COURSE DATA

DATA SUBJECT

Code: 33079
Name: Geology
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1104 - Degree in Environmental Sciences	Facultat de Ciències Biològiques	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1104 - Degree in Environmental Sciences	Geology	BASIC

COORDINATION

RENAU PRUÑONOSA ARIANNA

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 / LEARNING OUTCOMES

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Capacidad de evaluar, interpretar y sintetizar información geológica sobre el terreno y sobre mapas geológicos y otros métodos de representación.

Capacidad para identificar y valorar las características geológicas del medio físico y la descripción de materiales geológicos.

Comprender los conceptos, principios, procesos y teorías geológicas generales.

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 Earth¿s 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. INTERNAL GEODYNAMICS: III. MAGMATISM
Definition. What is magma? Bowen¿s Reaction Series. Volcanism and Plutonism. Plutonic and Volcanic Rocks. Textures and Structures of Igneous Rocks. Igneous Rock Bodies. Chemical Classification of Igneous Rocks. Lava Flows. Volcanosedimentary Rocks.

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- Macroscopic identification of igneous, metamorphic, and sedimentary rocks based on their composition, textures, and structures.

2- The geological map. 2a- Types of geological maps (lithological, structural, facies, sedimentary environment, geomorphological, hydrogeological, etc.). Interpretation: lithologies, ages, structures. 2b- Geological cross-sections. Representation of horizontal strata. Contacts; thickness of a layer. Representation of fold structures I: monoclinal folds. Strike and dip. Bedding plane traces. Usefulness for

identifying basic stratigraphic parameters. Representation of fold structures II: synforms and antiforms; synclines and anticlines; overturned structures. Representation of fracture structures III: fractures and faults normal faults, reverse faults, thrust faults, and nappes.
2c. Stratigraphic unconformities. 2d- Representation of igneous rock bodies.
2e. Diapirs.

3- Description of the geological history represented in a map.

4- Fieldwork practice.

7. Tutorials

Real-world issues and current events that impact the fields of geology and the environment are addressed. These case studies promote critical analysis and the application of scientific knowledge in concrete and dynamic contexts, at local, regional, and global scales.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	3,00
Theory	36,00
Laboratory	21,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	3,00
Individual or group project	5,00
Independent study and work	47,00
Preparation of lessons	35,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**90,00**

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:
Student learning will be assessed through a written exam consisting of reasoning-based questions. Contribution to the final grade: 70%.

Practical Work:

- Examination involving the interpretation of a geological map and related cartography. Contribution to the final grade: 20%.
- Rock identification exam. Contribution to the final grade: 10%.

In addition, attendance at in-person activities will be monitored and is a mandatory requirement to pass the course.

To pass the course, students must pass both the theoretical and practical components independently.

In the event of unforeseen circumstances that alter the normal development of the course, evaluation will be based on the theoretical topics covered and the practical sessions conducted, maintaining the proportional grading structure: 7 points for theory and 3 points for practical work. Depending on the situation, continuous assessment by topics or thematic units, as well as bibliographic assignments, may be implemented.

REFERENCES

- Tarbuck, E.J. y Lutgens, F.K. 2013. Ciencias de la Tierra. Una introducción a la Geología Física. Pearson, 848 pp., Madrid.

- Bastida, F. 2005, Geología. Una visión moderna de Las Ciencias de La Tierra. Volumen I, Ediciones Trea, 974 pp. Gijón.

- Bastida, F. 2005, Geología. Una visión moderna de Las Ciencias de La Tierra. Volumen II, Ediciones Trea,

1.031 pp. Gijón.

Monroe, J.S., Wicander, R. Y Pozo, M. (2008): Geología: Dinámica y evolución de la Tierra. Ed. Paraninfo. 726 pp.

- Gutiérrez Elorza, M., 2008, Geomorfología. Pearson-Prentice-Hall. ISBN: 978¿84¿8322¿389¿5

- Montgomery, C. M., 2014, Environmental Geology (11th). McGraw-Hill. ISBN: 978¿1¿260¿85397¿1

- J. A. Vera. (Ed.) 2004, Geología de España. Sociedad Geológica de España e IGME. Madrid. ISBN: 978¿84¿7840¿546¿6

- Pozo Rodriguez M., González Yélamos J. y Giner Robles J.L. (2004). Geología Práctica: Introducción al reconocimiento de materiales y análisis de mapas. Pearson Prentice Hall. ISBN: 978¿84¿205¿3908¿9

- Guerra Merchán, A. 1994. Mapas y cortes geológicos: interpretación y resolución de problemas geológicos. CEP-Málaga, Junta de Andalucía. ISBN: 978¿84¿86974¿35¿0