25202 - Introductory geology for environmental science

Información del Plan Docente

Academic Year	2016/17
Academic center	201 - Escuela Politécnica Superior
Degree	571 - Degree in Environmental Sciences 277 - Degree in Environmental Sciences
ECTS	6.0
Course	1
Period	First Four-month period
Subject Type	Basic Education
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The learning programme of this subject is based on the following distribution:

Lectures. ECTS Crédits: 3

Teching Methodology: Interactive exposition.

Practical classes and seminars ECTS Crédits: 1

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Teching Methodology: Cooperative working sessions. Environmental problems solution.

Prácticas de campo ECTS Crédits: 1

Teching Methodology: individual and group tasks during fieldwork. Environmental problems solution.

5.2.Learning activities

The programme of the subject consists of the following activities:

The activities are divided into on-site classes (40% of the subject) and personal working (60% of the subject).

On-site activities:

Lectures are given following an interactive exposition of the theoretical contents. At the end of every unit, the teacher will propose further reading/writing related with the explained geological content in order to solve environmental problems. The solution to those problems will be discussed and defended at the end of the lectures. The teacher may provide short-answer tests throughtout the lectures so as to determine the comprehension level and knowledge of the students.

Practical classes will be carried out in the laboratory and classroom. At the end of every class, the students are asked to write a short report in which they have to include the methodology and the most outstanding results. The reports will be collected and given to the teacher at the beguinning of the final exam.

Fieldwork is an important part of the subject in order to consolidate the theoretical contents shown in lectures. It has been planned a total of 2 full-day sessions and a two-days camp. Fieldtrips focus on lithology recognition, geological structure, development of geological cross-sections and the recognition of landforms. It requieres maximum dedication of the student who is asked to write a personal report that has to be given at the end of every field session.

In collaboration with the library staff, the students receive a 50 minutes explanation about Moodle digital ring and its application on the subject, and information on how to make a compulsory online course about the structure and bibliography on scientific reports. The achieved knowledge will be put into practice in an interdisciplinary tutorized group coursework (see explanation below).

Personal working activities:

This activities are thought to understand, learn and study the theorical contents explanied during the lectures with complete time flexibility.

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Lectures : The students will need to dedicate 1,5 hr per lecture in order to learn the subject contents.

Practical classes report: The students will need 0.75 hr per session. At least, the report must include the methodology and the results.

Fieldwork report: The student will need 1 hr per fieldtrip. The report must include the cross-sections, drawings and geomorphological maps.

Exams : The student will need a minimum of 15 hr to review the contents of the subject. The exam is divided into three parts. In the first one, the students have to recognise and describe images of different landsforms watched during the lectured or mapped in the fieldtrips. The second part is made up of short-answer questions. In the last one, the student has to make a geological cross-section.

Tutorized group coursework: It is elaborated in collaboration with the subject of Chemistry about an environmental problem that required to be solve as geological as quemical knowledge. It consist of four tasks:

Online Course (supported by the library staff)

Personal index and brief report

Group writing research work

Powerpoint exposition and defense of the work.

5.3.Program

Programme of Theory

UNIT I: introduction to geology

1. Introduction to Geology. History of Geology. Concepts catastrophists and creationists. Uniformitarianism of Hutton and Lyell. The models of landscape evolution of Davis, Penck and King. Geological time.

UNIT II: Structure and composition of the Earth

2. The interior of the Earth. Methods of study. Seismic waves and the structure of the Earth. Principal discontinuities of the Earth. The crust. The mantle, The lithosphere and the asthenosphere. The core. Earth materials: minerals and rocks.

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UNIT III: Minerals

3. Properties of minerals.. Minerals. Basic components of rocks. Composition of minerals. Structure of minerals. Physical properties of minerals. The crystalline form. Lustre, colour, streak, hardness, cleavage, fracture, specific gravity, Other properties of minerals. Principal mineral groups.

UNIT IV: rocks

4. The concept of rock. Igneous, sedimentary and metamorphic rocks. The geological cycles.

5. Igneous rocks. Concept of magma. Crystallization of magma. Evolution of magmas. Bowen's Series of Reaction. Magmatic differentiation. Textures: aphanitic, phaneritic, porphidic, vitreous, pyroclastic and pegmatitic. Assimilation and mixing of magmas. Origin of magmas. Types of igneous rocks.

6. Metamorphic rocks. Metamorphic environments. Factors of metamorphism: temperature, pressure and chemical activity. Metamorphic changes: textural and mineralogical. Types of metamorphism. Contact metamorphism: cataclastic and regional. Factors of metamorphism. Pizzarosity and schistosity. Typology. Classification of metamorphic rocks and principal types. Concept of metamorphic facies and mineral index.

7. Sedimentary rocks. Introduction. Definition of sediment. Types of sedimentation and types of sediments. Sedimentary environments. Properties of sediments and sedimentary rocks. Types of sedimentary rocks. Detritic rocks. Conglomerate, breccia, sandstone, limonite and lutite..Chemical rocks. Limestone, dolomites, siliceous, evaporates and carbonates. Lithification, compaction and cementation. Classification.

