



Year : 2018/19

## **60442 - Characterization of geological materials: techniques and applications**

### **Syllabus Information**

<b>Academic Year:</b>	2018/19
<b>Subject:</b>	60442 - Characterization of geological materials: techniques and applications
<b>Faculty / School:</b>	100 -
<b>Degree:</b>	541 - Master's in Geology: Techniques and Applications
<b>ECTS:</b>	5.0
<b>Year:</b>	1
<b>Semester:</b>	Second semester
<b>Subject Type:</b>	Optional
<b>Module:</b>	---

### **General information**

#### **Aims of the course**

#### **Context and importance of this course in the degree**

#### **Recommendations to take this course**

#### **Learning goals**

#### **Competences**

#### **Learning goals**

#### **Importance of learning goals**

#### **Assessment (1st and 2nd call)**

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

#### **Methodology, learning tasks, syllabus and resources**

#### **Methodological overview**

The methodology followed in this course is oriented towards achievement of the learning objectives. Since it has a theoretical and applied nature, the proposed activities are focused on the understanding of the main techniques of characterization, their fundamentals and requirements, as well as their applicability to specific problems. The different activities proposed to achieve the intended learning results are:

- Lectures: 2.4 ECTS
- Laboratory sessions: 0.8 ECTS
- Case studies: 1.2 ECTS
- Special practice sessions: 0.6 ECTS

The monitoring of the learning process will be favoured through conventional tutoring and more specific tutoring related to case studies. In addition, resource material will be uploaded on the virtual platform Moodle (<https://moodle2.unizar.es/add/>).

## Learning tasks

The course includes the following learning activities:

- **Lectures:** 24 hours. The precise syllabus is specified in the next section (4.3).
- **Laboratory sessions:** 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.
- **Case studies:** 12 hours. In the different sessions the students will review and analyze the results and conclusions obtained from the application of different techniques in selected research papers. Furthermore, they will solve real problems and cases of data treatment provided by several analytical techniques. One part of the sessions will be dedicated to the students' proposals of potential applications of several techniques to their Master's Dissertation, by consulting and reviewing research papers. At least one session will be reserved for the oral presentation of their works.
- **Special practices:** 6 hours. A visit to an analytical center, from the University of Zaragoza or from other research center.
- **Preparation of the written tests:** at least 36 hours of student's autonomous work.
- **Lab sessions reports:** at least 39 hours of student's autonomous work.

## Syllabus

The course will address the following topics:

### Section I

- Scanning and transmission of electron microscopy (SEM and TEM)
- Spectroscopic techniques (infrared, Raman, X-ray absorption, nuclear magnetic resonance, Mössbauer)
- Thermal analysis (differential thermal analysis, differential scanning calorimetry, thermal gravimetric analysis, dilatometry)
- X-ray diffraction (XRD) quantification
- Image techniques (atomic force microscopy, tunnel effect microscopy, confocal microscopy)
- Synchrotron: basis and applications

### Section II

- - Electron microprobe
- - Ion microprobe
- - X-ray fluorescence
- - ICP-MS
- - Neutron activation
- - Laser ablation

## Course planning and calendar

The timetable of lectures and practice sessions will be adjusted to the official calendar provided by the "Facultad de Ciencias".

The visit to an analytical center, from the University of Zaragoza or from other research center, will be scheduled by the "Comisión de Garantía de Calidad del Máster" and will be announced sufficiently in advance.

The precise dates of the different assessment activities will be published by the "Facultad de Ciencias" and announced sufficiently in advance (<https://moodle2.unizar.es/add/> and bulletin boards).

Lessons will start on the first school day of the 2018-2019 academic year's 2nd semester (available on the Facultad de Ciencias website: <http://ciencias.unizar.es>).

## **Bibliography and recommended resources**