

## COURSE SYLLABUS

### 1. Data about the program

|                                   |                                    |
|-----------------------------------|------------------------------------|
| 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 Study cycle                   | Doctorate                          |
| 1.6 Study program / Qualification | Doctoral training / PhD in Geology |

### 2. Course data

|                                      |   |              |   |                         |      |                      |     |
|--------------------------------------|---|--------------|---|-------------------------|------|----------------------|-----|
| 2.1 Name of discipline               | <b>Metallogeny models</b>                   |              |   |                         |      |                      |     |
| 2.2 Teacher responsible for lectures | Assoc. Prof. habil, PhD Călin Gabriel Tămaş |              |   |                         |      |                      |     |
| 2.3 Teacher responsible for seminars | Assoc. Prof. habil, PhD Călin Gabriel Tămaş |              |   |                         |      |                      |     |
| 2.4 Year of study                    | 1   | 2.5 Semester | 2 | 2.6. Type of evaluation | Exam | 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:   |     |                            |    |                                   | hours |
| 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  | <ul style="list-style-type: none"> <li>Ore deposits</li> </ul>                 |
| 4.2 Competences | <ul style="list-style-type: none"> <li>Use of references data bases</li> </ul> |

### 5. Conditions (where applicable)

|  |  |
|--|--|
| 5.1 Conducting lectures                      | <ul style="list-style-type: none"> <li>Video support</li> </ul>  |
| 5.2 Conducting seminars / laboratory classes | <ul style="list-style-type: none"> <li>Case studies</li> <li>Attendance of at least 80% of laboratory classes</li> </ul> |

### 6. Specific competences acquired

|                                 |  |
|---------------------------------|--|
| <b>Professional competences</b> | <ul style="list-style-type: none"> <li>• identification of ore deposit genetic types</li> <li>• control factors for ore deposit formation and their significance for exploration</li> <li>• use of theoretical knowledge to laboratory and field work</li> <li>• use of documentation sources in professional activity</li> <li>• petrography-metallogeny approach of the genetic process that control the formation of the ore deposits</li> <li>• skills to synthetise geology and ore deposit data and to create ore deposit models</li> </ul>  |
| <b>Transversal competences</b>  | <ul style="list-style-type: none"> <li>• ability to analyze and synthesize information about geological phenomena and processes</li> <li>• to acquire and apply an efficient approach in the individual and/or team scientific activity, by fulfilling the aims, respecting the terms and using the research results</li> <li>• the ability to routinely use analytical equipment and specialized software for data production, processing and interpretation</li> <li>• creation/writing of scientific / technical documentation</li> <li>• communication skills and the ability to present the personal scientific achievements or geological data from literature/industry</li> </ul> |

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

|   |  |
|---|--|
| 7.1 The general objective of the course | <ul style="list-style-type: none"> <li>• metallogeny models - synthesis and tool in the knowledge of the ore deposits and exploration</li> </ul>   |
| 7.2 Specific objectives                 | <ul style="list-style-type: none"> <li>• knowledge of the genetic characters of the ore deposits</li> <li>• the content of a descriptive model: short description, host rocks, age, tectonic setting, ore body morphology, mineralogy, ore structure and texture, control factors, supergene alteration, geochemistry signature, examples, etc.</li> </ul> |

## 8. Content

| 8.1 Lectures   | Teaching methods                                  | Comments |
|--|---|----------|
| The concept of ore deposit models, origin and evolution  | Presentation, discussion, case studies, exercises |          |
| Metallogeny models USGS 1986 and updated versions until 2017   |   |          |
| Case studies on ore deposit genetic types and correspondence with available models   |   |          |
| 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               |          |
| <b>Bibliography:</b><br>Bradley, D., Munk, L., Jochens, H., Hynek, S., Labay, K., 2013, A preliminary deposit model for lithium brines: U.S. Geological Survey Open-File Report 2013–1006, 6 p.<br>Cox, D.P., Singer, D.A. (eds.), 1986. Mineral Deposit Models. U.S. Geological Survey Bulletin 1693<br>Drew, L.J., 2005. A tectonic model for the spatial occurrence of porphyry copper and polymetallic vein deposits. Applications to central Europe: U.S. Geological Survey Scientific Investigations Report 2005–5272, 36 p.<br>John, D.A., Ayuso, R.A., Barton, M.D., Blakely, R.J., Bodnar, R.J., Dilles, J.H., Gray, F., Graybeal, F.T., Mars, J.C., McPhee, D.K., Seal, R.R., Taylor, R.D., Vikre, P.G., 2010, Porphyry copper deposit model, chap. B of Mineral deposit models for resource assessment: U.S. Geological Survey Scientific Investigations Report 2010–5070–B, 169 p. |   |          |
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Ludington, S., Barton, P.B., Johnson, K.M., 1985, Mineral deposit models: theory and practice, USGS Open-file report 85-391, 18 p.

Shanks, W.C. Pat, III, Thurston, R. (eds.), 2012, Volcanogenic massive sulfide occurrence model: U.S. Geological Survey Scientific Investigations Report 2010–5070–C, 345 p.

Taylor, C.D., Causey, J.D., Denning, P.D., Hammarstrom, J.M., Hayes, T.S., Horton, J.D., Kirschbaum, M.J., Parks, H.L., Wilson, A.B., Wintzer, N.E., Zientek, M.L., 2013, Descriptive models, grade-tonnage relations, and databases for the assessment of sediment-hosted copper deposits—With emphasis on deposits in the Central African Copperbelt, Democratic Republic of the Congo and Zambia: U.S. Geological Survey Scientific Investigations Report 2010–5090–J, 154 p. and data files.

Taylor, R.D., Hammarstrom, J.M., Piatak, N.M., Seal, R.R. II, 2012, Arc-related porphyry molybdenum deposit model, Chapter D of Mineral deposit models for resource assessment: U.S. Geological Survey Scientific Investigations Report 2010–5070–D, 64 p.

**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**

- Metallogenetic modeling is the purpose of a case study on an ore body/deposit and in the same time it is a working tool that facilitates exploration and evolves over time to comprise the newly acquired data obtained by field geological exploration and/or laboratory analysis, being for this reason an essential tool in geological activity.

**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  | Oral examination                  | 60%                            |
|  | Assessment of knowledge  | Ongoing evaluation                | 40%                            |
| 10.5 Seminars / laboratory classes   | Activity during seminars | Discussions, answers to questions | 40%                            |
|  | Assessment of knowledge  | Oral examination                  | 60%                            |
| 10.6 Minimum performance standard  |                          |                                   |                                |
| <ul style="list-style-type: none"> <li>• to pass the theoretical exam</li> <li>• to pass the examination concerning the geotectonic setting and the geochronology the area of interest for the PhD research topic</li> </ul> |                          |                                   |                                |

|               |   |  |
|---------------|---|--|
| Date of issue | Signature of the teacher responsible for lectures | Signature of the teacher responsible for seminars  |
| 10.05.2025    | Assoc.Prof. habil, PhD Călin Gabriel Tămaș        | Assoc.Prof. <i>habil</i> , PhD Călin Gabriel Tămaș |

|   |   |
|---|---|
| Date of approval by the doctoral school council | Signature of the doctoral school director |
| 16.05.2025                                      |   |