COURSE DATA

Data Subject	
Code	33079
Name	Geology
Cycle	Grade
ECTS Credits	6.0
Academic year	2024 - 2025

Study (s)

Degree	Center	Acad. year	Period
1104 - Degree in Environmental Sciences	Faculty of Biological Sciences	1	Second term

Subject-matter

Degree	Subject-matter	Character
1104 - Degree in Environmental Sciences	117 - Geology	Basic Training

Coordination

Name	Department
BASTIDA CUAIRAN, JOAQUIN	200 - Geology
RENAU PRUÑONOSA, ARIANNA	356 - Botany and Geology

SUMMARY

The subject of Geology is part of the Environmental Degree, and has a direct and first grade relation with environmental issues as a natural science that it is. The subject will be explained and understood as a description of physical and chemical processes induced energy changes that result in the development of geological processes. In this sense, the subject arises with the introduction of some basic issues in the context of Geological Sciences, to continue with the endogenous geological processes of great importance in the structure and composition of the Earth's crust and in particular to continue with the genesis of the exogenous geological processes that more significant by the fact take place on the earth's surface and they have a greater role in the environment. Setting the connecting links and interrelationships between endogenous and exogenous processes and without which many problems of geology not be explained.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1104 - Degree in Environmental Sciences

- Comprender los conceptos, principios, procesos y teorías geológicas generales.
- Capacidad para identificar y valorar las características geológicas del medio físico y la descripción de materiales geológicos.
- Capacidad de evaluar, interpretar y sintetizar información geológica sobre el terreno y sobre mapas geológicos y otros métodos de representación.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

- To know the structure of the Earth and the principles and evidence on which the structural model of our planet is based.
- To know that the Earth is in a permanent evolution that is based on internal energy (thermal and gravitational) that is the origin of internal processes and another external energy that is the cause of external geological processes.
- To understand the concept of "Geological Time" and the location in space and time of the main events in the evolution of the Earth's history.
- To know how to identify the rocks and rock bodies that we find in the lithosphere.
- To understand the representation of the main lithological, structural and age features of rock assemblages, through the reading and analysis of geological maps.
- To understand how internal and external processes the source of media diversity are, and
- environmental systems that are the support of life and the cause of the physiographic features of our landscapes.
- To learn to value the elements of geodiversity as an integral part of natural diversity and appreciate geological heritage.

DESCRIPTION OF CONTENTS

1. GENERAL CONCEPTS

1. THE GEOLOGICAL SCIENCES. Definition and aims. Historical stages in the development of the Geology. The scientific method in Geology. Description, prediction and retrodiccion. Structure of the Geological Sciences. Relation of the Geology with other sciences. Environmental geology and the Environmental Sciences in relation with the Geology.

2. THE EARTH AS A PLANET. The Earth in the Solar System. The Moon. Astronomical parameters of The Earth. Origin and primitive evolution of The Earth. Shape and dimensions.

3. PHYSICAL CHARACTERISTICS OF THE EARTH. Mass and density. Gravitational field. Elipsoid, spheroid and Geoid. Isostasy. Heat and radioactivity. Thermal flow and convection. The magnetic field of The Earth. Magnetic declination and inclination. Changes of polarity. Magnetosphere. Paleomagnetism.

4. THE INTERIOR STRUCTURE OF THE EARTH. Seismology. Types of seismic waves. Reflection and refraction. Variation of wave velocities. The interior structure in layers: Crust, Mantle, and Core. Continental and oceanic crust. Composition and horizontal and vertical structure of The Earths Crust. Seismic and dynamic structure of the Mantle. Mantle hot plumes and Hot Spots. The Layer "D" or of megaliths. The external and internal Core. Comparative Information of the meteorites. Minerals: structure and properties. Rock-forming minerals.

2. INTERNAL GEODYNAMICS

5. CRUSTAL PROCESSES: I CRUSTAL DYNAMICS. Paleomagnetism in the oceanic crust and expansion of the oceanic crust. Tectonic Plates. Dynamics in the limits of plates. Plate motions and stress regimes. Oceanic ridges. Foldbelts. Volcanic arcs. Oceanic trenches. Fracture zones. Linear volcanic island chains. Cratons and tectonostratigraphic terranes. Fracturing of cratons. Triple junctions. Wilson's Cycle. The system of Western europe grabens. Saline giants.

