UAB
Universitat Autònoma de Barcelona

Mineral Deposits

Code: 101051
ECTS Credits: 6

2025/2026

Degree	Type	Year
Geology	OT	3
Geology	OT	4

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

1- It is essential to have successfully completed the course on Mineralogy.

2- It is important to have taken or simultaneously taking the courses of Petrology (igneous, sedimentary and metamorphic) and Structural Geology.

Objectives and Contextualisation

- To know the main types of ore deposits
- To understand the ore deposits formational processes.
- To comprehend and relate petrographic, geochemical, structural or hydrological data in order to deduce the ore forming processes and develop exploration strategies for ore deposits.
- To learn how to use the reflected light microscope, to know the mineral optical properties as well as the method used to their identification.
- To know how to identify the main ore minerals and textures of the different studied ore deposit types.
- To deduce the mineral crystallization sequence and to know how to represent it in a paragenetic table.

Competences

Geology

- Display knowledge of the applications and limitations of geophysical methods for learning about the Earth.
- Display understanding of the size of the space and time dimensions of Earth processes, on different scales.
- Draw up and interpret geological maps and other means of depicting geological information (columns, correlation frames, geological cross-sections, etc.)
- Evaluate and carry out the selection and collection of suitable geological samples.
- Identify and characterise minerals and rocks through instrumental techniques, determine their formation environments and know their industrial applications.
- Identify and tackle environmental problems, plan land-use and know the principles of prevention and mitigation of geological risks.
- Learn and apply the knowledge acquired, and use it to solve problems.
- Obtain information from texts written in other languages.
- Plan the exploration and sustainable development of geological resources.
- Process, interpret and present field data using qualitative and quantitative techniques, and suitable computer programmes.
- Recognise, depict and reconstruct tectonic structures and the processes that generate them and relate types of rocks and structures to geodynamic environments.
- Recognise theories, paradigms, concepts and principles in the field of geology and use them in different areas of application, whether scientific or technical.
- Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
- Synthesise and analyse information critically.

Learning Outcomes

1. Apply instrumental techniques to characterise materials rock mechanics and geotechnics.
2. Construct subsoil models with applications for geological engineering.
3. Correctly interpret geological information with applications in the exploration of hydrocarbons and mineral deposits, and in geological engineering.
4. Correctly sample industrial mineral and rock deposits.
5. Draw up geological cross-sections or other types of presentation for geological data in order to characterise hydrocarbon reserves and mineral deposits.
6. Evaluate the environmental problems related to mining, industrial rock and hydrocarbon exploitations.
7. Learn and apply the knowledge acquired, and use it to solve problems.
8. Make geophysical prospections for geotechnical purposes, keeping in mind the limitations of the results and the margins of error.
9. Obtain information from texts written in other languages.
10. Provide solutions to geological problems in applied geology and engineering.
11. Reconstruct hydrocarbon reserves based on the appropriate data.
12. Relate tectonic structures to hydrocarbon reserves.
13. Relate the theories and principles of geology to the exploration of reserves and mineral deposits, and to problem solving in geological engineering.
14. Solve problems in reserves, mineral deposits and geological engineering based on field and laboratory observations and the concepts studied.
15. Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
16. Synthesise and analyse information critically.
17. Use geochemical methods to detect and study mineral deposits.

Content

Lectures:

1. Introduction

- Course overview
- Ore deposits in the current context
- Mineral systems Approach
- Classification of ore deposits

2. Study Techniques

- Fieldwork
- Geochemistry and geophysics
- Laboratory techniques
- Partitioning of trace elements, stable and radiogenic isotopes

3. Mineralizing Processes of Igneous and Metamorphic Origin

- Mineral deposits associated with mafic and ultramafic rocks: Chromitites, magmatic copper-nickel massive sulfides and platinum group element-bearing sulfides
- Mineral deposits associated with alkaline rocks: Carbonatites and kimberlites
- Mineral deposits formed through metamorphic processes

