

Academic Year/course: 2022/23

26424 - Environmental Geology

Syllabus Information

Academic Year: 2022/23

Subject: 26424 - Environmental Geology

Faculty / School: 100 - Facultad de Ciencias

Degree: 296 - Degree in Geology
588 - Degree in Geology

ECTS: 6.0

Year: 4

Semester: First semester

Subject Type: Compulsory

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 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, laboratory sessions and fieldwork.

The course has been designed to provide students with the necessary link between the theoretical knowledge and its practical use in the resolution of problems related with the Environmental Geology field.

The student will develop competences in the prevention, analysis and correction of interactions between human activities and natural systems, in terms of natural and cultural resources, environmental impacts (including impacts on geological heritage), geological hazards and environmental land use planning and management.

These approaches and objectives are aligned with the following United Nations Sustainable Development Goals (SDGs) (<https://www.un.org/sustainabledevelopment/>), in such a way that the acquisition of the results of Learning the subject provides training and competence to contribute to some extent to its achievement:

- Goal 12: Responsible consumption and production
- Goal 13: Climate Action
- Goal 14: Life under Water
- Goal 15: Life on Land

4.2. Learning tasks

This course is organized as follows:

- **Lectures** (2.8 ECTS: 28 hours). To develop the concepts and theoretical basis of the course. The course consists of three parts: Part I (Introduction), Part II (Resources: effects of human activities and its evaluation) and Part III (Environmental land-use planning and management).
- **Laboratory sessions** (2.2 ECTS: 22 hours). Two-hour laboratory sessions per week. Apply various laboratory and

fieldwork techniques for the environmental land use planning and management and for evaluating impacts of human activities.

- **Fieldwork** (1.0 ECTS). Two field trips in which the student can visit and analyses different situations where interactions between human activities and geological systems can cause impacts and geological hazards. It is also able to train in assessment of environmental land use planning and management and valuation of human activities impacts.

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

The learning activities proposed in the syllabus are structured in four parts following this sequencing of lecture & lab topics and fieldwork. This course will address the following topics:

Section I. Introduction

Lectures

- Topic 0. Introduction to Environmental Geology: concept and work lines.

Section II. Resources: effects of human activities and its evaluation

Lectures

- Topic 1. The heritage as a resource. Conservation of natural and cultural heritage sites. Management and uses. Geodiversity and paleontological sites: typology, valuation and heritage evaluation. Guidelines for heritage impacts assessment.
- Topic 2. Fauna and flora. Use of paleontological databases and techniques in environmental analysis. Applications in biodiversity analysis and conservation policies. Analysis of recent ecosystem evolution. Biodiversity response to climate changes.
- Topic 3. Water resources: development and exploitation. Pollution. Types of pollutants and toxicity. Point source pollution and non-point source pollution. Dispersion of pollutants in waters.
- Topic 4. Soil resources: human activities and soil degradation. Desertification, salinization. Soil pollution. Some basic concepts: vulnerability, buffer capacity, critical load, bioavailability. Main pollutants. Mitigation.
- Topic 5. Energy Resources: potential utilization risks. Fossil fuels, nuclear power, wind energy, hydraulic energy, tidal or wavy energy, geothermal energy, biomass.
- Topic 6. Mineral resources: environmental impact of the mining activity on the hydrosphere, atmosphere and soils. AMD prediction. Prevention and Treatment.

Practice sessions

- Topic 1. Heritage impacts assessment.
- Topic 2. Use of paleontological techniques in environmental analysis.
- Topic 3. Water balance calculations: the Aral Sea case. .
- Topic 4. Assessing of water quality for irrigation.
- Topic 5. Acid drainage prediction in mine sites.
- Topic 6. Identification of secondary minerals formed in AMD settings by means of X-ray powder-diffraction.

Section III. Environmental land-use planning and management

Lectures

- Topic 7. Definition and objectives of environmental land use planning: the role of Geology.
- Topic 8. Guidelines for spatial planning and land management at regional level.
- Topic 9. Stages in an environmental land use planning process.
- Topic 10. Environmental maps: synthetic and analytic mapping techniques.
- Topic 11. Geoenvironmental homogeneous land units: definition and mapping.
- Topic 12. Natural and geological hazards as limiting factors in the land use planning: classification and mapping.
- Topic 13. Environmental quality (vegetation cover, fauna, geological heritage and landscape) for spatial preservation: techniques and mapping.
- Topic 14. Oriented land use planning: capacity of morphodynamic homogeneous land units.

Practice sessions

- Production of geoenvironmental maps of interest in the design of environmental land use planning and management: descriptive (homogeneous land units), interpretative (geological hazards and quality conservation) and indicative (orientation and restriction) maps.

Section IV. Fieldwork (2 days)

- Local field case studies of interactions between human activities and geological systems: impacts, geological hazards and environmental land use planning and management.

4.4. Course planning and calendar

This is a first semester course. Classes will start the first academic week.

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=26424>