GUÍAS DOCENTES

Universidad de Jaén
School of Engineering of Linares

Mineral deposits

2024-2025

Grado en Ingeniería de Tecnologías Mineras
Doble Grado en Ingeniería de tecnologías mineras e Ingeniería civil

Guías docentes UJA

Horarios de tutorías

Llamamientos PAU

Syllabus 2024-25 - 14112022 - Mineral Deposits (Yacimientos minerales)

Caption
- Level 1: Tutorial support sessions, materials and exams in this language
- Level 2: Tutorial support sessions, materials, exams and seminars in this language
- Level 3: Tutorial support sessions, materials, exams, seminars and regular lectures in this language

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DEGREE: Grado en Ingeniería de minas (14112022)
FACULTY: SCHOOL OF ENGINEERING OF LINARES
DEGREE: Doble grado en Ingeniería de tecnologías mineras e Ingeniería civil (15012030)
FACULTY: SCHOOL OF ENGINEERING OF LINARES
ACADEMIC YEAR: 2024-25
COURSE: Mineral Deposits

SYLLABUS

1. COURSE BASIC INFORMATION

NAME: Mineral Deposits
CODE: 14112022 (*) ACADEMIC YEAR: 2024-25
LANGUAGE: English LEVEL: 1
ECTS CREDITS: 9.0 YEAR: 4 SEMESTER: PC

2. LECTURER BASIC INFORMATION

NAME: LÓPEZ SÁNCHEZ-VIZCAINO, VICENTE AGUSTÍN
DEPARTMENT: U117 - GEOLOGÍA
FIELD OF STUDY: 120 - CRISTALOGRAFÍA Y MINERALOGÍA
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LANGUAGE: - LEVEL: 1

3. CONTENT DESCRIPTION

LECTURES

I. Introduction to ore deposits

1.- Ore deposits: definitions. Ores and indutrial minerals. Mineral deposits. Viable mineral deposits. Economic geology. Ore and gangue minerals. Concentration. Mineral resources and ore reserves.

II. Ore-forming processes and associated rocks

2.- Ore-forming processes. Internal processes. External processes.

3 .- Introduction to petrology. Minerals and mineralogy . Petrology: igneous, metamorphic and sedimentary rocks.

4 .- Igneous rocks. Chemical and mineralogical composition.

5 .- Magmas. Evolution of magmas.

6 .- Igneous bodies morphology. Extrusive bodies. Intrusive bodies. Geodynamic settings. Igneous suites.

7.- Sedimentary rocks. Introduction. Clasification. Composition. Sedimentary environments. Sedimentary processes. Sedimentary structures. Detritic rocks. Carbonatic rocks.

8 .- Metamorphism. Types of metamorphic change. Types of metamorphism. The controlling factors of metamorphism. Description of a metamorphic region.

9 .- Metamorphic rocks and processes.

III. Ore deposits through time and space

10 .- Ore deposits through time and space. Tectonic settings. Associated rocks. Some general definitions

IV. Ore bodies morphology and textures

11.- Morphology of ore bodies types. Syngenetic and epigenetic deposits. Concordant bodies. Discordant bodies.
12.- Textural relationships in ore bodies. Primary textures. Secondary textures. Importance for ore processing.

V. Environmental geochemistry and mineral deposits

13.- Environmental geochemistry and mineral deposits. Geochemical reservoirs. Geochemical cycles. Environmental impact of mining activity.

VI: Classification and description of ore deposits

14.- Classification of ore deposits. Classification criteria. Classification by commodities.
15.- Iron deposits.
16.- Ferroalloy metals deposits: Mn, Ni, Cr, Co, Mo, V, W, Nb, Te.
17.- Light metals deposits: Al, Mg, Ti, Be.
18.- Base metals deposits: Cu, Pb-Zn, Sn.
19.- Precious metals deposits: Au, Ag, PGE.

LABORATORY SESSIONS AND FIELD TRIPS

I. Petrography of igneous and metamorphic rocks.

1.- Igneous rocks. Identification of volcanic and plutonic rocks. Classification. Crystallinity. Grain size. Crystal morphology.

2 .- Identification and description of **volcanic rocks**. Mineral assemblages. Textures.

3 .- Identification and description of **plutonic rocks**. Mineral assemblages. Textures.

4 .- Identification and description of **sedimentary rocks**. Mineral assemblages. Textures.

5 .-Metamorphic rocks. Classification. Identification and description of metamorphic rocks. Mineral assemblages. Textures.

