

Academic Year/course: 2022/23

## 60382 - Climatic changes, associated events and geologic record

### Syllabus Information

**Academic Year:** 2022/23

**Subject:** 60382 - Climatic changes, associated events and geologic record

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

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

**ECTS:** 6.0

**Year:** 1

**Semester:** Second semester

**Subject Type:** Optional

**Module:**

### 1. General information

### 2. Learning goals

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

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

#### 4.1. Methodological overview

The designed learning process will allow the students to acquire knowledge of the main causes and consequences of climate change processes, to understand the interaction among different systems, and to identify and interpret climatic proxies in the geological and biological record.

The knowledge acquired in the theory sessions is complemented with practical laboratory activities and field work, where the student will learn and demonstrate methods and analyses, and the results of their application.

The relevant learning activities are as follows:

1. Lectures (2.4 ECTS)
2. Laboratory sessions (2.2 ECTS)
3. Field work (1.4 ECTS)

#### 4.2. Learning tasks

The course includes the following learning tasks:

1. Lectures: 24 h. Detailed exposition of subjects via TIC's and active participation of students
2. Laboratory sessions: 22 h. Implementation of the working methods in the laboratory with appropriate equipment and techniques.
3. Field work: 2 journeys. Identification of relevant geological characteristics (sedimentologic, geomorphologic and paleogeographic) of pertinent study areas and implementation of study and sampling strategies appropriate for identifying characters with paleoclimatic significance.

- Autonomous work by students (87 h)

- Examination (3 h)

The teaching and assessment activities will be carried out on-site (face-to-face) unless, due to the exceptional health situation, the provisions issued by the competent authorities and by the University of Zaragoza provide for them to be carried out off-site (telematically), except for field practices.

### 4.3. Syllabus

The course addresses the following topics:

#### Theory sessions:

- 1.-Paleoclimatology: Introduction. Causes and indicators of paleoclimate change. Playing factors and scales.
- 2.-Climatic indicators
  - 2.1. Sedimentary facies with climatic implications
  - 2.2. Geomorphological indicators.
  - 2.3. Fossil fauna and flora.
  - 2.4. Geochemical indicators.
  - 2.5. Magnetic properties.
3. Analysis of climate evolution. Multiproxy approach to the sedimentary record with paleoclimatic interest.
  - 3.1. Quaternary continental records.
  - 3.2. Pre-Quaternary records.
  - 3.3. Analysis and interpretation of sedimentological, geochemical and paleogeographic data. Their application to ancient and modern sedimentary systems.
4. Climate changes and the paleontological record
  - 4.1. Bioclimatology.
  - 4.2. Analysis of paleontological records.
  - 4.3. Climatic change and evolution and extinction events.
5. Climate changes and their effects on the biota
  - 5.1. Major paleoenvironmental crises and their biotic consequences.
  - 5.2. Multiproxy analysis of climate change events across the Paleogene. Compilation of paleontological, geochemical and sedimentological data
- 6.- The Anthropocene
  - 6.1. The climate in the last millenium. The sixth mass extinction.
  - 6.2. Projections of changes in the coming years.

#### Practice sessions:

1. Analysis and interpretation of sedimentological and paleogeographic data
2. Analysis and interpretation of geochemical and paleontological data
3. Interpretation and treatment of chronological, isotopic and geochemical data from lacustrine and stalagmite records
4. Recovering and sampling of diverse sediment archives
5. Multidisciplinary evidence of the asteroid impact at the Cretaceous/Paleogene boundary
6. Multiproxy analysis across the Paleocene-Eocene transition (palaeontology, stable isotope geochemistry of bulk sediment and fossils, organic biomarkers, mineralogical composition, etc.) and interpretation

#### Field work:

- Ebro Basin: Evolution of the Miocene lacustrine and fluvio-lacustrine systems through space and time
- Quaternary fluvial and lacustrine records. Recognition and description of Quaternary fluvial and lacustrine records in Northern Spain. The Penultimate and the Last climate cycles in the Mediterranean Mountains.

### 4.4. Course planning and calendar

This course is taught during the second semester, on Monday from 16:00 until 20:00. The dates of fieldwork and examination are scheduled by university.

<https://ciencias.unizar.es/consultar-horarios>.

### 4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=60382>