaluation

Type of activity	9.1 Evaluation criteria	9.2 Evaluation methods	9.3 Percentage in the final grade
9.4. Course	Assessment of knowledge	Written exam	100%
9.5. Seminar/ laboratory			
9.6 Minimum standard for passing			
• Participation in at least 70% of the practical laboratory sessions; • Minimum grade of 5 in the written exam.			

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. Alexandra Tămaş

Signature of seminar coordinator

Şef lucr. dr. Alexandra Tămaş

Date of approval in the department:
20.04.2026

Signature of the head of department

Conf. dr. Nicolae Har