

# 60385 - Characterization of geological materials: techniques and applications

## Syllabus Information

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**Academic Year:** 2020/21

**Subject:** 60385 - Characterization of geological materials: techniques and applications

**Faculty / School:** 100 - Facultad de Ciencias

**Degree:** 624 - Master's in Geology: Techniques and Applications

**ECTS:** 3.0

**Year:** 1

**Semester:** Second semester

**Subject Type:** Optional

**Module:** ---

## 1.General information

### 1.1.Aims of the course

The course addresses the description of the most usual techniques applied to chemical and textural characterization of geologic materials along with the requirements of sample preparation. Accordingly, the course will deal with the application procedures of the different techniques and with all those aspects related to the choice of the most suitable specific techniques in every particular case. Finally, the validation and correct interpretation of their results will be treated.

This course is thus recommended for students with research interest on Petrology and Geochemistry and Crystallography and Mineralogy or on any other matters in which characterization of geologic materials through specific techniques is required or desirable.

### 1.2.Context and importance of this course in the degree

### 1.3.Recommendations to take this course

## 2.Learning goals

### 2.1.Competences

### 2.2.Learning goals

### 2.3.Importance of learning goals

## 3.Assessment (1st and 2nd call)

### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

## 4.Methodology, learning tasks, syllabus and resources

### 4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. It favors the understanding of the main characterization techniques, along with their applicability to specific problems.

Classroom materials will be available via Moodle (<https://moodle2.unizar.es/add/>). These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials, including a discussion forum.

Students are expected to participate actively in the class throughout the semester. It will be favoured that the students participate in tutoring activities (face-to-face or telematics)

### 4.2.Learning tasks

This is a 3 ECTS course organized as follows:

- Participatory master classes (1.8 ECTS: 18 hours).
- Laboratory sessions (0.8 ECTS: 8 hours). Two laboratory sessions will be held where the students will carry out

observations and analysis on real samples by means of electronic microscopy.

- Special practices (0.4 ECTS: 4 hours). A visit to an analytical center, from the University of Zaragoza or from other research center, will be made.

Learning activities will be carried out face-to-face, unless due to the sanitary situation, the competent authorities and the University of Zaragoza provide to carry them out by telematic means.

### **4.3.Syllabus**

Contents are divided into three blocks:

#### **Block I)**

- Physical characterization techniques: isotropy/anisotropy characterization, textural and porosimetric characterization
- Natural variability, sampling scale and analysis scale

#### **Block II)**

- Scanning and transmission electron microscopy (SEM and TEM)

#### **Block III)**

- Spectroscopic techniques (infrared, Raman, X-ray absorption, nuclear magnetic resonance, Mössbauer)
- Thermal analysis (differential thermal analysis, thermal gravimetric analysis, dilatometry)
- Image techniques (atomic force microscopy, tunnel effect microscopy, confocal microscopy)
- Synchrotron: basis and applications

### **4.4.Course planning and calendar**

Master classes and laboratory sessions will follow the oficial Facultad de Ciencias calendar. The visit to an analytical center will be agreed by the Comisión de Garantía de Calidad del Máster and will be announced well in advance.

The precise dates of the different continuous evaluation activities will be disclosed well in advance via Moodle. June and September exams dates will be those published by the Facultad de Ciencias and will be announced well in advance

Classes will start the first school day of the 2nd semester (it will be available in the web of the Facultad de ciencias: <http://ciencias.unizar.es>).

### **4.5.Bibliography and recommended resources**

[http://biblos.unizar.es/br/br\\_citas.php?codigo=60442&year=2020](http://biblos.unizar.es/br/br_citas.php?codigo=60442&year=2020)