II: Ores and their textures

6 .- Primary and secondary ore textures.

7 .- Ores and textures in iron and ferroalloy metals deposits.

8 .- Ores and textures in light metals and base metals deposits.

III: Geology of ore deposits in Spain

9 .- Fe deposits (Alquife-Las Piletas)
10.- Ni deposits (Aguablanca).
11.- Massive Cu-Pb-Zn sulfides mineral deposits (Iberian Pyritic Belt)
12.- Vein Pb deposits (Linares-La Carolina).

IV: Field trips

13.- The Linares-La Carolina mining district.

4. COURSE DESCRIPTION AND TEACHING METHODOLOGY

1.- Lectures

Explanations by the teacher, discussion and answer to questions. Presentations are available before lectures take place.

2.- Lab sessions

I. Petrography of igneous and metamorphic rocks.

Introductory explanations by teacher; students observations at the microscope; exercises: description of thin sections ; eventually, exercise tests in the online teaching platform.

II. Ores and their textures

Introductory explanations by teacher; students observations of rocks and minerals hand samples; exercises: description of samples and answer to related questions ; eventually, exercise tests in the online teaching platform.

III. Geology of ore deposits in Spain

Reading of texts and papers on the geology of specific ore deposits and answer to questions about them (eventually, exercise tests in the online teaching platform). Exercises will be evaluated by the teacher. Group discussion on the texts and questions and additional explanations by the teacher.

IV. Field trips

Students will receive previous explanations and guidebooks.

Each student will write a report summarizing the observations and activities made during the trips. Eventually, exercise tests in the online teaching platform or further activities in small groups will be required.

3.- Tutorial sessions

Group tutorials (2h) to solve doubts about the petrographic study of igneous, sedimentary and metamorphic rocks.

Group tutorials (1h) for the resolution of doubts about the texts on the geology of mineral deposits of metallic ores.

Group tutorials (2h) for the resolution of doubts about the work to be done on the excursions and visits.

Group tutorials (1h) to resolve doubts about the theoretical contents of the course.

The individual tutorials will be devoted to solving doubts of students or small groups of these in the six hours a week set aside for this purpose by the teacher and whose schedule is made public by the department.

LINK WITH THE SUSTAINABLE DEVELOPMENT GOALS (SDG)

The contents and activities of the Mineral Deposits subject and, very prominently, those related to the PIMED11_202123 project can be associated with the following SDGs:

- Goal 8.4: Improve progressively global resource efficiency in consumption and production.
- Goal 6.3: improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials.
- Goal 12.2: Achieve the sustainable management and efficient use of natural resources.

Students with special educational needs should contact the Student Attention Service (Servicio de Atención y Ayudas al Estudiante) in order to receive the appropriate academic support

5. ASSESSMENT METHODOLOGY

S1. Class attendance: 5.0%
S2. Theoretical contents: 45%
S3. Field trip report: 15%
S4. Lab sessions:
Exercises on thin sections and samples description: 20%
Petrography exam: 15%

Minimum grades in S2, S3 and S4 will be 4.

Students not being able (for sufficiently justified reasons) to take part in the lab sessions and excursion will have the right to make an exam with a 50% weight in the final grade of the course.

In extraordinary exam calls both theoretical and practical contens will be evaluated. The exam will be passed with a minimum grade of 5.

6. BOOKLIST (Access the bibliography in the Library catalog)

MAIN BOOKLIST:

- Principles of igneous and metamorphic petrology. Edition: 2. Author: Philpotts, A.R y Ague, J.J.. Publisher: Cambridge University Press (Library)
- Future global mineral resources. Edition: -. Author: Arndt, N.T., Fontboté, L., Hedenquist, J.W., Kesler, S.E., Thompson, J.F.H., Wood, D.G.. Publisher: Geochemical Perspectives, 6, 1, 171 pp (Library)

ADDITIONAL BOOKLIST:

- Ores and minerals: an introducing economic geology . Edition: -. Author: Barnes, J.W.. Publisher: Chichester [etc.]: John Wiley and Sons, 1996 (Library)
- Ore microscopy and ore petrography. Edition: -. Author: Craig, James R.. Publisher: New York: John Eiley and Sons, cop. 1994 (Library)
- Atlas of opaque and ore minerals in their associations. Edition: -. Author: Ixer, R. A.. Publisher: Buckingham: Open University Press, 1990 (Library)
- The geology of ore deposits. Edition: -. Author: Guilbert, John M.. Publisher: Long Grove : Waveland Press, 2007 (Library)

