ANX-PR/CL/001-01
LEARNING GUIDE

SUBJECT

63000270 - Exploration And Evaluation Of Mineral Deposits

DEGREE PROGRAMME

06AK - Master Universitario En Mineria Sostenible

ACADEMIC YEAR & SEMESTER

2025/26 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	63000270 - Exploration And Evaluation Of Mineral Deposits
No of credits	4 ECTS
Type	Compulsory
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	06AK - Master Universitario en Mineria Sostenible
Centre	06 - E.T.S. De Ingenieros De Minas Y Energía
Academic year	2025-26

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Ricardo Castedo Ruiz (Subject coordinator)	622	ricardo.castedo@upm.es	Sin horario. Send an email to make an appointment
Rogelio De La Vega Panizo	602	rogelio.delavega@upm.es	Tu - 11:00 - 14:00 W - 11:00 - 14:00

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Geographical Information System

- Formation of mineral deposits

- Economy and mineral extraction

- Basic knowledge of Geology (structures and geological series)

4. Skills and learning outcomes *

4.1. Skills to be learned

CE3 - To select and apply the more appropriate methods of exploration and valuation assessment of mineral deposits, to interpret the reports of the results and to assess the mineral resources/reserves according to international quality standards.

CE5 - To assess the environmental impact of the mining project in its exploration, economic pre-feasibility, exploitation and closing.

CG1 - To apply knowledge in advanced science and technology to the professional or research practice of Mining Engineering

CG2 - To be able to design, develop, implement, manage and improve products, systems, and processes in different environments of the mining activity, using advanced analytic, computational or experimental techniques.

CG4 - Capacity to learn in an international context and complex environments, multidisciplinary and bilingual (English-Spanish).

4.2. Learning outcomes

RA5 - Expert contracting of the more usual exploration methods, the interpretation of reports of results as a previous step for the assessment of the deposit discovered and the first design on the viability of a project at a conceptual level or pre-feasibility study.

RA6 - The development of studies and decision capability on the impact of mineral and energy resources extraction in the environment, even in the first phase of the minerals beneficiation, foreseeing the future affection on the natural environment.

RA4 - The qualification of mineral resources/reserves using and certifying the international qualifying rules, even if the ¿qualified person¿ skill is not awarded.

RA3 - Planning and application of the specific methodologies for the discovery of new mineral deposits or the increase of existing resources.

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

This subject introduces students to the fundamentals of mineral deposit exploration and subsequent resource evaluation. Using specialized simulation software, students will recreate geochemical exploration campaigns focused on the search for stratabound (sediment-hosted) deposits, based on Reduced Facies models.

Once a deposit is "discovered," students will perform a basic economic assessment of its viability. This project may be carried out individually or in small groups, depending on class size, and will be presented in class whenever possible.

In addition, the course covers various remote sensing techniques commonly used in mineral exploration.

5.2. Syllabus

1. Geological and metallogenetic framework of a deposit: stratigraphy and structure. Geological controls. Structural analysis and geometry of mineral deposits. Practical application.

2. Mining exploration methods and their specific application. An example: Geochemical exploration and its phases. Application to Red Beds. Practical realization and analysis of the results.

3. Economics of exploration. Results and economic strategies associated with decisions. The risks, their formulation and analysis.

4. Exploration: technology, economy, control and operations with cores and samples. Strategies in its distribution. Application.Tipología y clasificación de yacimientos metálicos. Diversos criterios y tipos de clasificación.

5. Remote Sensing Techniques

6. The exploration within the life cycle of a mining project. Phases and competences. International codes for the preparation of mineral resources and reserves reports. Application to previous cases.

7. Resource evaluation. Cut-off grade calculation. Methodology and application of the valuation of mineral deposits. Application to a stratoligated copper deposit.

6. Schedule

6.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	**Presentation** Duration: 01:00 Lecture **T5** Duration: 03:00 Lecture			
2	**T1** Duration: 04:00 Lecture			
3	**T2** Duration: 02:00 Lecture **T3** Duration: 02:00 Lecture			
4	**T5** Duration: 04:00 Lecture			
5	**T4** Duration: 02:00 Lecture **T6** Duration: 02:00 Lecture			**Geochemistry work** Individual work Progressive assessment and Global Examination Not Presential Duration: 02:00
6	**T5** Duration: 04:00 Lecture			
7	**T7** Duration: 04:00 Lecture			
8	**T7. Exploration mining company work** Duration: 03:00 Research-based learning **T5** Duration: 01:00 Cooperative activities			
9	**T7. Exploration mining company work** Duration: 03:00 Research-based learning **T5** Duration: 01:00 Cooperative activities			**Mineral companies economy** Individual work Progressive assessment and Global Examination Not Presential Duration: 03:00

10	**Field Trip (if possible).** Duration: 04:00 Practice field trip			**Mineral exploration work** Individual work Progressive assessment and Global Examination Not Presential Duration: 15:00 **Remote Sensing Techniques Work** Individual work Progressive assessment and Global Examination Not Presential Duration: 05:00 **Presentation of Mineral Exploration Work** Individual presentation Progressive assessment and Global Examination Presential Duration: 03:00
11				
12				
13				
14				
15				
16				
17				