6. CRUSTAL PROCESSES: II - STRUCTURAL GEOLOGY. Tectonic deformation. Types of tectonic deformation: folds and fractures. Elements of a fold. Types of folds. Mechanics of the folding, structures associated with the folds. Ductile deformation in conditions of metamorphism. No tectonic folds. Nechanics of the fracturation. Faults and joints. Elements of the faults. Fault slip. Types of faults. Graben, thrust faults and nappes. Saline Diapirs.

7. CRUSTAL PROCESSES: III - MAGMATISM. Definition. What is a magma? Volcanism and plutonism. Intrusive and extrusive rocks. Textures and structures of the igneous rocks. Bodies of igneous rocks. Chemical classification of the igneous rocks. Lava flows. Pyroclastic deposits.

8. CRUSTAL PROCESSES: IV - METAMORPHISM. Definition. Factors of the metamorphism. Metamorphic processes. Grade of metamorphism. Metamorphic minerals. Types of metamorphism. Metamorphic textures: slate fabric, cleavage and schistosity, gneíss, cataclasite, mylonite. Series of regional metamorphism: facies and metamorphic rocks.

3. EXTERNAL GEODYNAMICS I

9. SURFACE PROCESSES AND ENVIRONMENTS: I WEATHERING AND SOILS. External Earth processes. Earth-surface environments. Erosion and weathering. Processes of weathering. Products of weathering. Soil-forming factors. Soil profile. Paleosols. Pedocal, pedalfer, laterites i bauxites.

10 SURFACE PROCESSES AND ENVIRONMENTS: II - SEDIMENTARY ENVIORNMENTS. Contexts, processes and products. The energy that drives the processes of the Earth-surface geodynamics. Sedimentary basins. Transport mechanisms. Traction, saltación and suspension. Gravitational processes. Types of gravitational processes. Sedimentary load. Processes of sedimentation and types of sediments. Litification and diagenesis. The sedimentary rocks: Clastic, carbonates, evaporites, siliceous, phosphates, iron-aluminium ores, coal and oil. Stratification and lamination. Forms of sedimentary bodies. Sedimentary facies. Sedimentary structures. Sedimentary systems and environments: nonmarine, transitional, marine.

11 SURFACE PROCESSES AND ENVIRONMENTS : III GLACIAL, FLUVIAL and ALLUVIAL, EOLIAN AND LACUSTRINE ENVIRONMENTS. Present-day glaciersys. Types of glaciers. Glacier flow. Erosion and transport. Glacial sediments. The shape of landscape in glaciated areas.Glacial theory and Quaternary glaciations. Glacier Theory and Quaternary glaciations. Causes of glaciations.
Fluvial and alluvial enviornments. Definition. Types: colluvium, alluvial fans, braided rivers, meandering systems and anastomosed rivers. Environments and sub-environments. Processes of transport and sedimentation. Sedimentary forms.
Eolian enviornment. Definition and location. Processes of erosion, transport and sedimentation by wind. Desert pavement. Yardangs. Ripples of adhesion and dunes. Types of dunes. Loess.
Lacustrine environment. Definition and types. Classification of lakes. Property of the waters. Oxygen and nutrients. Temperature and density of lake waters. Water movement. Lacustrine sedimentation.

4. EXTERNAL GEODYNAMICS II

12 SURFACE PROCESSES AND ENVIRONMENTS: IV - UNDERGROUND WATERS AND THE KARST
Underground waters. Infiltration. Vadose and phreatic zones. Porosity and permeability. Aquifers. Groundwater flow. Groundwater withdrawal. The groundwaters as resource. Saltwater intrusion. Pollution of underground waters .
The Karst. Karstic landscapes. Endokarst and exokarts. Karst determinig factors. Dolina, uvala poljé. Caves. Speleothems. Clima, underground water table and karstic solution. Karst evolution.