4. Hydrothermal Mineralizing Processes

- Metal transport and deposition mechanisms in aqueous environments
- Ore deposits associated with felsic igneous rocks:
    - Pegmatite, skarn, porphyry copper, and tin-tungsten deposits
- Deposits associated with volcanic rocks:
    - High- and low-sulfidation epithermal deposits, volcanogenic massive sulfide (VMS/VHMS) deposits
- Deposits associated with sedimentary rocks:
    - Sedimentary-hosted massive sulfide (SHMS) deposits, lead-zinc in carbonates (Mississippi Valley-Type; MVTs), red beds, uranium in sandstones and unconformities, and iron-manganese accumulations

5. Surficial Mineralizing Processes

- Mechanically concentrated deposits (e.g., placers), supergene enrichment deposits, and residual mineral deposits (e.g., bauxites and laterites)

Practical Sessions:

In the 11 practical sessions, students will examine the main characteristics of metallic ore minerals using reflected light microscopy. Activities include mineral recognition, interpretation of textures, cross-cutting relationships, hand specimen observation, and analysis of mineral parageneses for key ore deposit types.

Session 1: Reflected light optical microscope - operation and optical properties of minerals

Session 2: Mineral textures, cross-cutting relationships, and parageneses

Session 3: Mineral identification

Session 4: Chromitite and magmatic Cu-Ni massive sulfides

Session 5: Hydrothermal alteration

Session 6: Skarns

Session 7: Porphyry copper, high- and low-sulfidation epithermal deposits

Session 8: Massive sulfides (VMS and SEDEX)

Session 9: Mississippi Valley-Type (MVT) and vein-type deposits

Session 10: Oolitic iron, Banded Iron Formation (BIF), and supergene enrichment

Session 11: Review session

Field Trip:

A one-day field trip is scheduled to visit ore deposits in Catalonia that exemplify the types covered in class. The exact site is selected annually depending on the academic calendar and the availability of collaborating mining companies.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Field work	7	0.28	3, 13, 12, 11, 9, 2, 6
Laboratory practical classes	22	0.88	16, 10, 2
Theoretical classes	22	0.88	16, 1, 13, 12, 4, 9, 17, 14, 2, 5, 8, 6
Type: Autonomous			
Exam preparation and tasks	82	3.28	16, 3, 1, 13, 12, 4, 9, 17, 14, 2, 5, 6

The course is organized with two lecture sessions per week, of 50 minutes each with all the group, and one practical session of 110 minutes per week.

The lecture sessions consist mainly in lessons where concepts are clarified, textures and ore deposit types are described, study techniques are summarized and ore forming processes are presented. These lectures are combined with simple calculations development to solve problems related to ore deposits, and cooperative groups assignments. Some of the tasks are developed during the class hour, but others are started towards the end of the class and the students have to finish them on their own.

The assignments consist of reading short texts or scientific articles that students need to understand, compare with previous information or material they have to search for. They should be able to summarize what they have learned and draw conclusions about the formation or exploration of the mineral deposit. Most texts are written in English. In addition to specific references, supplementary material (such as graphics, photographs, and diagrams) will be available to students on the virtual campus.

The practical sessions will be held in the Microscopy Laboratory, where the students will learn how to work with the reflected light microscope, how to recognize the principal ore minerals and how to interpret their textures. Hand samples will be studied also, from host rocks and ore and gangue minerals, of several deposits representative of the most significant types. The students will be able to use lab on their own during the study and exams weeks if the course teacher considers it necessary.

Practical sessions take place in the Microscopy Laboratory, where students learn to work with reflected light microscopy, recognize major ore minerals, and interpret textures. Hand samples of host rocks, ore and gangue minerals from various ore deposits representing significant typologies will also be examined. The students willbe able to use the Microscopy Laboratory on their own during the study and exams week, if deemed necessary by the subject coordinator.

Ore deposits fieldwork is compulsory and it will be conducted during a one-day field trip. This will be planned to visit nearby mineral deposits of interest.