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
5	Geochemistry work	Individual work	No Presential	02:00	20%	5 / 10	CG1 CG4 CE3 CE5
9	Mineral companies economy	Individual work	No Presential	03:00	20%	5 / 10	CG1 CG2 CG4 CE5
10	Mineral exploration work	Individual work	No Presential	15:00	30%	5 / 10	CG1 CG2 CG4 CE3 CE5
10	Remote Sensing Techniques Work	Individual work	No Presential	05:00	20%	5 / 10	CG1 CG2 CG4 CE3
10	Presentation of Mineral Exploration Work	Individual presentation	Face-to-face	03:00	10%	5 / 10	CG1 CG2 CG4 CE3 CE5

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
5	Geochemistry work	Individual work	No Presential	02:00	20%	5 / 10	CG1 CG4 CE3 CE5
9	Mineral companies economy	Individual work	No Presential	03:00	20%	5 / 10	CG1 CG2 CG4 CE5

10	Mineral exploration work	Individual work	No Presential	15:00	30%	5 / 10	CG1 CG2 CG4 CE3 CE5
10	Remote Sensing Techniques Work	Individual work	No Presential	05:00	20%	5 / 10	CG1 CG2 CG4 CE3
10	Presentation of Mineral Exploration Work	Individual presentation	Face-to-face	03:00	10%	5 / 10	CG1 CG2 CG4 CE3 CE5

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Mineral Companies economy	Written test	Face-to-face	00:30	20%	5 / 10	CG1 CG2 CG4 CE3 CE5
Geochemistry work	Written test	Face-to-face	00:30	20%	5 / 10	CG1 CG2 CG4 CE3 CE5
Mineral exploration	Written test	Face-to-face	00:30	40%	5 / 10	CG1 CG2 CG4 CE3 CE5
Remote Sensing Techniques Work	Written test	Face-to-face	00:30	20%	5 / 10	CG1 CG2 CG4 CE3

7.2. Assessment criteria

All course evaluations consist of the completion and submission of the required assignments.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Allègre C (2008) Isotope Geology. Cambridge Univ. Press, Cambridge, UK, 512 p.	Bibliography	
Brookins, D. G. (2012). Eh-pH diagrams for geochemistry. Springer Science & Business Media.	Bibliography	
Castroviejo R. (2007) Introducción al Estudio de los Recursos Minerales. MSc Aprovechamiento sostenible de los Recursos Minerales, R-5, serie introductoria. Red DESIR, Madrid, 78 p.	Bibliography	
Dill, H.G. (2009) The "chessboard" classification scheme of mineral deposits: Mineralogy and geology from aluminum to zirconium.- Earth Science Reviews, 100: 1-422 , Elsevier, Amsterdam.	Bibliography	
Espí, J.A., Vázquez, F. (2010).Guión de prácticas del curso de simulación de los resultados de una campaña de exploración minera, 80 p.	Bibliography	
Evans AM (1997) An Introduction to Economic Geology and its Environmental Impact. Blackwell, Oxford, 364 pp.	Bibliography	

Guilbert, J. M., & Park Jr, C. F. (2007). The geology of ore deposits. Waveland Press.	Bibliography	
Kelley KD, Golden HC, eds. (2014) Building Exploration Capability for the 21st Century. SEG Special Pub 18, Boulder, CO (USA), 329 p.	Bibliography	
Kesler SE, Simon AC (2015) Mineral resources, economics and the environment, 2nd. Ed. Cambridge University Press, 434 p.	Bibliography	
Levinson, A. A., Bradshaw, P. M., & Thomson, I. (1987). Practical problems in exploration geochemistry. Applied Pub Ltd.	Bibliography	
Marshall D, Anglin CD & Mumin H. (2004) Ore Mineral Atlas. Geol. Assoc Canada, Mineral Dep. Division, St. Johns Newfoundland, Canada, 112 p.	Bibliography	
Pohl W.H. (2011) Economic Geology: principles and practice. Wiley-Blackwell, Chichester, UK, 663 p.	Bibliography	
Ridley J (2013) Ore Deposit Geology. Cambridge Univ. Press, Cambridge, UK, 398 p.	Bibliography	
Robb L. (2005) Introduction to Ore-Forming Processes. Blackwell, Oxford, 373 p.	Bibliography	
Vázquez Guzmán F. (2012) Manual de Yacimientos Minerales. U.D. Proyectos, ETSIMM, UPM, Madrid, 597 p.	Bibliography	

http://bcs.wiley.com/he-bcs/Books?action=index&bcsId=6365&itemId=1444336622	Web resource	
TELEDETECCION AMBIENTALde EMILIO CHUVIECO	Bibliography	
Manual of Remote Sensing, Volume 3, Remote Sensing for the Earth Sciences. Libro editado por Andrew N. Rencz y Robert A. Ryerson	Bibliography	

9. Other information

9.1. Other information about the subject

This subject relates with the following ODS.

- **ODS 4 - Quality Education.** ODS 4.4: By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.
- **ODS 9 - Industry, Innovation and Infraestructure.** ODS 9.b: Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities. *In our case the commodity is the copper, in a developed country mine zone.*
- **ODS 12 - Responsible Consumption and Production.** ODS 12.2: By 2030, achieve the sustainable management and efficient use of natural resources. *It is clear in our case that the natural resources "will be found" by the student and must develop an efficient mine.*