UNIT V.- Internal Processes

8. Plate tectonics. Continental drift. Concept of lithospheric plates and physical properties. Plate boundaries. Palaeo-magnetism. Convection in the mantle. Causes of movement. The ocean deep. Continental margins. Ocean basins and dorsals of oceanic growth. Formation of orogenies. Types of orogeny. Evolution of the continents.

9. Deformation of the crust. Rheology of the materials. Regimens of force (extension, compression and shearing), mechanisms and structures of deformation. Isostacy and variations of the lithosphere. Structural geology. Situation of a plane in space. Orientation, direction, dip and strike. Normal, reverse and transform faults. Horst and rift. Folds: anticline, syncline, monocline and recumbent.

10. Earthquakes. Cause of earthquakes, theory of elastic rebound. Parameters of earthquakes and focal mechanisms. Seismicity and plate tectonics. Seismic and tsunami risk.

UNIT VI.- External Processe s

11. Sedimentary processes. Factors of control. Concept of facies. Stratigraphy. Evolution and geological time. Classification of sedimentary environments.

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12. Water as an external agent. Global water balance. The hydrological cycle and its phases. Evaporation and condensation. Precipitation. Infiltration Run-off. The drainage basin. Morphometric analysis. Types of drainage network. Evolution of drainage basins. Base level.

13. Weathering. Importance of climate in weathering. Physical weathering. Chemical weathering. Biological weathering. Indices of weathering. Forms of alteration. Soil.

14. Karstic processes. Characteristics of karstic solution. Classification and description of endokarstic and exokarstic forms. Destructive and constructive forms.

15. Forms and processes of slopes. Hydrology of slopes. Water erosion of slopes. Concepts and basic principles en soil and rock mechanics. Slope movements. Types of fall: collapse, slides, flows and complex movements. Determinant and triggering factors.

16. The fluvial environment. Current flow. Base level, Erosion by river currents. Transport of sediment by river currents. Sediment deposition by river currents. River valleys. Meanders and river terraces. Floods and flood control. Alluvial fans. Characteristics and morphological elements. Morphometric aspects and factors of control. The environment of lakes.

17. The marine environment. Coastal processes. Waves, Tides. Drift currents. Storms. Cliffs and rocky coasts. Beaches: processes and forms. Barriers and groynes. Salt marshes, estuaries and lagoons. Deltas. Reefs of seaweed and coral. Geomorphology and variations of sea level. Continental platform. Continental slope. Pelagic deep.

18. The desert environment. Wind movement of particles. Processes and forms of aeolic (wind) erosion. Deflation and abrasion. Forms of Aeolic erosion. Deflation bowls, yardangs, regs and ventifacts. Aeolic accumulations. Dunes and ergs. Mantles of sand. Loess deposits. Palaeo-environmental aspects.

19. The Glacial environment. The glacial domain, factors and distribution. The balances of masses in glaciers. Classification of glaciers. Mechanisms of movement of glacial masses. Processes of glacial erosion. Forms of glacial erosion. Transport of particles by ice. Forms and deposits of glacial accumulation. Fluvio-glacial, glacial-lacustrine and glacial-marine accumulations.

Practical Programme (Laboratory/classroom):

- P1: Visual recognition of the principal minerals. Identification of physical properties of minerals.
- P2: Visual recognition of the principal rocks. Classification of the principal rocks.
- P3: The representation of relief: the topographic map. Scale. Surveying and levelling. Basic forms of relief. Identification of different units of landscape and modelling on the topographic map. Calculations and sections with the topographic map.
- P4-P8: Geological maps. Interpretation of GEological maps and symbolos. Dip and thickness calculation. Geological cross-sections in horizontal, dipping, folded and faulted strata.
- P9-P10. Introduction to work with aerial photographs. Exercises of photointerpretation in lithological and structural landscapes, in the fluvial environment and in the aeolic environment.

Practical Programme (Field):

- **Excursion to the Pyrenees** . 4th week (departure at 7:00 a.m. from Huesca)
- **Excursion to the Sierra de Guara Range.** 7th week (departure at 7.00 a.m. from Huesca)

- **Camp to the Ebro Depression and the Iberian Range.** 11 week (departure at 7.00 a.m. from Huesca and at 8:00 a.m. from Zaragoza).

5.4.Planning and scheduling

Tipo actividad / Semana	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Actividad Presencial																					60
Teoría	2	2	2	2	2	2	2	2	2	2	2	2	2				2	2			30
Practicas			2	2	2	2	2	2	2	2	2	2	2								20
Gabinete																					
Prácticas externas			3				2,5				5										10
Trabajos en grupo																					0
Tutorías ECTS																					0
Evaluación																					0
Actividad No presencial																					90
Trabajo individual							1	1	3	3	4	4	4								20
Trabajo en grupo							1	1	1	2	3	4	4				4				20
Estudio	1	1	1	2	2	2	2	2	2	2	2	3	6	6	8	4	4				50
TOTAL	3	3	8	6	6	11	8	10	11	18	14	15	6	6	8	10	6	0	0		150

5.5.Bibliography and recomended resources

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