- Economic geology 100th anniversary volume: 1905-2005 J.W. Hedenquist, J.F.H. Thompson, R.J. Goldfa. Edition: -. Author: -. Publisher: Littleton: Society of Economic Geologists (2005) (Library)
- An Introduction to igneous and metamorphic petrology. Edition: -. Author: Winter, John D.. Publisher: Englewood Cliffs, New Jersey : Academic Internet Publishers (AIPI), 2007 (Library)
- Igneous and metamorphic rocks under the microscope: classification, textures, microstructures and m. Edition: [1st ed.]. Author: Shelley, David. Publisher: London [etc.]: Chapman & Hall, 1983 (1993 cop.) (Library)
- Igneous and metamorphic petrology. Edition: 2nd ed. Author: Best, Myron G.. Publisher: Malden: Blackwell Publishing, 2003 (Library)
- Petrology: the study of igneous, sedimentary and metamorphic rocks. Edition: 2nd ed. Author: Raymond, Loren A.. Publisher: Boston [etc.]: McGraw-Hill, cop. 2002 (Library)

7. SUSTAINABLE DEVELOPMENT GOALS

Agua limpia y saneamiento

Trabajo decente y crecimiento económico

Producción y consumo responsables

DETAILED INFORMATION

The contents and activities of the subject Mineral Deposits can be associated with the following specific goals of the SDGs mentioned above:

Goal 8.4: Improve progressively global resource efficiency in consumption and production.
Goal 6.3: improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials.
Goal 12.2: Achieve the sustainable management and efficient use of natural resources.

These targets indicate the great importance of the exploitation of mineral deposits globally for the efficient supply of raw materials, but with increasing emphasis on critical issues such as: respect for the environment, especially in terms of its effect on water, and the consideration of the life cycle of mining waste in the framework of the circular economy.

8. VIRTUAL / CLASSROOM TEACHING SCENARIO

TEACHING METHODOLOGY AND TRAINING ACTIVITIES

Considering the number of students enrolled in this subject in previous academic years and the number of classroom positions assigned, most of the planned training activities will be carried out in person. The online format will be used exclusively in individual tutoring sessions. The low number of students expected to enroll in the subject will also allow everyone to participate simultaneously in the practical sessions, to be held in the laboratories, and in the group tutorials, to be carried out both in the theory classroom and in the laboratories.

The following table shows a summary of the training activities and teaching methodologies that are proposed for the Multimodal Scenario and that correspond strictly to those that appear in the Course's Teaching Guide:

Training activities	**Format (face-to-face / online)**	**Teaching methodology. Description**
42 theory sessions on the contents of the program	100% face-to-face	42 sessions of participatory master classes, one hour each, developed in the classroom
31 hours of practical work in specialized laboratories on the contents of the program	100% face-to-face	31 hours of laboratory practices, divided into sessions of one or two hours, in the Department's teaching laboratories.
4 seminar sessions on the contents of the program	100% face-to-face	4 participatory seminar sessions, lasting one hour each, held in the classroom
Field trip of 7 hours duration	100% face-to-face	Field trip of seven hours duration to make geological observations related to the contents of the program.
3 collective Tutoring sessions Individual tutoring	100% face-to-face	The three collective tutoring sessions will last two hours each. Two of them will take place in teaching laboratories and one in

		the classroom. The individual online tutorials will take place synchronously and, eventually, asynchronously if necessary.

EVALUATION SYSTEM

As indicated in the " Criterios académicos para la adaptación de la docencia durante el curso académico 2020/21 en relación con la pandemia provocada por la COVID-19" approved by the Governing Council of the UJA, the objective pursued is to prioritize continuous evaluation over the rest of the evaluation instruments. In the global evaluation system for the multimodal scenario, the percentages assigned to the different aspects considered in the evaluation coincide with those contemplated in the evaluation system of the face-to-face modality of the subject (see Teaching Guide). In them, the weight of the evaluation of the theoretical aspects of the subject is 45% and conforms to the recommendations of the aforementioned Academic Criteria document.

CATEGORY	CRITERIA	INSTRUMENTS	WEIGHT
Assistance and / or Participation in face-to-face and / or virtual activities	Attendance and active participation in class. Participation in the debates.	Assist Control. Teacher observation and notes	5.0%
Theoretical concepts of the subject	Knowledge of the theoretical concepts and associated competences	Theoretical exam or exams	45.0%
Laboratory / field practices / use of ICT tools	Assimilation of practical knowledge and associated skills related to Blocks I, II and III of the practical class program.	Delivery of reports and student work on blocks I, II and III of the practical program. Teacher correction	15.0%
Carrying out work, cases or exercises	Assimilation of knowledge and associated competencies related to Block IV (field trip) of the practical class program	Reports and / or complementary activities on the field trip. Correction by the teacher	35.0%

Note 1. The weights assigned to the evaluated activities will only be considered if the qualification reaches the value of 4 in each of the sections Theoretical concepts, Laboratory practices and Completion of works.

