

## 26427 - Geological Hazards

### Syllabus Information

**Academic Year:** 2021/22

**Subject:** 26427 - Geological Hazards

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

**Degree:** 296 - Degree in Geology

**ECTS:** 6.5

**Year:** 4

**Semester:** Second semester

**Subject Type:** Compulsory

**Module:**

## 1. General information

### 1.1. Aims of the course

The main objectives of the course include:

- Recognise the main hazardous geological processes and the geological evidence related to their activity.
- Learn about techniques and methodologies aimed at predicting the future behaviour of hazardous processes.
- Know about the main mitigation strategies and their rationale.
- Gain experience on the acquisition, analysis and dissemination of information related to geological hazards.

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

Geological risk refers to the damage caused by geological processes on the human environment, including casualties, injuries and economic losses. The main objective of the geological risk analyses is to provide adequate knowledge and tools for the efficient and cost-effective prevention or reduction of the potential social and economic risks. In the current scenario, in which the fatalities and economic losses related to natural disasters are rapidly increasing, geologists are key actors for the design and implementation of mitigation policies. The subject has an outstanding importance in the professional activity of the applied geologists and their societal service.

### 1.3. Recommendations to take this course

- Address the subject following a self-organised continuous working plan, studying the theoretical contents on a frequent basis.
- Participate in all the activities of the subject, regardless of having any attendance control or not. Note that the exams will include the recognition of geological features related to geohazards shown in slides previously projected in the theoretical lectures.
- Make use of the personal tutorials, the resources available in the electronic platform and the recommended references.

## 2. Learning goals

### 2.1. Competences

- Ability to use the main concepts and approaches used in geological risk analyses.
- Gather information on the past activity of hazardous geological processes from geological and human records
- Capability to identify in the field and using remote-sensed data evidence related to the current or past activity of hazardous processes.
- Formulate predictions on the spatial-temporal distribution and magnitude of hazardous processes, considering their degree of uncertainty.
- Be familiar with the main mitigation measures.
- Conduct cost-benefit analyses aimed at assessing the cost-effectiveness of different mitigation measures.
- Know about benchmark references dealing with geohazards.

- Communicate orally and by written documents knowledge, reasoning and interpretations related to geohazards.

## 2.2. Learning goals

- Knows about the main concepts and methods used in geohazard analysis.
- Is able to interpret the activity of hazardous processes in the past using the geological and human record. Is also able to analyse the spatial-temporal distribution of the processes and their magnitude and frequency relationships.
- Is able to produce predictions with tested reliability on the future behaviour of hazardous processes.
- Know about the main mitigation measures and is able to assess their suitability.
- Is able to transfer orally and through written documents, data, hypothesis and interpretations on problems related to geological hazards.

## 2.3. Importance of learning goals

Geological hazards cause numerous fatalities and high economic losses. Hazardous geological processes are a significant limiting factor for social and economic development in Spain and in most regions of the world. Moreover, the damage related to the activity of most geological processes (floods, landslides, earthquakes, soil erosion?) is increasing at very high rates. It is essential to design and apply risk mitigation policies with the involvement of geologists. The geologists should be able to identify the geological processes that may operate in each territory, produce reliable predictions on their spatial-temporal distribution and magnitude, and propose efficient mitigation measures, both preventive and corrective. This is a subject with a large potential for understanding and managing numerous geological problems that affect our societies. In this course within the Geology degree, special attention is paid to the assessment of hazards through the analysis of the geological record. Geological and geochronological allows to significantly expand the temporal span of the human record and improve predictions on high-magnitude and low-frequency events. Moreover, the subject is designed considering that it is highly beneficial for the students to improve their capability to gather, analyse and communicate information related to geological hazards.

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

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

- Written exam on the content of the theoretical lectures and seminars. The exam will include long- and short-response questions, as well as a test on identification of features related to geohazards in projected slides. 60% of the final mark. A minimum of 50% is necessary for passing the subject.
- Elaboration of a bibliographic work related to the theoretical program and its presentation with power point. 15% of the final mark.
- Application of methodologies related to geological risk analyses, including cartographic methods, in practical sessions. 15% of the final mark.
- Participation in the field excursions and elaboration of brief reports. 10% of the final mark.

## 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. A wide range of teaching and learning tasks are implemented, such as lectures, seminars, practice sessions, fieldwork, autonomous work and study and exam.

The design of the learning process is based on the following underlying concepts:

- The student should be able to obtain sufficient theoretical and practical knowledge to perform hazard analyses; identification and characterization of hazardous processes, hazard and risk assessment, and selection of mitigation measures.
- The student should have sufficient skills for gathering data on hazardous geological processes in the field and using remote-sensed data.
- The student should become familiar with the basic literature dealing with geological hazards, including English texts. Should be also able to communicate data, hypotheses and interpretations, both orally and through written documents.
- The student should develop part of the learning program in an autonomous way, eventually with the advice of the lecturer.
- There should be a good coordination between the theoretical and practical activities.
- The content of the course should not be restricted to the information provided during the classes. The student should also make use of the recommended bibliographic resources. Part of these resources will be available in the corresponding electronic platform.

## 4.2. Learning tasks

This course is organized as follows:

- **Lectures**
- **Seminars.** There will be two kinds of seminars:
  - Talks given by the lecturer in English
  - Oral presentations by the students.
- **Practice sessions**
- **Fieldwork**
- **Autonomous work and study**
- **Exams**

Teaching and assessment activities will be carried out on site for as long and as much as possible. This scenario could change if safety regulations related to the covid19 crisis recommended online activities.

## 4.3. Syllabus

This course will address the following topics:

- Topic 0. Introduction to the geological hazards
- Topic 1. Seismic hazard
- Topic 2. Volcanic hazard
- Topic 3. Landslide hazard
- Topic 4. Avalanche hazard
- Topic 5. Flooding hazard
- Topic 6. Subsidence hazard
- Topic 7. Soil erosion
- Topic 8. Expansive clays
- Topic 9. Hazards related to coastal activity
- Topic 10. Eolian hazards

## 4.4. Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Sciences and Earth Sciences Department websites (<https://ciencias.unizar.es>, <https://cienciatierra.unizar.es>) and Moodle.

## 4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=26427>