Note: 15 minutes of a lecture session, within the schedule established by the institution/program, will be reserved for students to complete the evaluation of the teaching activity of the lecturers as well as of the subject/module assessment.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
global exam	10%	3	0.12	16, 7, 3, 1, 13, 12, 17, 14, 2, 5, 15, 8, 6
Individual and group tasks, field work exam	15%	8	0.32	16, 3, 1, 9, 14, 2, 8, 6
partial exams of theoretical concepts and problems	35%	4	0.16	13, 12, 4, 17, 5, 8, 6
practical exam	40%	2	0.08	10, 12, 11, 2

During the course, two thematic exams will be performed to assess the knowledge acquired in the theoretical classes. Additionally, students will be required to complete several assignments (either individually or in groups), as well as some tests, and a fieldwork exam. At the end of the course, students who failed the thematic exams will have the opportunity to retake them on the date set by the Faculty (Note: online activities are not recoverable). On this date, a final/global exam will be mandatory for all students. All partial and final exams will consist of short-answer questions that can be completed with the help of books and notes. Some questions may include simple calculation problems.

The practical laboratory component will be assessed through a practical exam at the end of the practical sessions, conducted in the microscopy lab itself. The exam will consist of mineral identification, description of textures in polished sections, and recognition of metallic ores in hand samples. This practical exam can be retaken on a date set by the lecturer. It will be open-note, allowing the use of diagrams and notes created by the student during the practical sessions.

There will also be a fieldwork exam at the end of the field trip.

The practical exam will count for 40% of the final grade, the theory and problem partial exams for 35%, the progress in assignments and the field exam for 15%, and a final comprehensive exam for the remaining 10%. If a student does not achieve a minimum grade (4 out of 10) in each of the major assessments, the weighting system will not apply, and the student will fail the course.

If a student requests a single evaluation (in the form and date determined by the Faculty), they will take an exam consisting of a theory test (50%), a practical exam on mineral recognition in hand specimens and under the microscope, with an oral evaluation (40%), and a fieldwork exam (10%). The date of this exam will be the same as the last theory partial exam of the subject.Attendance at the field trip and at 70% of the practical sessions will be mandatory.

The use of Artificial Intelligence (AI) tools is strictly prohibited in all phases of this course. Any assignment containing AI-generated content will be considered a violation of academic integrity and may result in partial or full grade penalties, or more serious disciplinary action in severe cases.

Bibliography

References for Lecture Sessions (highlighted the most recommended)

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- KESLER, S.E. and SIMON, A.C. (2015). Mineral resources, economics and the environment. *Cambridge University Press*.

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- PARK, C.F. and MACDIARMID, R.A. (1975). Ore Deposits. W.H. Freeman and Company.

- PIRANJO, F. (2009). Hydrothermal Processes and Mineral Systems. Springer.

- RIDLEY, J. (2013). Ore deposit geology. Cambridge University Press (llibre electrònic).

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References for Practical Sessions (highlighted the most recommended)

- AUGUSITHIS, S.S.P. (1995). Atlas of the textural paterns of oreminerals and metallogenic processes. Walter de Gruyter & Co.

- BASTIN, E.S. (1953). Interpretation of ore textures. The Geological Society of America.

- CASTROVIEJO, R. (2023). A Practical Guide to Ore Microscopy - Volume 1. Springer.

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- NEUMANN, U. (2019). Guide for the microscopical identification of ore and gangue minerals. Tübingen University Press.

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- THOMPSON, A.J.B. and THOMPSON, J.F.H. (1996). Atlas of alteration. Geological Association of Canada.

Recommended webpages

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DA MOMMIO, A. Alex Strekeisen. [Accessed: June 11th 2024]. Available at: https://www.alexstrekeisen.it/english/index.php

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IXER R.A. and DULLER, P.R. Virtual atlas of opaque and ore minerals and their associations. [Accessed: July 8th 2024]. Available at: http://www.atlas-of-ore-minerals.com/

ORE DEPOSITS HUB. Open Geoscience Talks on Ore Deposits. [Accessed: July 8th 2024]. Available at: https://oredepositshub.com/

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UNIVERSITY OF GENEVE. Mineral Resources and Geofluids. Lluís Fontboté. [Accessed: July 8th 2024]. Available at: https://www.unige.ch/sciences/terre/research/Groups/mineral_resources/opaques/opaques_menu.php

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Social Networks

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SOCIETYOFECONOMICGEOLOGISTS. Instagram of the SEG.[Accessed: July 8th 2024]. Available at: https://www.instagram.com/societyofeconomicgeologists/

Software

There is no need for specific software.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PCAM) Field practices	1	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	1	Catalan	first semester	morning-mixed
(TE) Theory	1	Catalan	first semester	morning-mixed