



## UNIVERSITY OF THE AZORES

Summer Course syllabus

### Geological Hazards

#### Duration

21 hours – indoor classes

21 hours - field trips

108 hours - study time and assessment tasks

#### ECTS

6 ECTS

#### Learning Outcomes

1. Understand the economic and social impacts of major destructive geological events and relate them with the Earth dynamics.
2. Identify the geological hazards associated with volcanic regions.
3. Understand the dynamics of seismic and volcanic phenomena in result of geological processes.
4. Understand the diversity, intensity and magnitude of geological hazards.

#### Syllabus

Students will acquire knowledge about the main concepts applied to the study of natural hazards as well as how the society is affected by natural hazards of geological origin. The occurrence of more than one hazard (cascade) is also analyzed for a broader risk assessment. The scale of impacts at local, regional and global levels is exemplified by historical cases. The geological processes associated with each hazard are introduced within the scope of the various specific topics. For each hazard, the trigger mechanisms, the effects caused by the specific vulnerabilities and the associated damages will be analyzed. Students will study the following topics:

##### 1. INTRODUCTION

- 1.1 Natural disasters and history
- 1.2 Notions on hazard and risk
- 1.3 Notions on multirisk

##### 2. GLOBAL TECTONICS AND MAGMATISM

- 2.1 The origin of the Earth and its internal structure
- 2.2 Geographical distribution and characterization of plate boundaries
- 2.3 Geographic distribution and geostructural setting of volcanism
- 2.4 The geological cycle and the main types of rocks
- 2.5 Geological setting of the Azores archipelago

##### 3. VOLCANIC HAZARD

- 3.1 Introduction to volcanology
- 3.2 Volcanic hazards

- 3.3 Eruptive history
- 3.4 Monitoring and prediction
  
- 4. SEISMIC HAZARD
  - 4.1 Introduction to seismology
  - 4.2 Quantification of seismicity
  - 4.3 Paleoseismology and historical seismicity
  
- 5. LANDSLIDE HAZARD
  - 5.1 Introduction to landslides
  - 5.2 Triggering mechanisms
  - 5.3 Monitoring and forecasting
  
- 6. TSUNAMI HAZARD
  - 6.1 Introduction to tsunamis
  - 6.2 Triggering mechanisms
  - 6.3 Paleotsunamis

## **Methodology**

Indoor classes will make use of the available resources to better demonstrate the size and the violence of geological hazards and its impacts on human activities. Image analysis (photos and videos) as well as descriptions related to important occurrences will help the students to raise their awareness about the importance of geological risks mitigation.

Field trips will allow students to identify several geological hazards, to discuss their mechanisms and to assess their impact through in-situ discussion.

## **Assessment**

Assessment is based on tests and papers carried out during the course. Papers can be written in Portuguese or English.

Papers will not be accepted after established deadlines. Students won't be granted the opportunity of exam or appeal without medical certificate.

## **References**

- ABBOTT, P.L. (2008) – Natural Disasters (7th ed.), McGrawHill.
- ALEXANDER, D. (1999) – Natural Disasters. UCL Press. 650 p.
- BELL, F. (2003) Geological Hazards: Their Assessment, Avoidance and Mitigation. Taylor & Francis; 1 ed.
- BRYANT, E. (2005) Natural Hazards. Cambridge University Press.
- DAVIDSON, R. & DAVIS (1997) - Exploring Earth – An Introduction to Physical Geology. PrenticeHall (1<sup>st</sup> edition).
- KELLER, E. A., DEVECCHIO, D. E. (2011) Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes Prentice Hall; 3 ed.
- GASPAR, J. L., GUEST, J. E., DUNCAN, A. M., BARRIGA, F. J. A. S., CHESTER, D. K. (eds.) (2015) Volcanic Geology of São Miguel Island (Azores Archipelago), Geological Society of London Memoir, 44.