Note 2. Students who, for a justified reason, cannot attend the practical classes or participate in the excursion and, therefore, cannot carry out the activities related to both, will have the right to take an exam in which the practical knowledge raised in the mentioned activities and whose evaluation will suppose 50% of the final grade of the subject.

Note 3. The evaluation in the extraordinary calls will be carried out by means of an exam in which both the theoretical contents and the practical contents of the subject will be evaluated. The exam will be passed with a minimum grade of 5.

MEANS

In addition to all the face-to-face teaching infrastructure of the UJA and the collections of minerals, rocks and thin sections of the Geology Department, all available communication resources will be used (virtual teaching platform, videoconference, chats, email), as well as all the technical and electronic resources available at the University of Jaén: electronic bibliographic resources, remote computer resources, etc.

9. VIRTUAL TEACHING SCENARIO

TEACHING METHODOLOGY AND TRAINING ACTIVITIES

Adaptation to virtual teaching through teaching activities, both synchronous and asynchronous, will be based on the use of electronic resources offered by the University of Jaén: PLATEA Virtual Teaching Platform, Google GSuite UJA, electronic bibliographic resources, fundamentally.

The follow-up of the non-classroom academic activity will be carried out by email, individual and group tutoring by videoconference and the PLATEA space forum.

The minimum acquisition of the competences linked to the teaching of laboratory practices and the realization of geological observations in the field will be completed through the use of other training activities that appear in the original teaching guide, such as practical activities, seminars, solving exercises and presentation / exhibition of works by the student.

The following table shows by way of summary the training activities and teaching methodologies developed in this non-classroom setting:

Training activities	**Format (face-to-face / online)**	**Teaching methodology. Description**
42 theory sessions on the contents of the program	Online	42 sessions of participatory master classes, one hour each, conducted by videoconference. If necessary, after agreement with the students of the subject, we could opt for asynchronous activities.
31 hours of practical work in specialized laboratories on the contents of the program	Online	Substitution of the 31 hours of laboratory practices, divided into sessions of one or two hours, for synchronous and asynchronous online training activities: - Virtualized realization, as far as possible, of laboratory practices (synchronous and asynchronous). - Realization (asynchronous) and defense (synchronous) of individual works. - Resolution of cases or exercises (synchronous and asynchronous).
4 seminar sessions on the contents of the program	Online	The 4 participatory seminar sessions, lasting one hour each, will be held by videoconference.
Field trip of 7 hours duration	Online	The field trip to make geological observations will be replaced by synchronous and asynchronous online training activities in which digital information (maps, photographs, diagrams) corresponding to the area of interest and equivalent areas is displayed.
3 collective Tutoring sessions Individual tutoring	Online	All tutoring sessions will be conducted online, synchronously and asynchronously.

EVALUATION SYSTEM

In this scenario, continuous evaluation becomes more relevant than in the previous two, so this evaluation system is strengthened by establishing different percentages of weights for the evaluable aspects, as shown in the following table: TEGORY

CATEGORY	CRITERIA	INSTRUMENTS	WEIGHT
Assistance and / or Participation in face-to-face and / or virtual activities	Attendance and active participation in class. Participation in the debates.	Assist Control. Teacher observation and notes	10.0%
Theoretical concepts of the subject	Knowledge of the theoretical concepts and associated competences	Two theoretical exams	40.0%
Carrying out work, cases or exercises	Knowledge of the practical concepts of the subject and acquisition of associated skills. In the delivery of reports and exercises, the correct identification and	Delivery by the students and correction by the teacher of the following works: 1. Description and classification of igneous, metamorphic and	50.0%

	description of the photographs of the studied geological samples and the precision of the geological language used will be assessed. In addition to the structure of the document, the quality of the documentation used, originality, language correction (spelling, syntax) and presentation In the presentations of the students, the structure, precision and conciseness of the language and the correctness of the exposed contents will be valued.	sedimentary rock samples. 2. Description, analysis and origin of textures of samples of ores from mineral deposits of different metals. 3. Identification and description of ores from mineral deposits of different metals. 4. Questions about the geological characteristics of mineral deposits in Spain from the study of a scientific publication on said deposits. 5. Reports and presentations on different aspects of the geology and mineralizations of the Linares-La Carolina mining district. Relative weight: 1. 10% 2-3. 10% 4. 10% 5. 20%	

