

<b>POLI</b> ESCOLA SUPERIOR TECNOLOGIA GESTÃO <b>TÉCNICO</b> <b>GUARDA</b>	<b>SUBJECT DESCRIPTION</b>	<b>MODELO</b> PED.013.03
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Course	Energy and Environment					
Subject	Geology					
Academic year	2023-2024	Curricular year	2nd	Study period	1st semester	
Type of subject	Compulsory	Student workload (H)	Total: 126	Contact: 60	ECTS	4,5
Professor(s)	Ana Maria Morais Caldas Antão					
<input checked="" type="checkbox"/> Area/Group Coordinator <input type="checkbox"/> Head of Department	(select)	José Carlos Almeida				

## PLANNED SUBJECT DESCRIPTION

### 1. LEARNING OBJECTIVES

The issue of Raw Materials in the current European context of a Clean & Green Europe. Understand the importance of geology in the "environment". Know the main types of rocks and minerals and some properties and characteristics of clays. Evaluate the importance of external geodynamics processes in the modeling of terrestrial relief relating to ancient and modern geological environments. Knowing how to read and interpret geologic maps and cross-sections. Applying geological knowledge (geological process and properties of rocks) on a wide range of issues: landfills, natural hazards (earthquakes, volcanoes, floods, coastal erosion) and landslides. Acquire interdisciplinary skills and group work through research, preparation and development of geological reports.

### 2. PROGRAMME

#### THEORETICAL

- A. Practical orientation of the discipline in the scope of the course. Geologic documentation. Earth structure and the theory of Plate Tectonics. Geo-History (time and geology).
- B. Constitution of the Earth. The cycle of internal and external geodynamics processes.
- C. The concept of susceptibility, hazard and risk in natural Earth processes.
- D. Earthquakes. Seismic waves and ground failure. Seismic scales. World distribution of earthquakes. Seismic zonation in Portugal – there importance. Tectonics: types and mechanisms of deformation. Faults, joints and folds
- E. Basic knowledge of mineralogy and petrology. The clays: main characteristics.
- F. Deserts and wind action.
- G. Glaciers and glaciation. Glacier erosion and deposits.
- H. Streams and floods – the hydrologic cycle. Stream erosion, transport and deposition of materials. Hjulstrom graphic interpretation. Flooding. UE law and policy (dir 2007/60/CE).
- I. Coastal zones – waves and tides. Coastal erosion.
- J. Alteration and alterability of rock materials. Soil origin and formation.

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#### PRACTICAL

- Observation and interpretation of thematic geological maps. Elaboration of topographical and geological cross-sections and their interpretation. Determination of areas and distances in maps.
- Analysis of intensity distribution seismic maps, of seismograms and seismic risk maps; epicentre determination of an earthquake. Analysis, elaboration, and interpretation of Volcanic risk maps.
- Observation, identification and classification of rocks and minerals.
- Observation of aerial photographs in stereoscopic view and their geological interpretation.
- Assessment of flood-frequency analysis.
- Analysis of river and desert morphology using Google Earth ® data
- Observation of rock massifs: assessment of rocky slope instability in the Guarda region.
- Geoenvironmental analysis and assessment of locations for the implementation of various works
- Analysis and geological environment in the regional and land-use planning. Site evaluation and selection. Exercises about coastal evolution, rivers and dunes movements
- Laboratory determination of some rock properties: mass density, porosity, sound velocity with a wet and dry specimen, durability parameters (slake durability) and strength parameters (point Load strength ).

### 3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

This is the first approach to the area of Geosciences (s.l.), where more two UC of curricular structure of the course are integrated. For this, are provided to students, theoretical fundamentals that enable them a practical application in the scope of the course. It is intended that the student knows how to analyze and interpret geologic information - maps, geological cross-sections, etc. – as well as identify characteristics and behaviors of rock materials. Interdisciplinary skills are acquired through UC implementation, preparation and presentation of various works held in group with the aim of resolving issues proposed

### 4. MAIN BIBLIOGRAPHY

#### Mandatory

- ANTÃO, A.M. (2006) – *Algumas noções e conceitos sobre alteração de rochas*. Instituto Politécnico da Guarda. Coleção de manuais da ESTG. ISSN 1645-8281
- Professor documents.
- BLACKBURN, W. & DENNEN, W. (1994) – *Principles of mineralogy*. WCB
- F. G. BELL (1998) - *Environmental Geology*. London. Blackwell
- FOLEY, MCKENZIE & UTGARD (1999) - *Investigations in environmental geology*. New Jersey. Prentice Hall.
- GALOPIM DE CARVALHO, A. M. (1997) – *Geologia. Petrogénese e orogénese*. Universidade Aberta.
- GALOPIM DE CARVALHO, A. M. (2002) – *Introdução ao estudo do Magmatismo e das Rochas Magmática*. Âncora Editora.
- GALOPIM DE CARVALHO, A. M. (2003) – *Geologia Sedimentar. Sedimentologia*. Âncora Editora
- GALOPIM DE CARVALHO, A. M. (1997) – *Cristalografia e Mineralogia*. Universidade Aberta.
- GALOPIM DE CARVALHO, A. M. (2003) – *Geologia Sedimentar. Vol. I - Sedimentogénese*. Âncora Editora