13 SURFACE PROCESSES AND ENVIRONMENTS: V CLASTIC SHORELINES, DELTAS, TIDAL FLATS AND ESTUARIES. The shape of the coast. Changes of the sea-level. Sea-level Systems tracts. Classification of coasts.
Beaches. Subenvironments of a beach. Seasonal dynamics of a beach. Barrier-islands . The lagoon. Tidal inlets, ebb and flood deltas. Washover fans.
Deltas and fan-deltas. Environments of a delta: delta plain, delta front and prodelta. Types of deltas.
Tidal flats. Suptatital, intertidal and subtidal zones.
Estuaries. Types of estuaries.

14 SURFACE PROCESSES AND ENVIRONMENTS: VI. MARINE ENVIRONMENTS. Holocene coral reefs. Controlling influences for the development reefs on the open sea. Types of reefs. Reefal environaments. Coral zonation in a modern reef.
Shallow siliciclastic seas. Shelf sedimentation. Submarine canyons. The continental slope. Oceanic canals. Deep-sea fans.

5. THE GEOLOGICAL TIME. REGIONAL AND ENVIRONMENTAL GEOLOGY.

15 GEOLOGICAL TIME. The geological record. Nature of the stratigraphic record. Geological time (physical time, stratigraphical time, historical time). Transgressions and regressions. Walther's Law. Unconformities. Types of unconformities. Gaological age-dating. Absolute and relative dating. The time in unconformities. Geochronology and chonostratigraphy. The geologic time chart.

16 REGIONAL GEOLOGY. Geology of Spain. Orogenies: Cadomian, Variscan and Alpine. Alpine fold-belts. Cenozoic basins and volcanic fields. Tectonostratigraphic domains in the Iberian System and in the Betics. Catalánides, Aragonese Branch, Linking Zone, Castilian - Valencian Branch. The Prebtic. Evolution of the Iberian System and the Betics.

17 ENVIRONMENTAL GEOLOGY. Geological hazards. Environmental impact of the mining labors and extraction of hydrocarbons.Waste disposal. Underground storage of compressed air, natural gas and CO2. Geological perspective of Climate Change. Geodiversity and geoheritage. Conservation and interpretation of the geodiversity. Geoturism.

6. PRACTICES

1-Macrocospic recognition of igneous, metamorphic and sedimentary rocks, on the basis of its composition, textures and structures
2-The geological map
2a Types of geological maps (litologic, estructural, facies, sedimentary environments, geomorphologic, hydrogeologic, ...etc). Keys: lithology, age and structure.
2b- Geological cross-sections.
Horizontal beds. Contacts, thickmess of a unit.
Folds-I: monoclines. Strike and dip.
Folds-II: synform and antiform (syncline and anticline,
overturned folds).
Faults: normal faults, overthrusts, nappes.

2c- Stratigraphic unconformities.
2d- The mapping of igneous rocks.
2e- Diapirs.
3- Description of the geological history of a map.
4- Field practice.

7. Tutorials

Six offers, to choosing three:

1- Program of literacy in Geology

2- Plate tectonics. Cratons, foldbelts and terranes.

3- Mineral resources

4- Igneous rocks bodies. Plutons, dikes and sills.

5- Strike-slip faults and shear, pull-apart basins, transcurrence, transformation faults

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	36,00	100
Laboratory practices	21,00	100
Tutorials	3,00	100
Attendance at events and external activities	3,00	0
Development of individual work	5,00	0
Study and independent work	37,00	0
Readings supplementary material	10,00	0
Preparing lectures	21,00	0
Preparation of practical classes and problem	14,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The knowledge, that the student must acquire in this subject, will be acquired throughout the course through of different activities, such as:

- Theoretical master classes
- Laboratory practice classes
- Theoretical and practical exams
- Field trips

EVALUATION

Theory:

- The assessment of learning will be done through a written exam with reasoning questions. Participation in the final grade: 70%.
- There will be a control of attendance at face-to-face activities, necessary to pass the subject.

Practice:

- Resolution exam of a geological map. Participation in the final grade: 20%
- Rock recognition exam. Participation in the final grade: 10%

To pass the subject, each of its parts (theory, maps and rocks) must be passed individually.

In the event of an unforeseen circumstance that alters the normality established in the teaching process, the evaluation will be of the theory topics taught and the practices carried out, maintaining proportionality in the grade of 7 points (theory) and 3 points (practice). Depending on the circumstances, it may be planned to carry out a continuous evaluation by topics or blocks of topics and the realization of bibliographic works.

REFERENCES

Basic

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