All the activities to be evaluated that have been proposed for the virtual scenario have their equivalent in the face-to-face scenario. In case of having to pass throughout the semester from a multimodal scenario (100% face-to-face in the case of this subject) to a totally virtual one, the activities that have already been delivered and evaluated will have the weight that corresponds to them in the evaluation of the non-classroom setting.
Note 1. The weights assigned to the evaluated activities will only be considered if the qualification exceeds the value of 4 in the sections Theoretical conceptsÂÂ and Completion of works, cases or exercisesÂÂ.
Note 2. Students who, for a justified reason, cannot attend the practical classes or participate in the excursion and, therefore, cannot deliver the activities corresponding to the practical contents of the subject, will have the right to take an exam in which the practical knowledge raised in the aforementioned activities will be evaluated, the evaluation of which will represent 50% of the final grade for the course.

Extraordinary call

Assessment	**Test Format (face-to-face / online synchronous or asynchronous)**	**Description**	**Percentage**
Percentage	Online	Both the complete theoretical contents and the complete practical contents of the subject will be evaluated. The exam will be passed with a minimum grade of 5.	100%

MEANS

All available communication resources (virtual teaching platform, videoconference, chats, email) will be used, as well as all the technical and electronic resources of the University of Jaén: electronic bibliographic resources, remote computing resources, etc. Along with this, the teacher will use for the practical contents of the subject a collection of digital photographs corresponding to the main samples of rocks, minerals and thin sections for the microscope that are usually used in the classroom practices of the subject.

DATA PROTECTION CLAUSE (on line exams)

Institution in charge of data processing: Universidad de Jaén, Campus Las Lagunillas, s/n, 23071 Jaén

Data Protection Delegate: dpo@ujaen.es

Purpose: In accordance with the Universities Law and other national and regional regulations in force, carrying out exams and assessment tests corresponding to the courses students are registered in. In order to avoid frauds while sitting the exam, the exam will be answered using a videoconference system,

being able the academic staff of the University of Jaén to compare and contrast the image of the person who is answering the exam with the student's photographic files. Likewise, in order to provide the exam with evidential content for revisions or claims, in accordance with current regulation frameworks, the exam will be recorded and stored.

Legitimacy: compliance with legal obligations (Universities Law) and other national and regional regulations currently in force.

Addressees: service providers who are the owners of the platforms where the exams are carried out and with whom the University of Jaén has signed the corresponding data access contracts.

Storage periods: those established in current in force regulations. In the specific case of exam videoconference recordings, not before the examination records and transcripts are closed or the exam can still be reviewed or challenged.

Rights: you can exercise your right of access, amendment, cancellation, opposition, suppression, limitation and portability by sending a letter to the postal or electronic address indicated above. In the event that you consider that your rights have been violated, you may submit a complaint to the Andalusian Council for Transparency and Data Protection www.ctpdandalucia.es

CLASS RECORDING CLAUSE PERSONAL DATA PROTECTION

Person in charge: Universidad de Jaén, Paraje Las Lagunillas, s/n; Tel.953 212121; www.ujaen.es

Data protection delegate (DPO): TELEFÓNICA, S.A.U. ; Email: dpo@ujaen.es

Procedure aim: To manage proper recordings of teaching sessions with the aim of facilitating learning process under a multimodal and/or online teaching

Period for record storage: Images will be kept during legal term according to regulations in force

Legitimacy: Data will be managed according to legal regulations (Organic Law 6/2001, December 21, on Universities) and given consent provided by selecting corresponding box in legal admission documents

Data recipients (transfers or assignments): Any person allowed to get access to every teaching modality

Rights: You may exercise your rights of access, rectification, cancellation, portability, limitation of processing, deletion or, where appropriate, opposition. To exercise these rights, you must submit a written request to the Information, Registration and Electronic Administration Service of the University of Jaen at the address above, or by e-mail to the address above. You must specify which of these rights you are requesting to be satisfied and, at the same time, you must attach a photocopy of your ID card or equivalent identification document. In case you act through a representative, legal or voluntary, you must also provide a document that proves this representation and identification. Likewise, if you consider that your right to personal data protection has been violated, you may file a complaint with the Andalusian Data Protection and Transparency Council www.ctpdandalucia.es