Course Unit	Option II - Environmental Geology			Field of study	Earth Sciences								
Master in	Environmental Technology			School	School of Agriculture								
Academic Year	2022/2023	Year of study	1	Level	2-1	ECTS credits	3.0						
Type	Semestral	Semester	1	Code	1076-409-1105-01-22								
Workload (hours)	81	Contact hours	T -	TP 45	PL -	TC -	S -	E -	OT 10	O -			

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s): Tomás de Aquino Freitas Rosa Figueiredo

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Handle, at a basic level, with geological maps and map based geological data
2. Use theoretical tools provided to interpret natural phenomena focused in the selected topics (groundwater, slope stability, erosion and river sediment load
3. Identify and assess environmental risks associated to those phenomena

Prerequisites

Before the course unit the learner is expected to be able to:
Basics on Geology, Soil Science and/or Hydrology, at graduation level in Sciences or in Engineering

Course contents

I. Geology of Portugal: short overview; II. Selected topics: 1. Groundwater (concepts on Hydrogeology; use quality and environmental impacts; Portuguese Continental aquifer systems); 2. Slope satbility (concepts on Soil Mechanics; risks and implications on land use planning; slope stabilization techniques); 3. Erosion and river sediment load (soil erosion by water: processes, factors; river erosion and sediment transport; river morphology; river and catchment management)

Course contents (extended version)

1. Introduction: programme context and justification, objectives and structure
2. Part I – Geology of Portugal: brief overview Overview on the Geology, Lithology and Relief
   - Structural units of Iberian Peninsula
   - Structure and Relief of Continental Portugal
   - Geological evolution of Continental Portugal
   - Geology, Lithology and Relief of Portuguese Continental territory: a synthesis
3. Part II – Selected topics of Environmental Geology: presentation and justification
4. 2. Groundwater
   - Concepts: groundwater; aquifer (classification, descriptive parameters); water balance
   - Short description of Portuguese Continental aquifer systems
   - Water in soils and rocks: flow in porous media and Darcy law, flow descriptive parameters
   - Steady and transient flow: applications to ditches and wells
   - Groundwater use and quality, and environmental impacts
5. Slope stability
   - Basic concepts on Soil Mechanics
   - Risks and implications to land use planning
   - Slope stabilization techniques
6. Erosion and river sediment load
   - Soil erosion by water: processes and factors
   - Erosion, transport and sedimentation in river networks
   - River morphology dynamics. Applications (reservoir silting, river sands extraction)
   - River and catchment management: principles and approaches

Recommended reading

1. Ahnert, F. (1998) Introduction to Geomorphology. Arnold, London, UK.
2. Casale, R. e Margottini, C. , eds. (1999) Floods and Landslides: Integrated Risk Assessment. Springer, Berlim, RFA.
3. Lencastre, A. e Franco, A. (2006) Lições de Hidrologia, 3ª ed. , reimp. . Universidade Nova de Lisboa, Monte da Caparica.
4. Morgan, R. P. C. (2005) Soil Erosion and Conservation, 3ª ed. . Blackwell, Oxford, UK.
5. Morgan, R. P. C. e Rickson, R. J. , eds. (1995) Slope Stabilization and Erosion Control: A Bioengineering Approach. E & FN Spon, London, UK.

Teaching and learning methods

Theory lectures supported by syllabus and references provided to students at semester start. Practicals comprising supervised activities, include lab work and exercises, with guidelines provided during semester. Tutorial support for students during semester, includind exams period.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
   - Practical Work - 80% (Tasks developed in each block of the programme, weighted according to block extent.)
   - Intermediate Written Test - 20% (Complementary assessment, compulsory for students not achieving positive results in Practicals.)
2. Alternative 2 - (Regular, Student Worker) (Final, Supplementary, Special)
   - Final Written Exam - 100% (For students not selecting/fulfiling requirements of/achieving positive mark in Alternative 1.)

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

Tomás de Aquino Freitas Rosa Figueiredo	Amilcar António Teiga Teixeira	Manuel Joaquim Sabença Feliciano	Maria Sameiro Ferreira Patrício
06-12-2022	06-12-2022	08-12-2022	19-12-2022