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- GALOPIIM DE CARVALHO, A. M. (2011) – *Dicionário de Geologia*. Âncora Editora
- GOMES, C.F. (1988) – *Argilas: o que são e para que servem*. Fundação Calouste Gulbenkian
- HOLMES, A. E HOLMES, D. (1979) - *Geologia física*. Ed. Omega. Barcelona
- KEHEV, A.E. (2006) – *Geology for Engineers and Environmental Scientists*. 3<sup>rd</sup> Ed. Pearson Prentice Hall.
- MELENDEZ, B. e FUSTER, J. (1984) – *Geologia*. Paraninfo S.A. Madrid.
- MONTGOMERY, C. W. (1997) – *Environmental Geology*. McGraw-Hill. 5<sup>a</sup> Ed.
- PLUMMER, CARLSON & HAMMERSLEY (2013) – *Physical Geology*. McGraw-Hill. 14<sup>th</sup> Ed.
- REBELO, J.A. (1999) – “As cartas geológicas ao serviço do desenvolvimento”. Edição do IGM. [http://www.lneg.pt/CienciaParaTodos/edicoes\\_online/diversos/cartas](http://www.lneg.pt/CienciaParaTodos/edicoes_online/diversos/cartas)
- REGÊNCIO MACEDO, C.A. & BERNARDO SOUSA, M. (1982) – “Leitura e interpretação de cartas geológicas”. Universidade de Coimbra.

#### Optional

- ABBOTT, P. L. (1996) – *Natural Disasters*. Wm. C. Brown Publishers.
- CAMPY, M. e MACAIRE, J.J (1989) – *Géologie des formations superficielles*. Mason, Paris.
- CONTE, D., THOMPSON, D. e MOSES, L. (1997) – *Earth Science. An integrated Perspective*. McGraw-Hill
- Deer, W., Howie, R., Zussman, J. (1992) – *Minerais constituintes das rochas. Uma introdução*. Fundação Calouste Gulbenkian.
- DERCOURT, J. e PAQUET, J. (1986) – *Geologia. Objectos e métodos*. Livraria Almedina. Coimbra
- *Engineering geological maps – a guide to their preparation* (1976). The Unesco Press.
- GALOPIIM DE CARVALHO, A. M. (1997) – *Cristalografia e mineralogia*. Universidade Aberta
- KRAUSKOPF, K. B. e BEISER, A. (2000) – *The Physical Universe*. McGraw-Hill.
- Lillsand & Kieper (1978) – *Remote sensing and image interpretation*. J. Wiley & Sons
- VELHO, J.L. (2010) – “*Mineralogia industrial. Princípios e Aplicações*”. Lidel Editora

#### “Sites” recommended

- <http://www.apgeologos.pt/index.htm>
- <http://www.earth-pages.com/>
- <http://www.emsc-csem.org/index.php?page=home>
- <http://geopor.pt/>
- <http://www.geoscienceworld.org/>
- <http://www.usgs.gov/>
- <http://www.lneg.pt/>
- <https://geoportal.lneg.pt/>
- <https://www.dgeg.gov.pt/>
- <https://assimagra.pt/pt/>

## **5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)**

Expository and presentation of some case studies. Theoretical and practical exercises, analysis of maps and execution of laboratory tests are proposed. Also, field classes for presentation of relevant aspects of the subject are proposed. Evaluation is made by frequency/examination and by various types of works made in groups by students. This works, presented in the class, are valid for the frequency and normal exam, not counting for the appeal one.

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## 6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

It is intended to give to students that don't have geology in high school, some basic concepts of geology applied to the course. For this, is proposed some bibliographic and web search by submitting works to the class, where it is intended to present some national and international specialized reference sites. The laboratory classes serve to a first contact with rock materials (rocks and minerals), and for a further determination of rock properties. These are determinate through lab tests made by groups of 2 students, ending in a critical report about procedures and test results. Field classes serve as demonstration of some theoretical concepts, alerting and make aware the students to the importance of this UC in the Course in analysis, culminating with the presentation of a case-study in the scope of environmental geology.

## 7. ATTENDANCE

Attendance is strongly recommended especially in practical and field classes, but there is no mandatory minimum to be observed by students.

## 8. OTHERS

Should be respected the good standards of hygiene and safety when the student is working in laboratories, and in the field, they must have the usual care in outdoor environment.

## CONTACTS AND OFFICE HOURS

Laboratory of Geotechnics 1. [anantao@ipg.pt](mailto:anantao@ipg.pt)

## DATE

8 de novembro de 2023

## SIGNATURES

*Professor(s), Area/Group Coordinator or Head of Department signatures*

Professor

*Ana Maria Antão*

(signature)